



# Sun StorageTek Virtual Tape Library

VTL Plus 2.0 Update 1

**User Guide**

96267

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July 2009





# Virtual Tape Library

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## VTL User Guide (Plus 2.0 Update 1)

Sun Microsystems, Inc.  
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# Revision History

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| VTL User Guide | 96267  |          | Nov 2006  | Base document supplied by the vendor.      |
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|                |        | G        | May 2008  | Revised for VTL Plus 2.0 Update 1.         |
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# About this book

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This book introduces tape virtualization and guides you through the administration of Sun StorageTek Virtual Tape Library (VTL) solutions, including VTL Plus 2.0 and VTL Value systems. It starts with a high-level explanation of VTL technology, common deployment architectures, and special features. It then provides detailed instructions for carrying out the tasks common to VTL administration according to Sun VTL best practices, including:

- SAN zoning
- using the VTL Console graphical user interface (GUI) and installing copies on management stations
- administering local area network (LAN) connections
- designing, creating, and managing virtual libraries and virtual tapes
- using special features like automatic tape caching, automatic tape archiving, and tape replication
- using encryption and data compression features to best advantage
- handling failback after a high-availability system has failed over
- reporting
- configuring and using email notifications

Finally, appendices provide additional information that, while not essential to a normal installation, may prove useful in special circumstances.

The document is *task-oriented*, organized around the work you have to do rather than around the features or components of the product. Each chapter and section begins with a list of the tasks it contains. Tasks are presented in order, and the steps in each process are numbered, in the sequence in which they are to be performed. Conditional steps (steps that you perform only in specified circumstances) begin with the condition (“If A ...”) and end with the corresponding action (“... do B”); if the condition does not apply, you simply skip the step. Each task ends with a reference to the next task in the sequence:

**Next task:** “Installing ...” on page 3.

When the setup process branches, the task ends with conditional alternatives:

**Next task:**

- If the customer does not plan to run the management console from a host on the local area network (LAN), press *Skip*, and go to the next task.
- Otherwise, carry out the procedure “Configuring the Ethernet LAN” on page 57.

When you have finished a sequence of tasks, this is clearly noted:

**Stop here.**

To minimize the time you spend switching between publications or between major sections of the document, we have made an effort to avoid cross references to external information wherever possible. If you need to have a figure, a table, or a procedure, it should always be, at worst, on a neighboring page.

## Taking advantage of this book’s hypertext features

If you choose to view this book online, rather than in printed form, you can jump quickly to any part of the book by clicking on the corresponding entry under the *Bookmarks* tab on the left side of the Adobe Acrobat interface. In addition, clicking on entries in the table of contents, cross references, or references to subsequent tasks will take you directly to the indicated part of the document. You can then use the back arrow on the Adobe Acrobat Reader to return, if desired, to the point you left. In addition, clicking on most Uniform Resource Locators (URLs) and on most references to online resources will open your default web browser to the corresponding web page, so that you can, if necessary, obtain a required download immediately (be aware, however, URLs to specific pages change frequently and may not always be accurate).

## Understanding the conventions used in this book

The table below illustrates the conventions that represent literal and variable values, commands, and property names in this book.

| Convention                           | Meaning                                                                                                                                                             | Examples                                                                                                      |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| <code>AaBbCc123</code>               | Fixed-width text is used for literal values, including names of commands, files, directories, literal computer inputs/outputs, and Uniform Resource Locators (URLs) | Edit your <code>.login</code> file.<br>Use <code>ls -a</code> to list files.<br><code>% You have mail.</code> |
| <i>AaBbCc123</i><br><i>AaBbCc123</i> | Oblique text is used for variables that stand for real names or values and for book titles.                                                                         | To delete a file, type:<br><code>rm filename.</code>                                                          |
| <b>ABCD</b>                          | Bold, san-serif text indicates callouts in illustrations.                                                                                                           | Click <code>Submit</code> ( <b>A</b> below).                                                                  |
| 1.                                   | Numbered paragraphs indicate steps in a process that should be executed in sequential order.                                                                        |                                                                                                               |
| ■                                    | Bulleted paragraphs indicate lists of alternatives or components.                                                                                                   |                                                                                                               |
| <code>[VTL_Plus]#</code>             | a commandline prompt                                                                                                                                                |                                                                                                               |

## Obtaining the latest information and supporting resources

The Sun StorageTek Support portal <[www.support.storagetek.com](http://www.support.storagetek.com)> provides links to the latest documentation, software updates, and licensing resources for VTL Plus solutions. Always check the portal for updates to this document before proceeding. Documents distributed on CDROM may not reflect the latest changes to VTL hardware, software, and services.

## Commenting on this book

Sun welcomes your comments and suggestions for improving this book. Contact us at [glafs@sun.com](mailto:glafs@sun.com). Please include the title, part number, issue date, and revision: *VTL User Guide (Plus 2.0 Update 1)*, part number 96267 (July 2009 Revision GG).



# Introduction: VTL appliances and enterprise data-protection

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Sun StorageTek VirtualTape Library (VTL) technology makes the benefits of disk-to-disk-to-tape architecture available to complex backup environments that cannot readily accommodate the disruptions and administrative burdens that often accompany major changes to information-management environments and processes. VTL solutions make disk media available to applications that are configured to work with tape. VTL software presents your existing tape-centric backup architecture with what appear to be familiar tape libraries, drives, and data cartridges while managing the complexities of the implementation—disk arrays, RAID groups, and logical volumes—internally.

Such transparency is absolutely critical when backup is just one aspect of an enterprise-wide business-continuity plan. When legacy systems and multiple, interdependent applications, procedures, policies, and/or service providers are involved, even modest changes to a backup architecture can have unforeseen, far-reaching consequences.

The advantages that disk-to-disk backup has to offer are no less critical in complex environments. Heavy workloads, tight schedules, and multiple dependencies often make backup windows very tight or non-existent. Jobs that fail to complete cannot, in most cases, be retried. Tape-based backup systems perform well when handling big jobs, like full backups of large files and file systems that can stream large amounts of sequential data. But much of the current backup workload consists of intermittent, essentially random I/O—incrementals, full backups of heterogeneous small servers and workstations, and small files (such as those associated with email systems). Tape drives perform poorly under these conditions. But disk-based storage is ideally placed to handle this type of I/O.

The remainder of this chapter provides:

- a brief summary of VTL “Features” on page 2
- a detailed discussion of the “Advantages of VTL tape virtualization” on page 4
- a more in-depth look at selected, “Key VTL features and options” on page 8.

---

# Features

The Sun StorageTek VTL solution has the following features:

- Emulation of most widely used tape libraries, drives, and media types, including the latest Sun StorageTek T10000-series drives and media
- Dynamic allocation of disk capacity

VTL software can allocate disk space to virtual tapes in 5-GB increments, up to the full, rated capacity of the emulated media. This minimizes wasted space, provides natural load balancing, and optimizes the performance of the disk array.

- Auto Archive feature

The Auto Archive option writes data to physical tape whenever a backup application or utility moves a virtual tape from a virtual library to an import/export slot. The physical tape library must support barcodes: the VTL software has to find a matching barcode in the physical library in order to export a virtual tape to a physical cartridge.

- Replication of tapes to local and remote VTL systems

VTL software supports manual copying and both event- and policy-driven automatic replication methods.

- Automated Tape Caching option

With the optional tape-caching feature, VTL software can automatically save a single virtual volume with a single barcode in two physical forms, one on disk and one on physical tape. The tape-caching feature manages retention and migration of the physical images, under the control of user-specified policies and schedules. This lets users keep space in the disk cache free for new backup sets while retaining the tape images of older virtual volumes. When a virtual volume no longer resides in the disk cache, a pointer in the cache seamlessly redirects requests to the tape image.

- High availability option

An optional, high-availability configuration provides intelligent failover, with duplicate, self-monitoring VTL server nodes and redundant, primary and standby paths between backup applications and VTL data.

- Encryption and secure data destruction

To ensure that the data that you export to physical tape is confidential and secure, VTL offers a Secure Tape Option that uses the Advanced Encryption Standard (AES) algorithm published by the National Institute of Standards and Technology, an agency of the U.S. government.

The Shred feature insures military standard, secure data destruction by overwriting virtual tape with random bit patterns. Data destruction jobs are queued so that the shred process does not have an excessive impact upon performance.

- Data compression

Sun VTL Plus 2.0 supports both software-based and hardware-based data compression.

Both data-compression technologies offer similar functionality. Both are based on the LZO algorithm. When necessary, either can increase the amount of data that will fit on a virtual tape of a given capacity. Compression ratios can approach 2:1 for data sets made up of highly compressible file types, such as plain text and uncompressed bitmapped images (incompressible file types, such as ZIP archives, GIF images, and JPG images reduce the attainable compression proportionately).

However, the optional VTL Plus 2.0 compression hardware offers significantly higher throughput performance compared with the software-only approach. Specialized ASICs (application-specific integrated circuits) on the optional compression cards perform the calculations that software-only solutions must perform on the system CPU.

- Support for Sun StorageTek ACSLS and Library Station library-management software

ACSLs and Library Station support makes a high degree of integration possible between VTL solutions and complex enterprise storage environments that include large libraries with multiple partitions and mixed open systems and mainframe systems. Sun VTL virtual libraries can cache or copy tape volumes to storage pools on shared, ACSLS-managed libraries. Alternatively, ACSLS can be configured to manage virtual libraries.

- Email notifications

The VTL email alerts feature monitors an extensible set of pre-defined critical system functions and automatically notifies a local system administrator by email. You can extend or modify the CallHome monitoring scripts to customize monitoring for your needs.

- X-ray diagnostics

The X-ray feature combines snapshots of the current state of the appliance, its configuration, and its environment with system event logs and saves the result in a standard, tape-archive (tar) format.

Key VTL features are discussed in more detail later in this chapter.

## Advantages of VTL tape virtualization

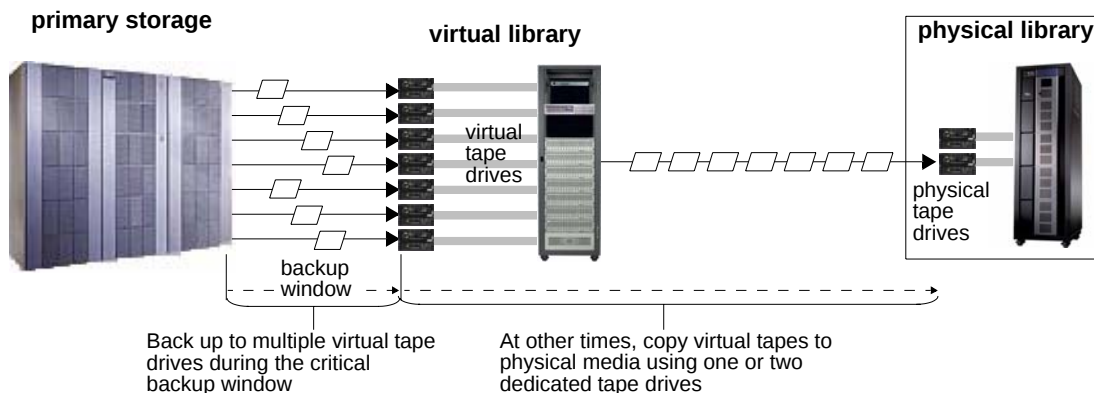
Adding Sun StorageTek VirtualTape Library appliances to an existing tape-based backup architecture can thus realize the following advantages:

- “Shorter runtimes and reduced dependency on backup windows” on page 4
- “Shorter run times for non-sequential backup jobs” on page 5
- “Improved reliability” on page 5
- “Better utilization of tape subsystems” on page 5
- “Larger, more flexible libraries” on page 6
- “Compatibility with ACSLS management software” on page 6
- “True tape virtualization with dynamically allocated disk space” on page 7.

### Shorter runtimes and reduced dependency on backup windows

VTL appliances can handle a narrow backup window by using numbers of virtual drives operating in parallel, something that would be highly impractical with physical tape drives. In this way, the critical, first copy of the primary data is reliably transferred to disk-based virtual tape in minimum time. Thereafter, vaulting software and/or VTL tape-caching features can copy the backup from virtual to physical media using a smaller, more economical number of physical drives. See the figure below:

*Multiple virtual drives speed backup during the critical backup window*



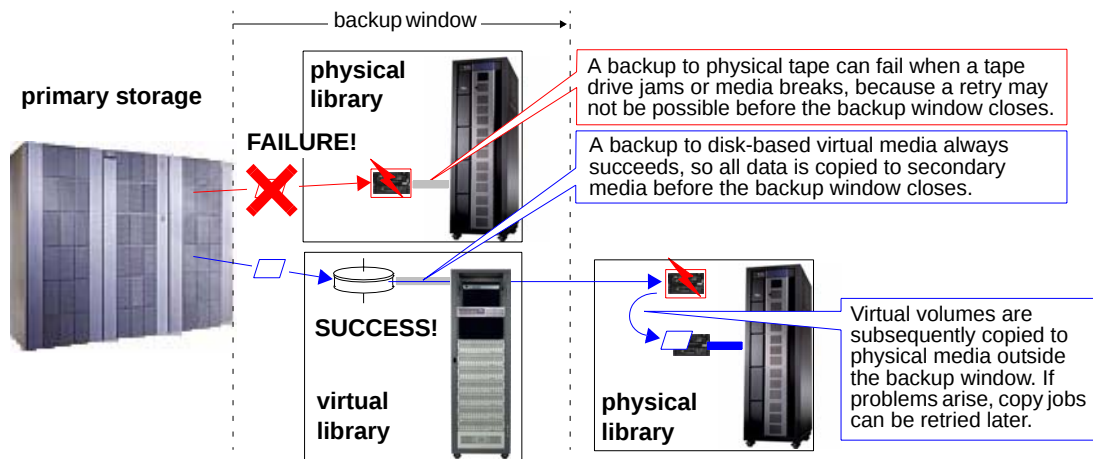
## Shorter run times for non-sequential backup jobs

Disk-based VTL systems reduce run time when storage operations are poorly matched to the operational characteristics of tape backup systems. Properly configured, streaming tape backups achieve transfer rates that are as high as or higher than those attainable by disk technology. But many common jobs—such as incrementals and full backups of workstations—produce semi-random I/O. Non-sequential I/O keeps tape drives busy mounting, unmounting, and positioning media, greatly reducing throughput. Disk-based secondary storage is much better suited to these semi-random backup jobs.

## Improved reliability

Disk-based VTL systems can significantly increase the reliability of the backup process. Backup jobs are more likely to succeed the first time, because the critical step—the creation of a copy of the data—is a simple, fast write to a RAID subsystem. Jammed tapes, lack of ready media, and off-line drives no longer ruin jobs. See the figure below:

*Backup is more reliable with virtual tape libraries*



## Better utilization of tape subsystems

Disk-based VTL systems can improve utilization, performance, and reliability of tape-storage subsystems. When non-sequential I/O is backed up to disk, tape can be reserved for sequential jobs that can stream a physical tape drive. Large-scale full backups can, for instance, go directly to tape, insuring maximum performance. Jobs

that produce intermittent or non-sequential I/O, such as incrementals and backups of work stations, are copied to tape only after they have been backed up to disk and incorporated into large, sequential backup sets. This approach uses tape drives continuously, at close to their maximum throughput. The drives spend less time idle, since they mount and reposition less often. Fewer drives and tapes are needed for a given workload. Devices and media suffer less wear and tear.

## Improved utilization of backup media

Tape virtualization lets you create emulated tape volumes that are more closely sized to the average size of your backup media. If you do not decide to use tape caching (see “Automated Tape Caching” on page 12), you set the maximum capacity of your virtual tapes to 50-60 GB or to the average size of your backup jobs (whichever is larger). This approach minimizes wasted space in the critical disk cache, where the first copy of each backup job is stored, and makes a maximum number of cartridges available for backup jobs at any given time. Your copy/vault software can then consolidate these smaller volumes onto full-sized physical tape cartridges outside the backup window. If you also enlarge the size of the library, as described below, you can accommodate a larger total number of these smaller virtual tapes.

If you adopt tape caching, you cannot size virtual tapes this way, since, as we shall see, the disk and physical-tape images of the virtual tape must be logically identical.

## Larger, more flexible libraries

The Sun VTL virtual library faithfully emulates a Sun L700 physical tape library. But, while the L700 has 678 slots, the Sun VTL can have up to 64000 in a non-tape caching solution, depending on the backup application (see “Automated Tape Caching” on page 12). This is a particularly important consideration if you improve media utilization by reducing the size of your virtual tape volumes, as described above. One large virtual library can, on its own, serve all the needs of a backup application master server.

## Compatibility with ACSLS management software

Tape virtualization lets you control disk-based virtual libraries with the same industry-standard, Sun ACSLS software that controls physical tape libraries. ACSLS adds an additional virtualization layer to your backup environment, further reducing disruptions to established infrastructure and policies while, at the same time, bringing new capabilities.

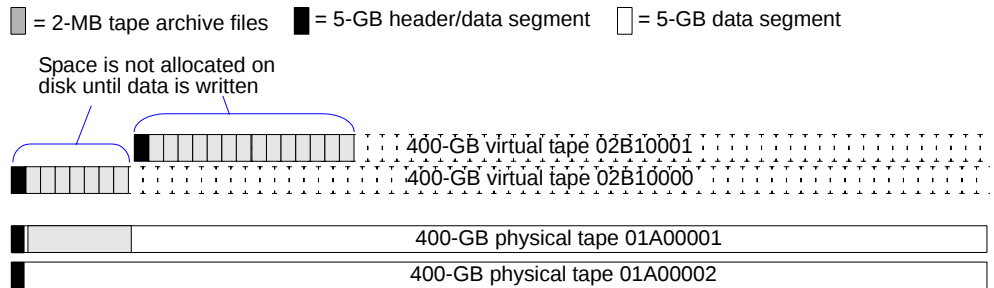
Operating systems and backup applications that currently interact with a physical library via ACSLS continue to use ACSLS when accessing VTL virtual libraries. ACSLS further hides the particulars of disk-based tape virtualization behind a standard, well-known interface.

This ability to mask the library implementation from client applications and operating systems lets ACSLS make disk-based tape-virtualization available to platforms that could not otherwise support it. Platforms that do not support SCSI passthrough library control, such as Unisys, Tangent, and mainframe operating systems, can back up to Sun VTL virtual libraries using ACSLS.

The more powerful, more specialized library-control functionality of ACSLS improves the availability of suitably configured VTL solutions. The brief SCSI path interruptions that may accompany failover and failback are less likely to interfere with the backup application, because ACSLS retries the connection aggressively enough to restore the path.

## True tape virtualization with dynamically allocated disk space

Correctly configured, dynamically sized virtual tape volumes provide the highest capacity and performance. When tapes are created with the VTL Capacity On Demand feature enabled, the VTL software allocates space as data is written to disk rather than all at once. For instance, a physical tape with a capacity of 400-GB can be emulated without allocating any space initially, and thereafter enlarged as needed in 5-GB increments (see the figure below).



This approach to space allocation has two major advantages. First, it minimizes wasted disk capacity. Second, and perhaps more importantly, it maximizes array performance and reliability. Dividing data into multiple segments distributes it more evenly across the array, involves more volume groups in each I/O, and reduces the average length of each seek during I/O.

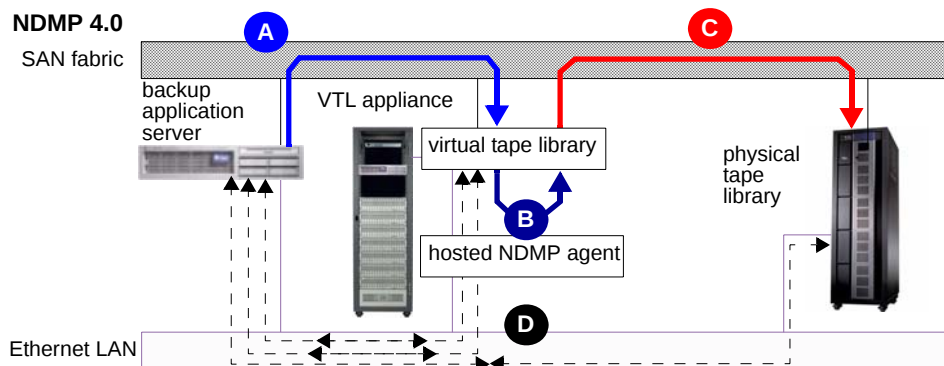
## Key VTL features and options

- “NDMP migration” on page 8
- “VTL high-availability option” on page 9
- “Automated Tape Caching” on page 12
- “Virtual tape replication” on page 12
- “VTL Secure Tape encryption option” on page 15.

## NDMP migration

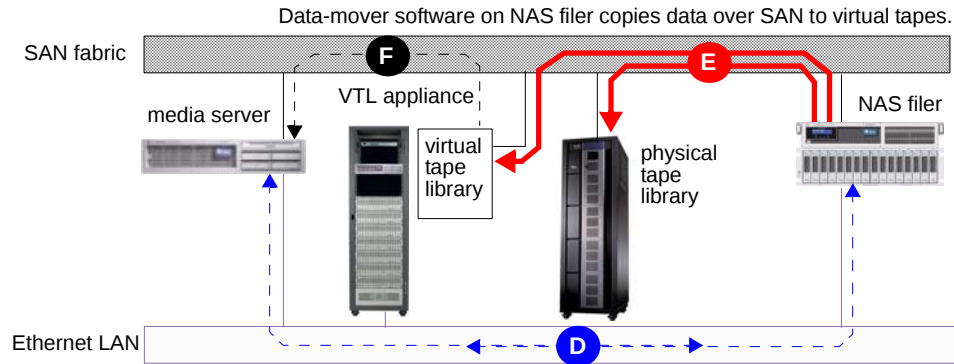
Backup applications that support Network Data Management Protocol (NDMP) 4.0 with Sun VTL virtual libraries can mount virtual tapes on a suitably configured VTL Plus 2.0 server, copy them to physical media, and track copies using backup application management databases. The backup application backs up data across the SAN, creating the critical first copy on VTL virtual tape (**A** below). The backup application then mounts the virtual tapes to an NDMP agent hosted on the VTL server (**B**) and copies them over the SAN to physical media (**C**) by sending NDMP command and control information across the Ethernet LAN (**D**).

To take advantage of this functionality, you must enable the VTL Plus 2.0 Hosted Backup and NDMP options.



Note that the Sun VTL Plus Hosted Backup and NDMP options are not required when backing up a Network Attached Storage (NAS) filer to a VTL appliance. In this instance, the NAS filer is simply a backup client. The backup application server

controls NDMP agent software on the filer (**D** below). This agent software copies data from the filer over the SAN to virtual tape volumes (**E**) mounted by the backup media server (**F**), so no software has to be hosted on the VTL appliance.



## VTL high-availability option

In a VTL high-availability system, intelligent self-monitoring software, redundant hardware, and high-availability LAN and SAN configurations protect both the data path and your ability to manage storage. To help you to better understand the steps in the failover configuration process, this section provides a high-level description of the three key components of the high-availability VTL solution:

- “Server node failover” on page 9
- “Management path failover” on page 10
- “Storage path failover” on page 11.

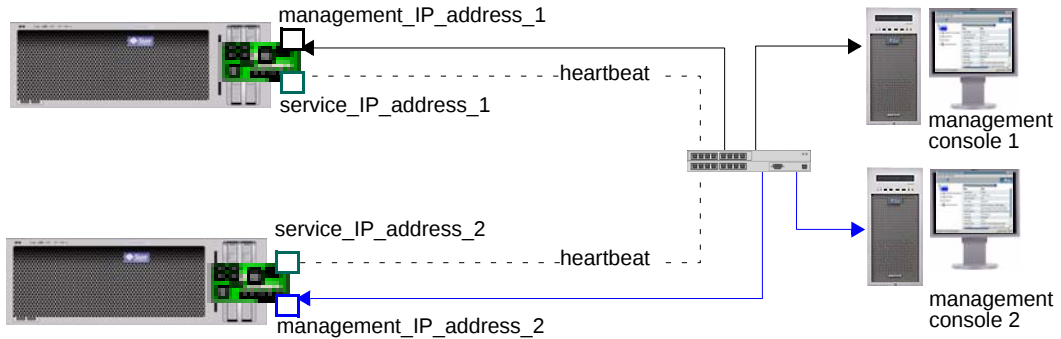
### Server node failover

The Sun StorageTek VTL high availability option uses two server nodes, each configured to monitor its companion. Each member of the pair serves as the primary server for its own storage clients and as the secondary, standby server for those of its companion. To protect against server failures, each server sends heartbeat information to its secondary using a service IP address. If heartbeat information indicates a fatal error in a companion server’s processes, the healthy server notifies its companion that it is assuming primary server responsibility for both sets of clients and initiates failover. If the heartbeat information stops altogether, the healthy server immediately initiates failover. Finally, if a primary server’s own, self-monitoring routines detect a storage device connectivity failure and cannot determine if the failure is local, the primary reports the failure to its companion via the heartbeat signal. If the companion, secondary server can access all devices,

including the device in question, the failure is local to the primary, and the secondary initiates failover. If the secondary cannot access devices, the outage is global, and no failover occurs.

Service IP addresses carry heartbeat information between VTL nodes and management IP addresses carry commands between nodes and VTL management consoles

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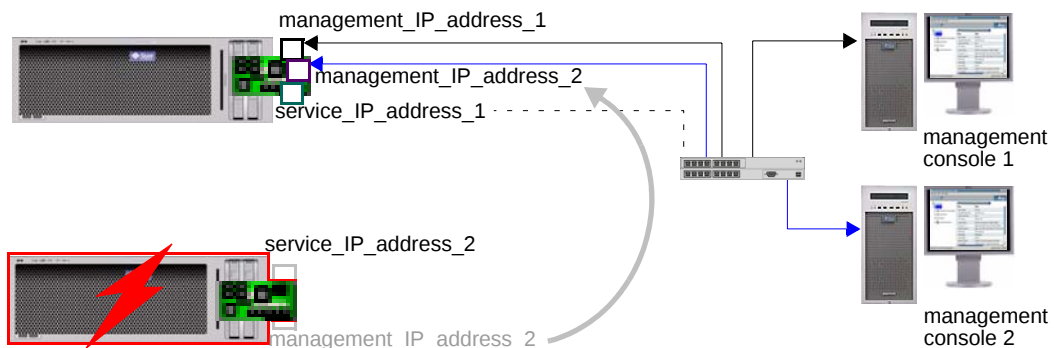


## Management path failover

When a high-availability VTL system fails over, the failover server automatically inherits the failed server's management IP address, so that remote management consoles can still reach the VTL system.

If the heartbeat signal is lost, the management IP address for the failed node transfers to the healthy node

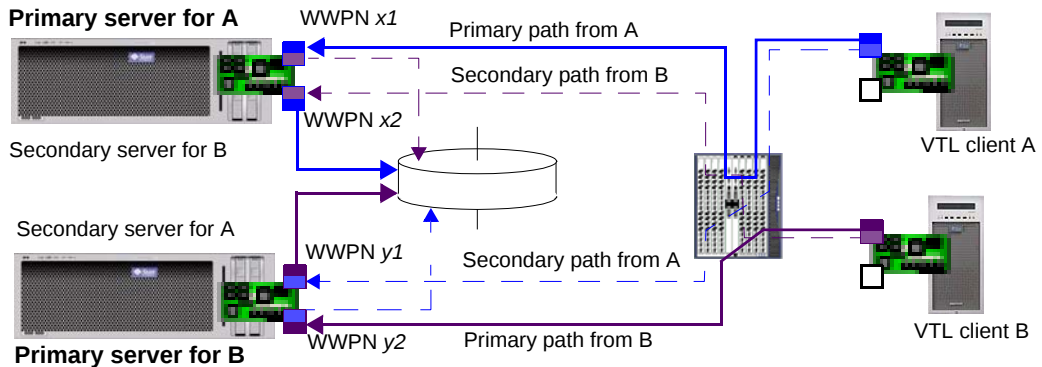
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## Storage path failover

In a standard-availability VTL system, there is one logical path from a VTL client to VTL storage, and every Fibre Channel port is either a target port for a VTL client or a storage-facing initiator. But in a high-availability system, there are two paths, a *primary* and a *secondary* or standby path, as shown below.

Fibre Channel path failover in high-availability VTL systems



## Failover during replication

If a replication operation is in progress when failover or failback occurs, replication stops. Once failover/failback has completed, replication resumes with the next normally scheduled operation.

## Mirroring and failover

If mirroring is in progress during failover/recovery, after the failover/recovery the mirroring will restart from where it left off.

If the mirror is synchronized but Fibre Channel connectivity is lost between the server and storage, the mirror may become unsynchronized. It will resynchronize automatically after failover/recovery.

A synchronized mirror will always remain synchronized during a recovery process.

## Automated Tape Caching

The Automated Tape Caching option presents backup applications with virtual tape volumes that are physically implemented on disk, tape, or both. This keeps the implementation simple—the backup application manages only the virtual tape volumes and virtual libraries—while giving the backup administrator the ability to fine tune the physical implementation for best performance and reliability.

VTL software can implement virtual tape volumes and virtual libraries using an optimal combination of resources: disk arrays, physical tapes, physical libraries, and physical tape drives. VTL policies specify where data should reside—on disk for fast random access, on tape for longer term storage, or on both for maximum redundancy—and for how long. Under policy control, VTL software can automatically copy backup sets from disk to tape, outside of the backup window. It can retain the backup sets in the disk cache for a specified period, so that users can rapidly restore data during the period when the need is highest. It can then free up the disk cache for new backup sets while retaining an image on tape. If a restore is necessary, a pointer in the disk cache points the request to the physical tape image, transparently and automatically. The Automated Tape Caching option thus simplifies and automates management of the disk cache, insuring adequate capacity with minimum disk resources.

Policies can be built around the number of days that data sets reside on disk, around a disk-capacity high water mark, or around a specified event or time of day. Physical tape I/O can thus be run as a background process that does not interfere with production datacenter operations.

---

**Note** – Automated Tape Caching and Auto Archive/Replication cannot be used at the same time on the same virtual library.

---

## Virtual tape replication

Replicating data provides additional protection for the information on a virtual tape by maintaining a copy locally or on another VTL server. VTL software supports three replication methods, two of them automatic and one a manual process that can be used if you are not using the automatic methods.

See the following subsections for additional information:

- “Auto Replication” on page 13
- “Replication” on page 13
- “Remote Copy” on page 14.

## Auto Replication

The `Auto Replication` option copies virtual tapes from a virtual library to another VTL server whenever a backup application or utility moves a virtual tape to an import/export slot.

You enable Auto Replication at the library level when you create a virtual tape library (see “Setting up the Auto Replication option” on page 52). You can then selectively enable the feature on a tape-by-tape basis as tapes are created. You cannot alter the Auto Replication status of an existing virtual tape.

## Replication

The VTL `Replication` feature maintains synchronized *replica resource* copies of virtual tapes on a designated VTL server. At the end of a policy-defined replication interval, VTL software copies data that has changed and is not currently in use from the primary virtual tapes to the replica resources.

During normal operation, backup clients have no access to replica resources—the latter are purely internal protections within the VTL system. If the primary virtual tape is corrupt or otherwise unusable, however, administrators can *promote* replica resources as part of their disaster recovery process. Once promoted, the replica resource becomes the primary virtual tape, with the same barcode and attributes. Backup clients can thus use it for recovery as if it were, in fact, the original copy.

You can configure the VTL Replication feature for either:

- Remote Replication or
- Local Replication.

### *Remote Replication*

Remote Replication maintains synchronized copies of virtual tape volumes on the storage arrays of a pair of VTL appliances that are connected across Ethernet local area networks (LANs) or Wide Area Networks (WANs). Data is thus transferred at LAN/WAN speed, but is not subject to the distance limitation imposed by Fibre Channel storage area network (SAN) technology.

### *Local Replication*

Local Replication maintains local, synchronized copies of virtual tape volumes on the storage arrays of a single VTL appliance. Data is transferred at SAN speed over distances limited to the maximum possible with a Fibre Channel SAN.

## *Remote Copy*

Remote Copy copies a single virtual tape to another server on demand.

## Replication requirements

The following are the requirements for setting up a replication configuration:

- (Remote Replication) You must have two VTL servers.
- (Remote Replication) You must have write access to both servers.
- You must have enough space on the target server for the replica resource.
- The target server must be a 64-bit server.

## Port requirements for replication

The Sun VTL appliance comes with four gigabit Ethernet ports configured in the software. The primary port is net0, and it is called nge0 or e1000g0, depending upon which server node you have. That port should be connected to the customer's network for management purposes (running the console, issuing CLI commands, etc).

The second port, net1, is configured on the appliance's private 10.0.0.x network. That should be left as-is, configured for use by Sun service representatives or customer personnel under the direction of Sun support. There is a cable connected from that port to the 3COM switch included with the appliance, and that network is used to manage the appliance components (servers, switches, and disk controllers).

Two ports are left available for use with IP replication. Those ports are net2 and net3, and they come pre-configured with the IP addresses 192.168.0.1xx (the addresses are different for each port and for each server within the appliance).

To use these last two ports for IP Replication, the ports must be connected to a customer switch (not the appliance's internal 3COM switch). To make sure these ports and only these ports are used for replication, configure them with IP addresses on the same subnet as the replication ports on the target server. If you use the same network segment as your main management port, replication traffic will use that port, regardless of whatever IP addresses you have set for the replication ports. The same holds true for the target server. Replication traffic will go to the principle port on the target server, the one that is used for management traffic.

To set the addresses, do not use Solaris commands like ifconfig. Set the IP addresses from within the VTL console. Log in with root permissions and right-click on the server name so that a menu pops up and allows you to select "System Maintenance." From within "System Maintenance," select "Network." Select the interface you want

to configure (net2 or net3), assign the port the proper address, netmask and gateway. Configure the second port with its own address, but use the same netmask and gateway.

When you set up replication, select the target server's IP addresses that are to be used for replication. Do not use the target server's main management port. If you follow these instructions, replication traffic will have two ports to use on both ends and replication traffic will not be competing with traffic for VTL management or internal VTL management. The best performance will come if you are able to dedicate the network segment for replication and not have the replication traffic.

## VTL Secure Tape encryption option

The VTL Secure Tape option uses the Advanced Encryption Standard (AES) algorithm to protect physical media that might otherwise be vulnerable to theft or diversion during transit. VTL software encrypts data when it is exported to physical tape and decrypts it when it is reimported to virtual tape.

## Key management

The Secure Tape feature provides for flexible cryptographic key management that can be adapted to local security requirements and policies. Administrators can generate a single key for all exported tapes or multiple, unique keys for different tapes or sets of tapes. Multiple keys are more secure in the sense that the compromise of a single key exposes fewer tapes. But keys are harder to manage. Administrators must keep track of which key applies to which tape, because using the wrong key will cause indecipherable data to be imported into the virtual library. To facilitate centralized key management, keys can be exported to an external *key package* file. Key packages can be centrally generated and distributed, by secure means, to remote sites where data is imported to or exported from VTL systems.

## Password protection

For additional security, each key is password-protected. Administrators must provide the correct password before changing a key name, password, or password hint, and before deleting or exporting a key.

## Sun VTL Operational Restrictions

VTL Plus and VTL Prime are appliances running a specialized version of Solaris 10 on Sun Servers with Sun disk arrays. They use specific versions of software, firmware and configuration scripts that have been tuned for VTL. These cannot be viewed as individual components such as Solaris 10 on a server or a Sun 6140 disk array connected to a host. It cannot be modified based on readily available component upgrades such as FRUs, hardware upgrades, firmware, software maintenance, or software applications that are not specifically noted as part of the VTL offering or VTL maintenance. Special purpose scripts or software cannot be loaded onto the Solaris 10 host running the VTL software even if they've been shown to be effective or helpful with non-VTL systems. If there are specific questions or concerns with your implementation, open a support case to Sun VTL Backline Support -- don't rely on general email aliases.

## Understanding VTL Zoning

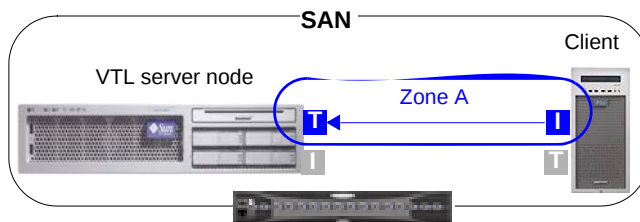
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Zoning is the crucial first step when integrating a storage system, such as the VTL appliance, into a Fibre Channel storage area network (SAN). While specific zoning recommendations must vary from SAN environment to SAN environment, this chapter describes the basic requirements that all successful VTL deployments must address.

- “Zoning for standard-availability systems” on page 17
- “Zoning for high-availability systems” on page 18.

### Zoning for standard-availability systems

The basic zoning requirement for VTL solutions that do not implement the high-availability feature is that each SAN zone contain only one initiator and one target, as shown in the figure below.



You zone standard-availability VTL systems the same way, regardless of the type of zoning you use. In a soft-zoned SAN, each target and initiator is defined by a logical World Wide Port Name (WWPN), while in a hard-zoned SAN, target and initiator are defined by physical port numbers. But, in either case, you have one client initiator and one VTL target per zone.

# Zoning for high-availability systems

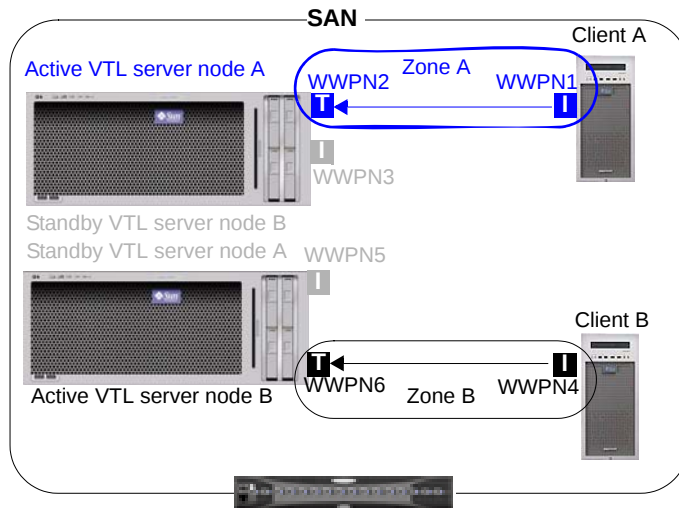
Zoning a high-availability system is slightly more complex than zoning a standard system, due to the need for redundant paths between initiators and targets. Once again, each SAN zone can have only one initiator and one target. But the total number of zones you need depends on whether the SAN is soft-zoned (by World Wide Port Name) or hard-zoned (by port number). See:

- “WWPN zoning (soft zoning)” on page 18
- “Port zoning (hard zoning)” on page 19.

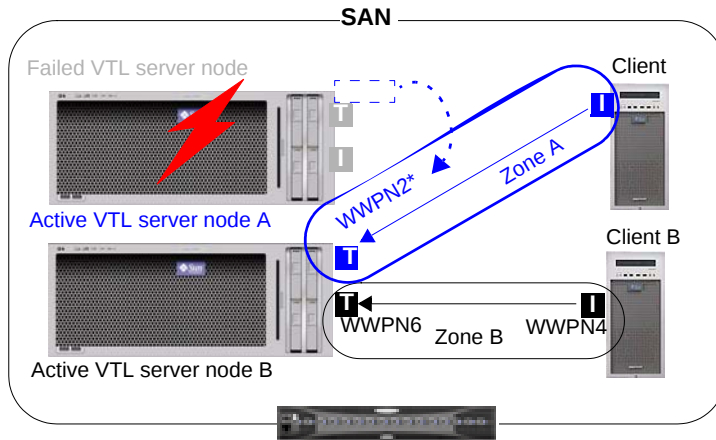
## WWPN zoning (soft zoning)

A soft-zoned SAN maps initiator to target using a logical World Wide Port Name (WWPN), rather than a physical hardware address. This name-to-name zoning establishes a logical route that may traverse varying physical ports and varying physical paths through the SAN. To accomplish failover, we thus need only a single zone for the client initiator, the active VTL target, and the standby VTL target.

See the figure below shows a soft-zoned SAN before VTL failover:

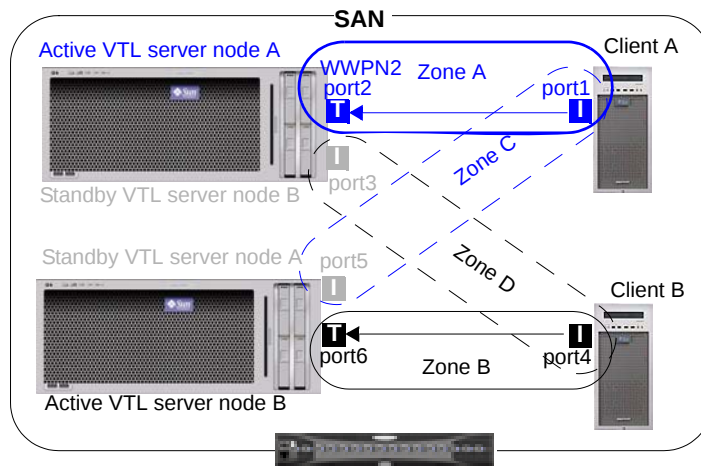


During failover, the zone still contains only one initiator and one target at a time. But the target WWPN is remapped from a port on the failed server node to a physical port on the standby server. The standby physical port spoofs the WWPN of the failed port, so zoning does not change. The figure below shows a soft-zoned SAN after VTL failover, with a standby port spoofing the WWPN of the failed port:



## Port zoning (hard zoning)

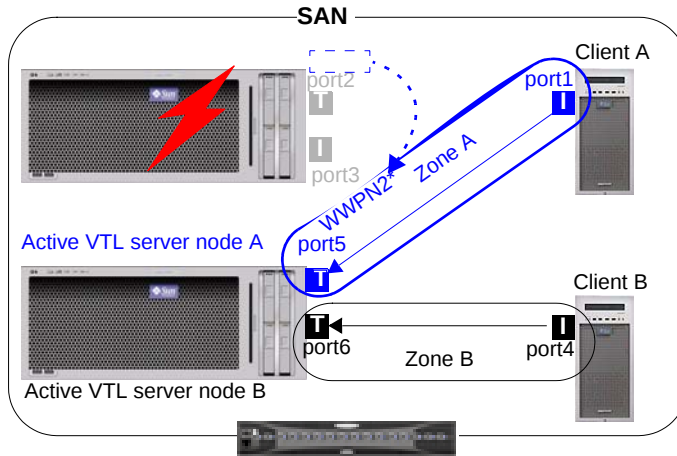
A hard-zoned SAN maps initiator to target using a physical port address. This port-to-port zoning establishes a fixed, physical route through the SAN. So, since each SAN zone can contain only one initiator and one target, you must provide two zones for each initiating client. The figure below shows a hard-zoned SAN before VTL failover:



As the above figure shows:

- one zone defines the path to the primary VTL server node
- the other zone defines the path to the standby server.

During failover, the standby port becomes active by spoofing the WWPN of the failed port. The figure below represents a hard-zoned SAN after VTL failover:



sample.wpnchart.ods - OpenOffice.org Calc

File Edit View Insert Format Tools Data Window Help

|    | A          | B                                       | C             | D                    | E                    |
|----|------------|-----------------------------------------|---------------|----------------------|----------------------|
|    | VTL Port # | WWPN                                    | Port function | Stands by for port # | Fails over to port # |
| 1  | 0          | [21] [00] [00] [e0] [8b] [0e] [b8] [94] | Disk          |                      |                      |
| 2  | 1          | [21] [01] [00] [e0] [8b] [2e] [b8] [94] | Disk          |                      |                      |
| 3  | 2          | [21] [00] [00] [e0] [8b] [0e] [bc] [9c] | Host          | 8                    | 12                   |
| 4  | 3          | [21] [01] [00] [e0] [8b] [2e] [bc] [9c] | Host          | 9                    | 13                   |
| 5  | 4          | [21] [00] [00] [e0] [8b] [1e] [e8] [e9] | Disk          |                      |                      |
| 6  | 5          | [21] [01] [00] [e0] [8b] [3e] [e8] [e9] | Disk          |                      |                      |
| 7  | 6          | [21] [02] [00] [e0] [8b] [5e] [e8] [e9] | Host          | 10                   | 14                   |
| 8  | 7          | [21] [03] [00] [e0] [8b] [7e] [e8] [e9] | Host          | 11                   | 15                   |
| 9  | 8          | [21] [00] [00] [e0] [8b] [1e] [72] [e4] | Host          | 12                   | 2                    |
| 10 | 9          | [21] [01] [00] [e0] [8b] [3e] [72] [e4] | ACSLs server  | 13                   | 3                    |
| 11 | 10         | [21] [02] [00] [e0] [8b] [5e] [72] [e4] | Host          | 14                   | 6                    |
| 12 | 11         | [21] [03] [00] [e0] [8b] [7e] [72] [e4] | Host          | 15                   | 7                    |
| 13 | 12         | [21] [00] [00] [e0] [8b] [0a] [49] [d5] | Host          | 2                    | 8                    |
| 14 | 13         | [21] [01] [00] [e0] [8b] [2a] [49] [d5] | Host          | 3                    | 9                    |
| 15 | 14         | [21] [00] [00] [e0] [8b] [1a] [5e] [93] | Host          | 6                    | 10                   |
| 16 | 15         | [21] [01] [00] [e0] [8b] [3a] [5e] [93] | Host          | 7                    | 11                   |

Sheet1 / Sheet2 / Sheet3

Sheet 1 / 3 Default 100% STD \* Sum=0

SAN clients include backup application hosts, such as Symantec NetBackup master servers, and ACSLS servers (if ACSLS is to control VTL virtual libraries). VTL must not share initiator ports with other SAN clients, such as physical tape devices.

**Next task:** When you have completed zoning, log in to the VTL server, scan for Fibre Channel devices, and make sure that all devices are visible.

## Using the VTL console

---

The Virtual Tape Library console application is the graphical user interface that you use when administering and managing the VTL system. The console provides you with full control over virtual library operations, from creating libraries and tapes to managing disk storage and data migration from disk to physical tape.

The VTL console software is installed on a management workstation that you provide and communicates with the appliance via your local area network (LAN). In most deployments, your Sun service representative will install one instance of the console for you (you can install as many additional instances as you require on other machines, though no more than two instances can access the same VTL server at the same time). For information on installing additional instances of the console, see “Installing the VTL console” on page 145.

The following sections explain how you use the console application:

- “Running the VTL console application” on page 22
- “Populating the console” on page 22
- “Understanding the VTL console interface” on page 24.

---

**Note** – For information on the text-based, VTL command line user interface, see Appendix A, “VTL command line reference” on page 171.

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# Running the VTL console application

## ▼ Launching the VTL console

1. To launch the console on a Sun Solaris workstation, open a terminal window and enter the command shown below:

```
% /usr/local/vtlconsole/vtlconsole &
```

2. On a Microsoft Windows system, press the Start bar to access the main menu system, and select All Programs > Sun Microsystems > VTL 5.0 > VTL Console.

3. To launch the console on a Linux workstation, open a terminal window and enter the command shown below:

```
% /usr/local/vtlconsole/vtlconsole &
```

Stop here.

---

## Populating the console

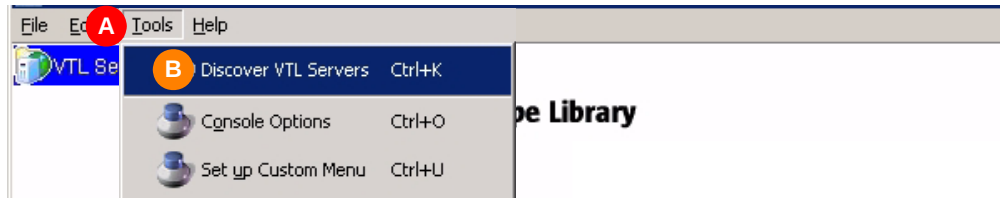
Once the console is running, you can specify the VTL servers that you want to see in the object tree at the left side of the VTL console. You can discover, add, or remove servers:

- “Discovering VTL server nodes” on page 22.
- “Adding a server node to the console tree” on page 23
- “Deleting a server node from the console tree” on page 24

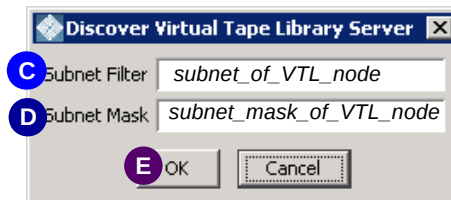
## ▼ Discovering VTL server nodes

Whenever a VTL server is added to the subnet managed by a VTL console, you can discover the new addition and its properties using the procedure below.

1. From the console main menu, select **Tools (A below)**, then select **Discover VTL Servers from the submenu (B)**.



2. When the **Discover Virtual Tape Library Server** dialog appears, enter the **subnet filter (F below)** and **subnet mask (G)** for the VTL appliance. Then press **OK (H)**.

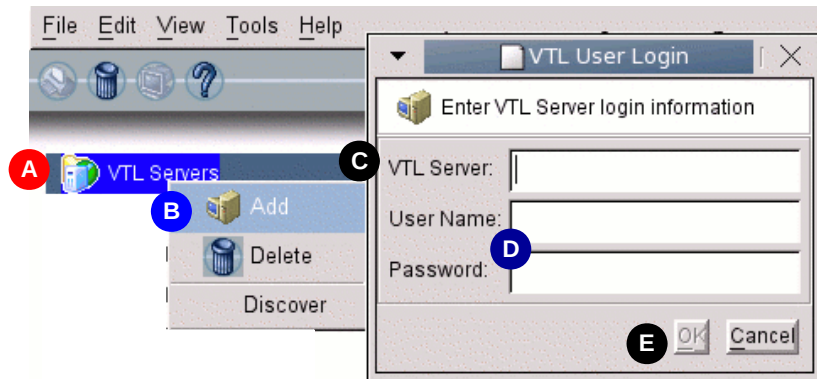


After a short wait, the VTL console application discovers the appliance and adds it to the list on the left side of the graphical user interface (GUI).

Stop here.

## ▼ Adding a server node to the console tree

1. In the tree view of the VTL console, right-click on **VTL Servers (A below)**.



2. From the context menu, select **Add (B above)**.

3. When the VTL User Login dialog appears, enter the VTL Server host name or IP address (C above) and the User Name, and Password (D), and press OK (E).

Stop here.

## ▼ Deleting a server node from the console tree

1. In the tree view of the VTL console, right-click on the name of the server you wish to delete from the console view.
2. From the context menu, select Delete.
3. When the confirmation dialog appears, select Yes.

Stop here.

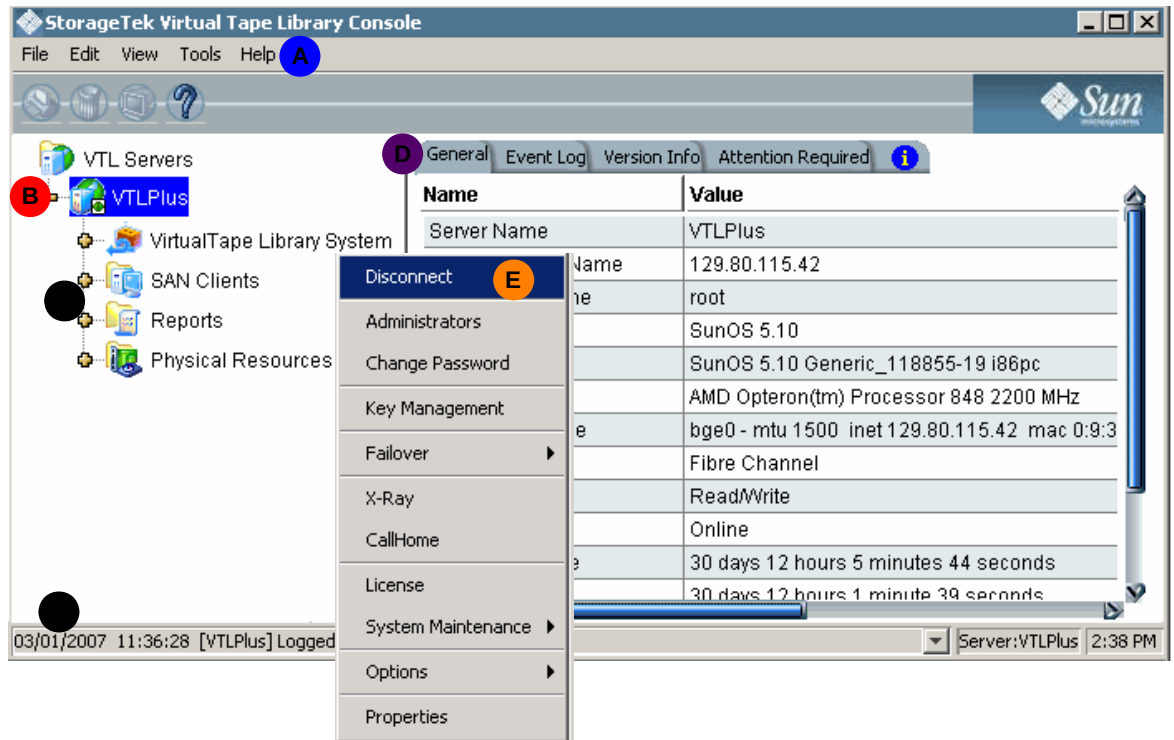
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# Understanding the VTL console interface

The VTL console interface consists of four main parts: a main menu, a left-hand main window pane, a right-hand main window pane, and a status bar at the bottom of the interface. The VTL main menu system (A below) lets you control the console and carry out the administrative functions it supports. The left hand pane of the VTL console interface represents the component objects of the VTL system as the branches of a tree (B and C below). It contains the following major branches:

- “Virtual Tape Library System” on page 26
- “SAN Clients” on page 27
- “Reports” on page 27
- “Physical Resources” on page 28.

Clicking on the icon for a VTL server (B below) opens the log-in dialog.



Once you have logged in to the server, clicking on the plus (+) symbol next to the icon expands the server branch of the interface, revealing the sub-components of the VTL system: the Virtual Tape Library System, SAN Clients, Reports, and Physical Resources (C above).

Clicking on the plus (+) symbol next to any icon expands the corresponding branch of the object tree, revealing the sub-components and sub-branches that lie beneath it. Clicking on the minus (-) symbol collapses the branch.

Selecting an object in the tree displays a tabbed property sheet for the object in the right-hand pane of the console (D above). Right-clicking an object opens a context menu system that lets you change the properties of the object or perform tasks with the object (E).

The status bar at the bottom of the window (F above) displays versioning information for the locally installed console software. A drop-down box displays console session information.

# Virtual Tape Library System

The Virtual Tape Library System branch of the object tree is the primary management tool for routine VTL operations. Right-clicking on the subbranches of the Virtual Tape Library System gives you access to context sensitive menus that control most of the common VTL management operations.

## Virtual Tape Library System icons

The following table explains the icons that represent virtual tape drives and virtual tapes in the console object tree.

| Icon                                                                              | Description                                                                                                                 |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
|  | The <b>C</b> icon indicates that a virtual tape drive has compression enabled.                                              |
|  | The <b>A</b> icon indicates that a virtual tape is a cache for a physical tape. Requires the Automated Tape Caching option. |
|  | The <b>S</b> icon indicates a direct link tape (a link to the physical tape). Requires the Automated Tape Caching option.   |
|  | The yellow <b>O</b> icon indicates that data has been written to the virtual tape and not yet cached to physical tape.      |

## The structure of the Virtual Tape Library System

The Virtual Tape Libraries branch lists the virtual tape libraries that are currently defined. Each virtual tape library contains a virtual tape drive branch containing one or more drives and a virtual tape branch containing one or more tapes, sorted in barcode order. Right clicking on the members of the Virtual Tape Libraries subbranch brings up a context menu listing operations that can be performed on the branch. These include:

- assigning virtual tape libraries and/or drive to SAN clients (backup servers).
- creating and deleting virtual tapes
- creating and deleting virtual tape drives
- enabling replication or auto-archiving features for tapes in the library
- setting Automated Tape Caching policies (if you are using this option)
- enabling, disabling, or configuring the tape capacity on demand feature
- moving virtual tapes between slots, drives, and the virtual vault
- modifying tape properties, such as barcodes and write protection

The `Virtual Tape Drives` branch lists the standalone virtual tape drives that are currently defined. Right clicking on the members of the `Virtual Tape Drives` subbranch brings up a context menu listing operations that can be performed on the branch.

The `Virtual Vault` branch lists the virtual tapes that are currently being stored outside the virtual tape libraries, in barcode order. Virtual tapes in the vault can be replicated, exported to a physical tape, or moved to a virtual library or standalone drive. The number of tapes that can be stored in the vault is limited only by the available disk storage space.

The `Import/Export Queue` branch lists the import and export jobs and Automated Tape Caching jobs that have been submitted. If needed, you can cancel a pending job from here. You can have up to 32 concurrent import/export jobs running, depending upon the number of physical tape drives attached to your VTL.

The `Physical Tape Libraries` branch lists the physical tape libraries that are available to VTL. Right clicking on the members brings up a context menu that lets you inventory slots, import/export or move physical tapes, copy the physical tape to virtual tape, or link physical tape to virtual tape for direct access.

The `Physical Tape Drives` branch lists the standalone physical tape drives that are available to VTL. Right clicking on the members brings up a context menu that lets you eject physical tapes, copy physical tapes to virtual media, or link physical tapes to virtual media for direct access.

The `Replica Resources` branch lists the virtual tapes that have been replicated from a remote server. Clients do not have access to replica resources.

The `Database` branch contains configuration information for the VTL. The database can be mirrored for high availability.

## SAN Clients

The `SAN Clients` branch of the VTL object tree lists the backup servers that back up data to VTL libraries. By right-clicking on this branch and its subbranches, you can add SAN clients, assign them to libraries, unassign them, view client properties, etc.

## Reports

The `Reports` branch of the VTL object tree holds reports that you generate. Reports can cover:

- throughput

- physical resource allocation and configuration
- disk space usage
- Fibre Channel adapter status and configuration
- replication status
- virtual tape and library information
- job status

By right-clicking on this branch, you can select and generate reports.

## Physical Resources

The `Physical Resources` branch of the VTL object tree lists Fibre Channel HBAs and storage devices attached to the VTL server. Storage devices include the disk volumes that hold virtual tapes, physical tape libraries and physical tape drives. Right-clicking on this branch or its subbranches brings up context menus that let you scan devices or prepare devices for use as virtual tape.

The following table describes the icons that describe physical resources in the console object tree:

| Icon                                                                                | Description                                                                                                                                       |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
|    | The <b>T</b> interface icon indicates that this is a target port.                                                                                 |
|   | The <b>I</b> interface icon indicates that this is an initiator port.                                                                             |
|  | The <b>D</b> interface icon indicates that this is a dual-port interface card.                                                                    |
|  | The red arrow indicates that this interface has no access to storage. Either a device is not connected to the interface, or the device is down.   |
|  | The <b>V</b> icon indicates that this disk has been virtualized.                                                                                  |
|  | The <b>D</b> icon indicates that this is a physical ("Direct") device.                                                                            |
|  | The <b>F</b> icon indicates that this is shared storage and is being used by another server. The <code>Owner</code> field lists the other server. |

## VTL operations

---

This chapter covers routine configuration, administration, and management of server nodes, virtual tape libraries, drives, and tapes, including:

- “Managing network connectivity” on page 29
- “Managing virtual libraries” on page 35
- “Managing tapes” on page 88
- “Managing tape caching” on page 122
- “Creating and viewing reports” on page 125
- “Encrypting and shredding data” on page 129
- “Working with the Event Log” on page 137
- “Managing VTL servers” on page 142.

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## Managing network connectivity

VTL appliances use your Ethernet local area network (LAN) for system management and administration and your storage area network (SAN) for connecting to the system’s storage clients (your backup hosts). Sun services personnel establish required connectivity during the system installation process. However, if you subsequently make changes to your network configurations, you can update the VTL configuration using the procedures in this section.

- “Configuring local area network connections” on page 30
- “Setting the VTL server node host name” on page 32
- “Obtaining SAN interface configuration information” on page 33
- “Administering SAN client connections” on page 34.

## ▼ Configuring local area network connections

1. In the Network Configuration property sheet, enter the Domain name (A below). Check the Append suffix to DNS lookup check box (B) if the customer needs to append the domain name to the machine name during DNS lookup.

The screenshot shows the 'Network Configuration' dialog box. It has a title bar with a blue icon and the text 'Network Configuration'. The main area contains several fields and controls:

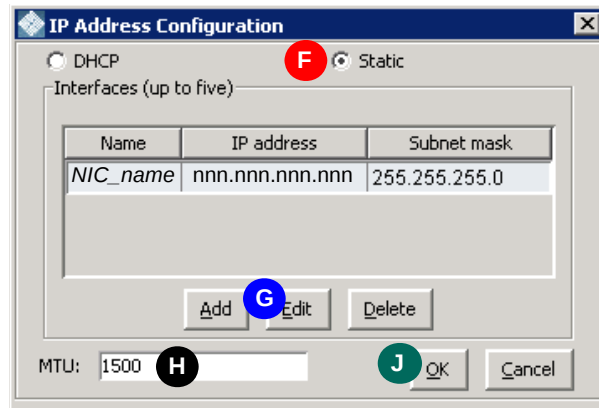
- Domain name:** A text field containing 'domain\_name'. A blue circle with the letter 'A' is next to it.
- Append suffix to DNS lookup:** A checked checkbox. A pink circle with the letter 'B' is next to it.
- DNS (up to two):** A list box containing 'nnn.nnn.nnn.1'. A purple circle with the letter 'C' is next to it. Below the list box are 'Add', 'Edit', and 'Delete' buttons.
- Default gateway:** A text field containing 'nnn . nnn . nnn . nnn'. A green circle with the letter 'D' is next to it.
- NIC:** A text field containing 'NIC\_name'. A black circle with the letter 'E' is next to it. To the right of the text field is a 'Config NIC' button.
- Enable SSH:** An unchecked checkbox.
- Enable FTP:** An unchecked checkbox.
- Allow root to login in telnet session:** An unchecked checkbox.
- Network Time Protocol:** A text field containing 'Config NTP'.
- OK** and **Cancel** buttons at the bottom right.

2. Enter IP address information for the Domain Name Server (if used) in the DNS section (C above), using the Add and Edit buttons.
3. Enter the IP address of the Default gateway (D above).
4. Select the *NIC\_name* Ethernet interface, and push the Config NIC button (E above).

*NIC\_name* is nge0 on VTL Plus systems and e1000g0 on VTL Value systems.

On VTL Plus systems, do not change the configuration of the other Ethernet interfaces. They are reserved for system use. For details, see the appendix on VTL private network addresses.

5. When the IP Address Configuration property sheet appears, click the Static radio button (F below).



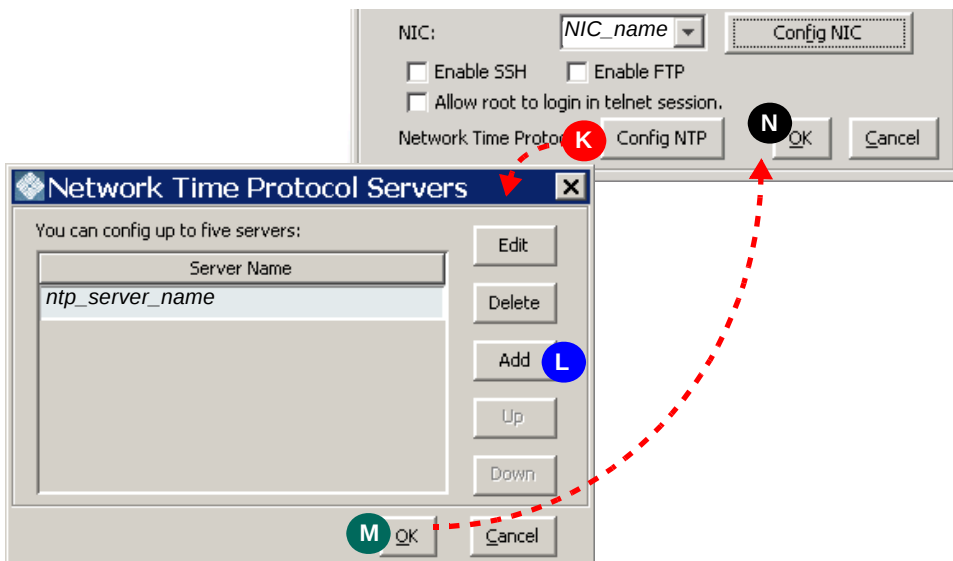
6. Click the Edit button (G above), and enter the IP address that the customer provided.

7. Leave the MTU text field (H above) as set by the factory.

8. Press OK (J above).

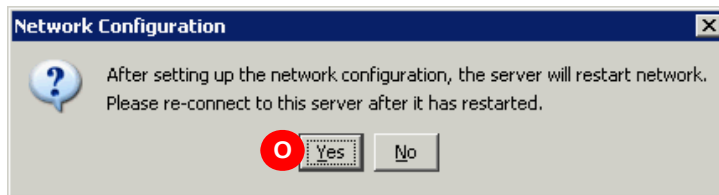
You return to the Network Configuration property sheet.

9. If Network Time Protocol (NTP) is in use, press Config NTP (K above). When the Network time Protocol Servers dialog appears, use the controls provided (L) to enter the NTP server IP addresses. Click OK (M).



Note the `Enable SSH`, `Enable FTP`, and `Allow root to login in telnet session` check boxes. While `ssh` is enabled by default, `ftp` and `remote login by root` are disabled for security reasons. Sun recommends that you leave these options set to the defaults. For secure remote access, use the `vtladmin` account with `ssh` or `sftp`. Then, if root privileges are required, use the `su` command after logging in.

10. When you return to the `Network Configuration` property sheet, click **OK** (N above).
11. When you are prompted to restart the network, press **Yes** (O below).



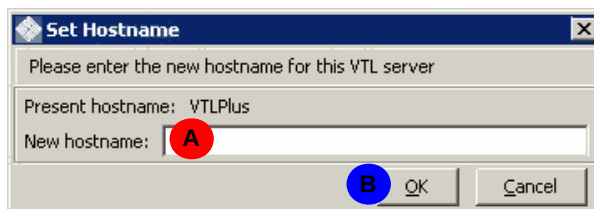
The network should restart automatically.

12. Reconnect to the VTL server node.

Stop here.

## ▼ Setting the VTL server node host name

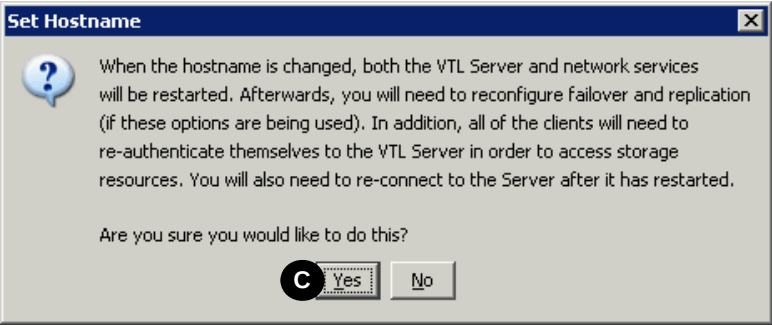
1. When the `Set Hostname` dialog appears, enter a valid name for your VTL appliance (A below).



Valid characters include letters, numbers, underscores, and dashes.

2. Press **OK** (B above).

3. When prompted to restart the network and server, press **Yes (C below)**.



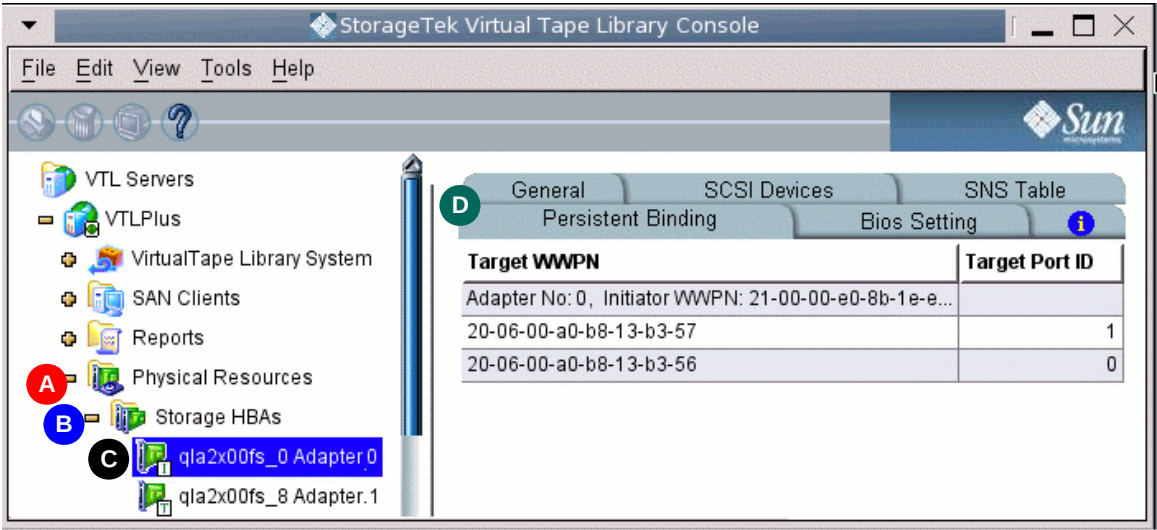
4. Log back in to the server to continue working.

Stop here.

### ▼ Obtaining SAN interface configuration information

You can obtain the configuration information for any of the Fibre Channel host bus adapters on the VTL server by examining the object in the VTL console.

1. In the tree-view pane of the VTL console, select **Physical Resources (A below)** and **Storage HBAs (B)**.



2. Select the HBA that you wish to check (C above), and, in the pane at right, use the tabs to locate the required information (D).

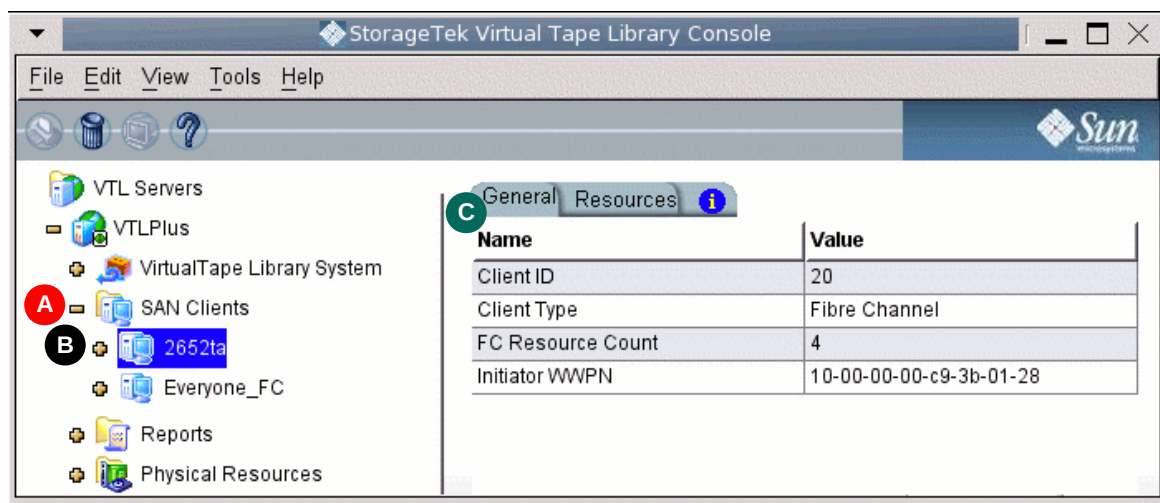
Stop here.

## ▼ Administering SAN client connections

You can obtain the configuration information for any of a VTL server's SAN clients by examining the object in the VTL console, as described below.

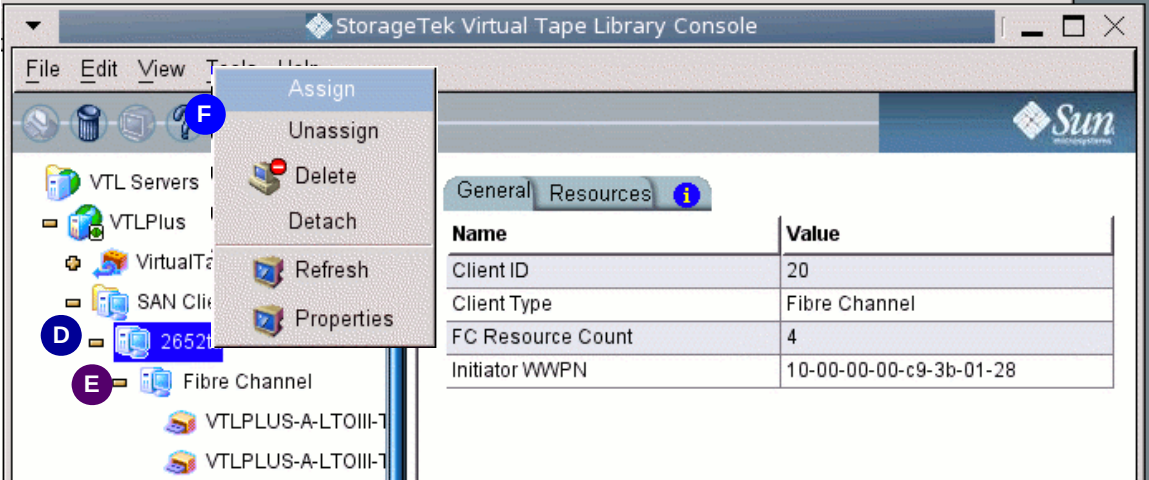
To add a SAN client, see "Connecting virtual libraries with storage clients" on page 66.

1. In the tree-view pane of the VTL console, select SAN Clients (A below) and click on the name of the client (B).



2. In the pane at right, use the tabs to see adapter information (C above).

3. To see virtual device assignments, expand the client node (D below) and Fibre Channel protocol node (C) of the tree view.



4. Right-clicking on the client node (D above) or Fibre Channel protocol (C) node opens a menu of administrative actions (F).

Using the context menu, you can Assign virtual devices to clients, Unassign virtual devices from clients, Delete the client or protocol, Detach devices, and view or refresh client properties.

Stop here.

# Managing virtual libraries

This section covers the essential configuration tasks that are performed whenever virtual libraries, devices, and media are added to the VTL system. During initial configuration, the tasks in this section are run sequentially by the VTL configuration wizard. During routine system maintenance, you may also run them independently, as described below:

- “Configuring and provisioning virtual libraries” on page 41 (includes “Creating virtual tape libraries” on page 43 and “Creating virtual tapes” on page 58)
- “Connecting virtual libraries with storage clients” on page 66.

## Configuring physical libraries and devices

VTL software supports either direct-attached libraries or, optionally, shared libraries managed by ACSLS/Library Station software.

- If you are using a direct-attached library, see “Managing direct-attached physical tape storage” on page 36.
- If you are using a shared library, see “Managing ACSLS and Library Station tape pools” on page 40.

## Managing direct-attached physical tape storage

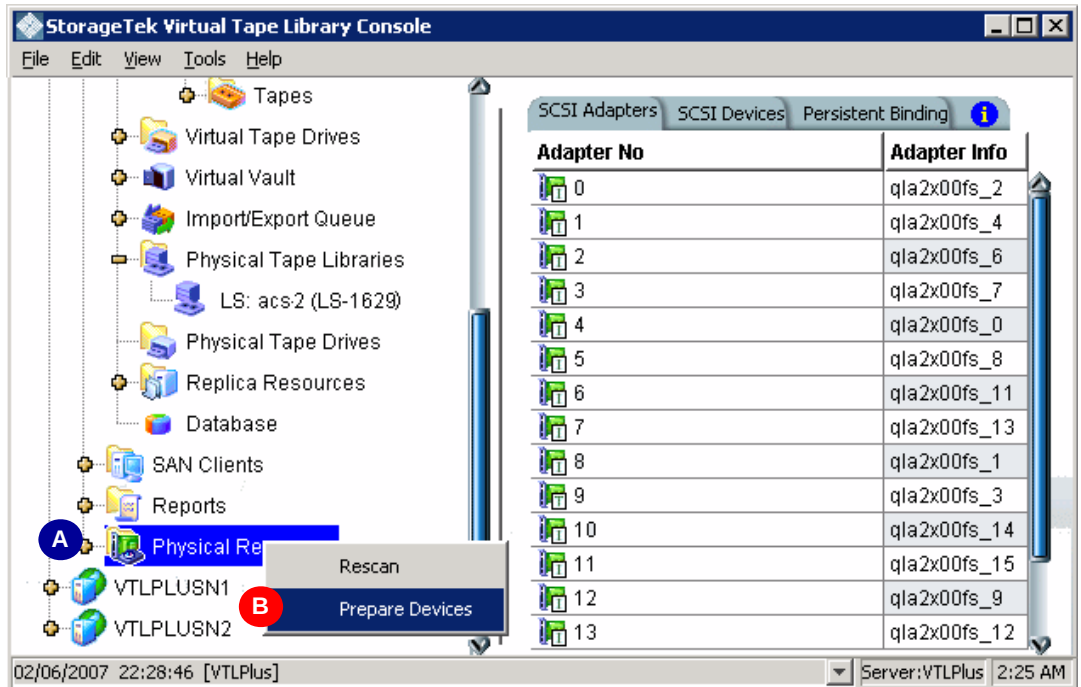
If you have a direct-attached library or device, you must assign the library or device to VTL using the VTL console software. Carry out the following tasks:

- “Preparing physical libraries and devices for assignment” on page 36
- “Assigning direct-attached physical tape libraries/devices” on page 39.

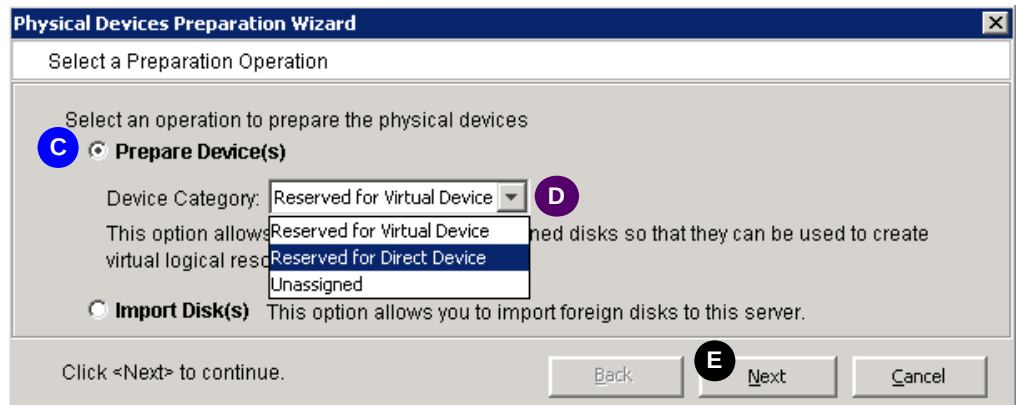
### ▼ Preparing physical libraries and devices for assignment

1. **If you have not added a new physical library or tape device, stop here and go to the next task.**

- Otherwise, in the object tree of the VTL console, right-click the **Physical Resources node (A below)**, and select **Prepare Devices** from the context menu **(B)**.



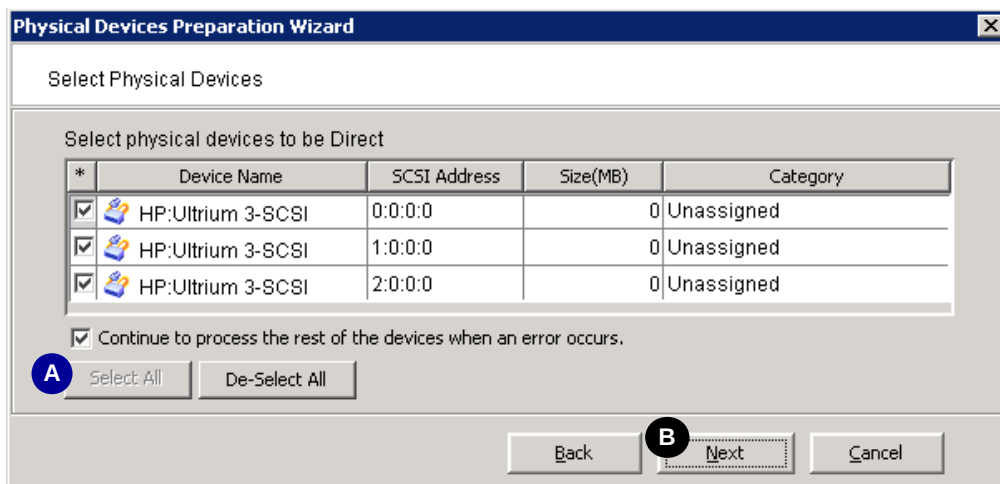
- When the **Select a Preparation Operation** dialog appears, click the **Prepare Device(s) radio button (C below)**.



- Select **Reserved for Direct Device** from the **Device Category list control (D above)**, and press **Next (E)**.

5. When the **Select Physical Devices** panel appears, use the check boxes and/or the selection buttons (F below) to select the libraries or devices that you want to assign to the VTL system. Press **Next** (G).

If you are configuring an IBM iSeries/AS400 solution, assign IBM Magstar 3590E11, 3592, or Ultrium LTO1, LTO2, or LTO3 physical drives to the virtual tape library for use in import and export operations.

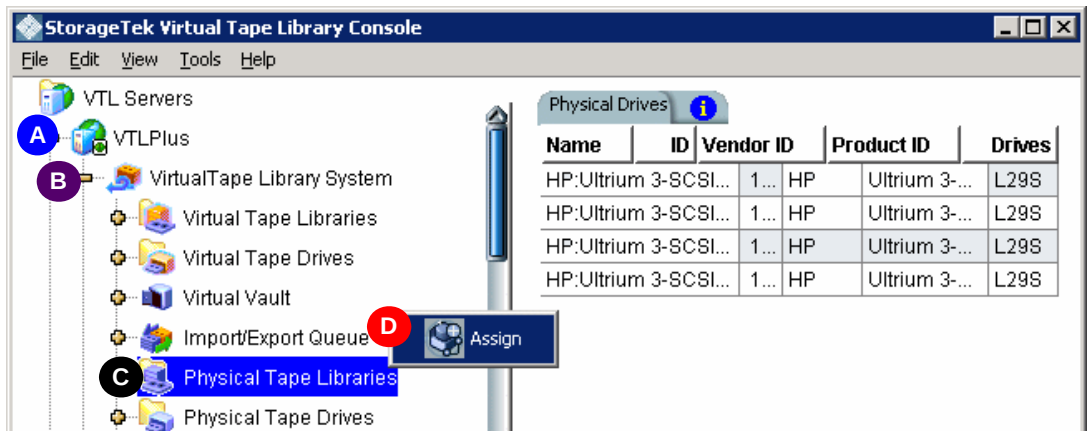


6. When the **Prepare Device** panel appears, press **Finish**.

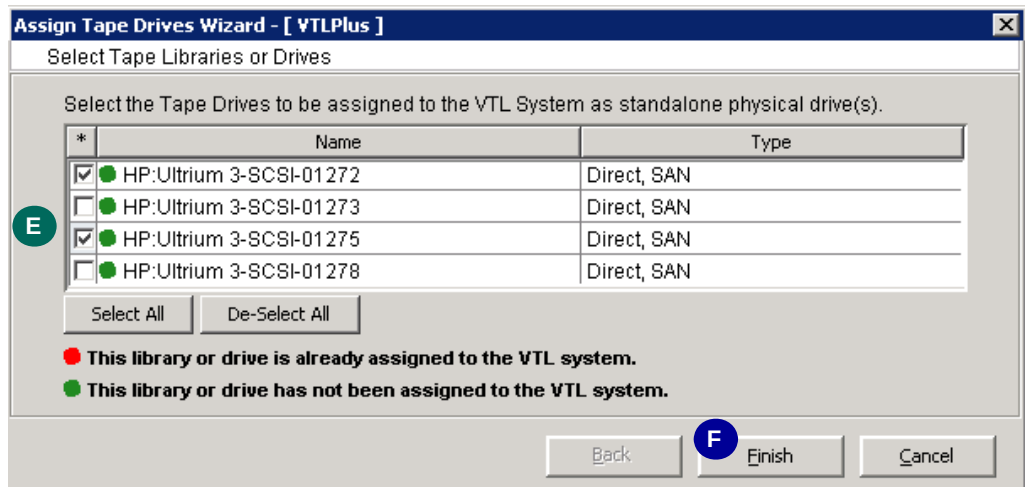
**Next task:** "Assigning direct-attached physical tape libraries/devices" on page 39.

## ▼ Assigning direct-attached physical tape libraries/devices

1. In the object tree of the VTL console application, open the branch for the VTL server (A below).



2. Open the branch for the Virtual Tape Library System (B above).
3. Right-click on the Physical Tape Libraries branch (C above), and select Assign from the context menu (D).
4. When the Select Libraries or Drives dialog appears, use the check boxes and or selection buttons (E below) to assign physical tape drives to the VTL system.



5. Press Finish (F above).

Stop here.

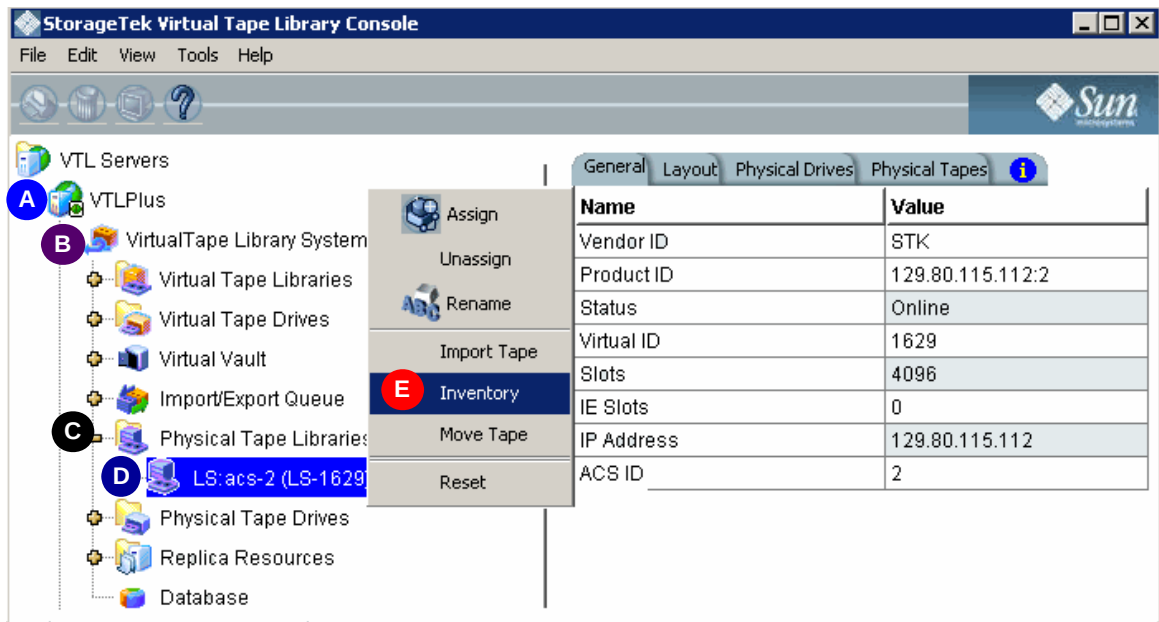
## Managing ACSLS and Library Station tape pools

When the VTL software's ACSLS/Library Station option is enabled, Sun StorageTek ACSLS Manager™ or Library Station software manages the physical library and the tape volumes in the VTL system's assigned tape pools. You merely need to update the VTL console view whenever tapes are added or removed from the pool. Proceed as follows.

### ▼ Inventorying ACSLS/Library Station libraries from VTL whenever tapes are added to or removed from pools

When you add or remove tapes from an ACSLS/Library Station pool, inventory the tapes through the VTL Console:

1. In the object tree of the VTL console, open the branch for the VTL server (A below).
2. Open the branch for the Virtual Tape Library System (B below).
3. Open the branch for the Physical Tape Libraries (D below).
4. Right-click on the name of the physical library (D below), and select Inventory from the context menu (E).



Stop here.

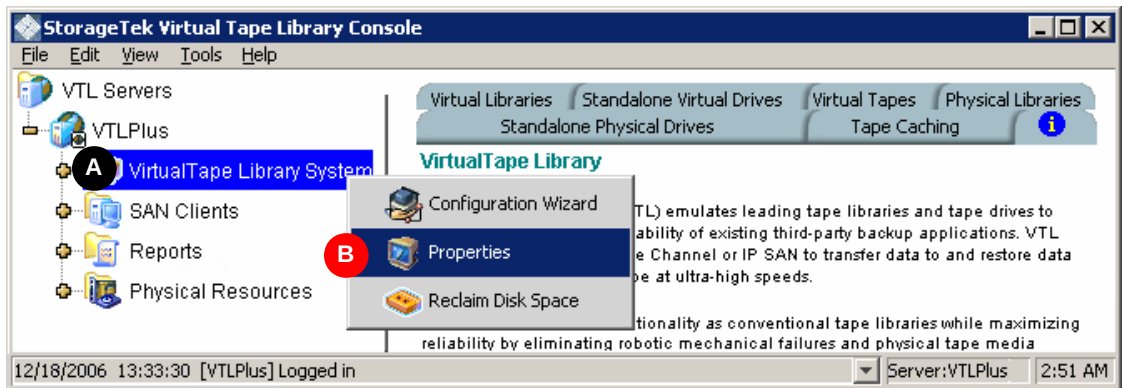
## Configuring and provisioning virtual libraries

This section describes the procedures for creating and maintaining virtual libraries, with their virtual drives and media. It documents the following procedures:

- “Setting virtual library system properties” on page 41
- “Creating virtual tape libraries” on page 43
- Setting up optional functionality (see “Configuring Automated Tape Caching” on page 47, “Setting up the Auto Archive feature” on page 51, or “Setting up the Auto Replication option” on page 52)
- “Generating the virtual library” on page 53
- “Creating virtual tapes” on page 58.

### ▼ Setting virtual library system properties

1. In the tree view at the left of the VTL console, right-click the VirtualTape Library System (A below), and select Properties from the context menu (B).



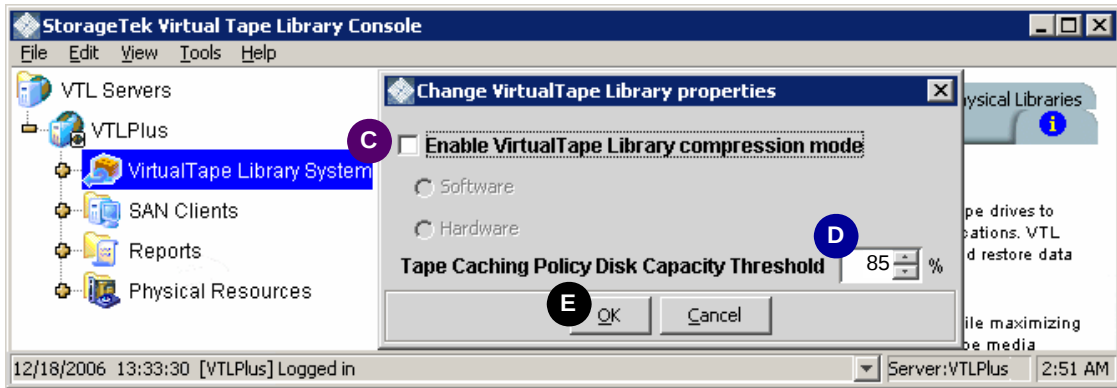
2. When the Change VirtualTape Library properties sheet appears, if you wish to use VTL compression software, check the Enable Virtual Tape Library compression mode check box (C below).

Consider your requirements carefully before enabling software compression. Software compression is a computationally demanding operation that consumes processor cycles that would otherwise be used to move data. When you enable the feature, you thus trade throughput performance for capacity. Most VTL solutions are aimed at increasing backup performance. VTL storage is used as a fast, temporary repository for data that will be moved to physical tape for long-term storage. In such cases, the hardware-based compression capabilities of physical tape drives provide

both the needed long-term storage capacity and the fastest possible transfer to tape media. Compression hardware cannot further compress data that has been compressed by software, so the end-to-end backup process is significantly slower.

On the other hand, the VTL software compression feature is valuable when it is truly needed:

- when data is stored on the appliance long-term, rather than cached pending migration to long-term storage on physical tape
- when data has to be replicated across a slow WAN link.



3. If you plan to use tape caching, use the spinner control to adjust the Tape Caching Policy Disk Capacity Threshold to 85% (D above).

When using automatic tape caching, you have to make sure that the disk never fills up, preventing you from creating new virtual volumes. The 75% threshold has been found to offer a good margin of safety.

4. Press OK (E above).

**Stop here.**

## ▼ Creating virtual tape libraries

1. When the Create Virtual Library Wizard appears, select the type of library that you want to emulate (A below), enter a Virtual Library Name (B) or use the default, and press Next (C).

Select a unique, informative virtual library name. A name that indicates the backup application media server and the function or usage of the library (such as NDMP data migration) is one useful possibility.

Select the Sun VTL library type for compatibility with major backup applications, such as Symantec NetBackup. For compatibility with IBM i-Series/AS400 clients, choose the IBM3590, IBM3584, or IBM3583 library type.

Specify Virtual Library Name and Type

Please specify a virtual library name or use the default name.

**Virtual Library Name** **B** mediaServerName\_libraryUsage

Invalid characters for the Resource Name: < > " & \$ / \'

| Vendor ID    | Product ID      | Revision | Maximum Drives | Maximum Slots |
|--------------|-----------------|----------|----------------|---------------|
| SPECTRA      | GATOR 64000     | 2.00     | 32             | 644           |
| OVERLAND     | NEO Series 2000 | 2.21     | 2              | 30            |
| OVERLAND     | NEO Series 4100 | 2.21     | 4              | 60            |
| <b>A</b> SUN | VTL             | 3.15     | 20             | 678           |

Click <Next> to continue.

Back **C** Next Cancel

2. When the Enter Virtual Drive Information dialog appears, select the type of tape drive you want to emulate (D below), and enter a Virtual Drive Name Prefix (E).

Enter Virtual Drive Information.

Please specify a virtual drive name prefix or use the default name prefix.

**Virtual Drive Name Prefix** **E** virtualLibraryName\_make\_model-

Invalid characters for the Resource Name: < > " & \$ / \'

**Total Virtual Drives:** 10 **F**

| Vendor ID    | Product ID | Media Type |
|--------------|------------|------------|
| STK          | T9840B     | T9840B     |
| <b>D</b> STK | T9840C     | T9840C     |
| STK          | T9940B     | T9940A     |

Click <Next> to continue.

Back **G** Next Cancel

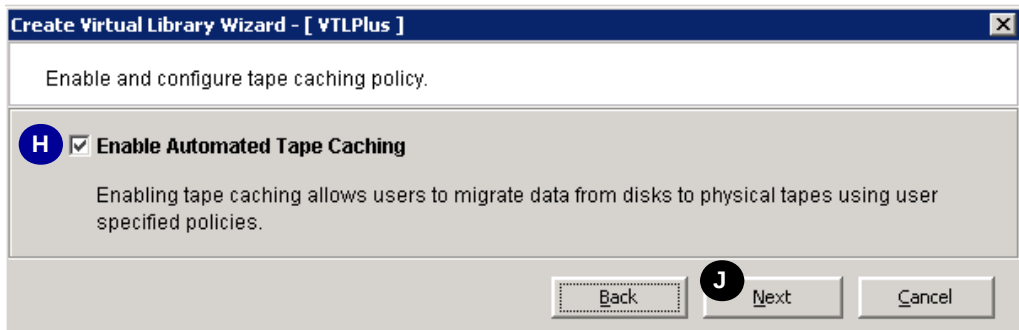
If you plan to attach a physical tape library to the VTL appliance for tape import or export, emulate the physical library so that virtual tapes will be compatible with their physical counterparts.

Select an informative virtual drive-name prefix that shows the relationships between virtual libraries and drives. Using the virtual library name plus the make and model of the emulated drive is one possibility.

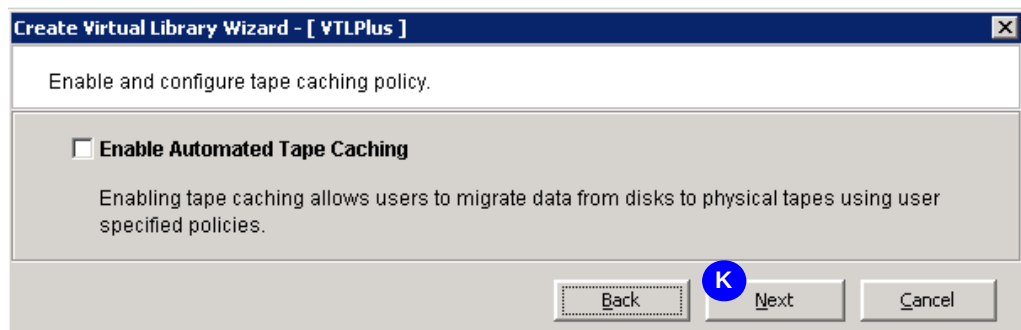
3. **Select the Total Virtual Drives using the spinner control (F above), and press Next (G).**

To insure that the four target ports on a VTL appliance are fully and evenly utilized, create one virtual library and at least four virtual tape drives for each client (backup server) that connects to the VTL system.

4. **If you are going to use tape caching, check the Enable Automated Tape Caching check box when the dialog appears (H below). Press Next to enter the change (J). Then stop here, and go to the Next task list at the end of this procedure.**



5. **If you are not going to use tape caching, press Next (K below) to skip over the Enable and configure tape caching policy dialog.**



The Auto Archive/Replication dialog appears.

6. If you do not intend to implement autoarchiving or replication, press **Next** (L below) to skip over the Auto Archive/Replication dialog.

**Create Virtual Library Wizard - [ VTLPlus ]**

Enter Virtual Library Information.

☐ **Auto Archive / Replication**

☒ Auto Archive

☒ Move

The grace period before deleting the tape: 365 day(s)

☐ Copy

☐ Eject physical tapes to I/E slots after export

☐ Encrypt data when exporting to physical tape with the selected key.

Select a Key: [ ]

☐ Auto Replication

☒ Copy ☐ Move

The grace period before deleting the tape: 0 day(s)

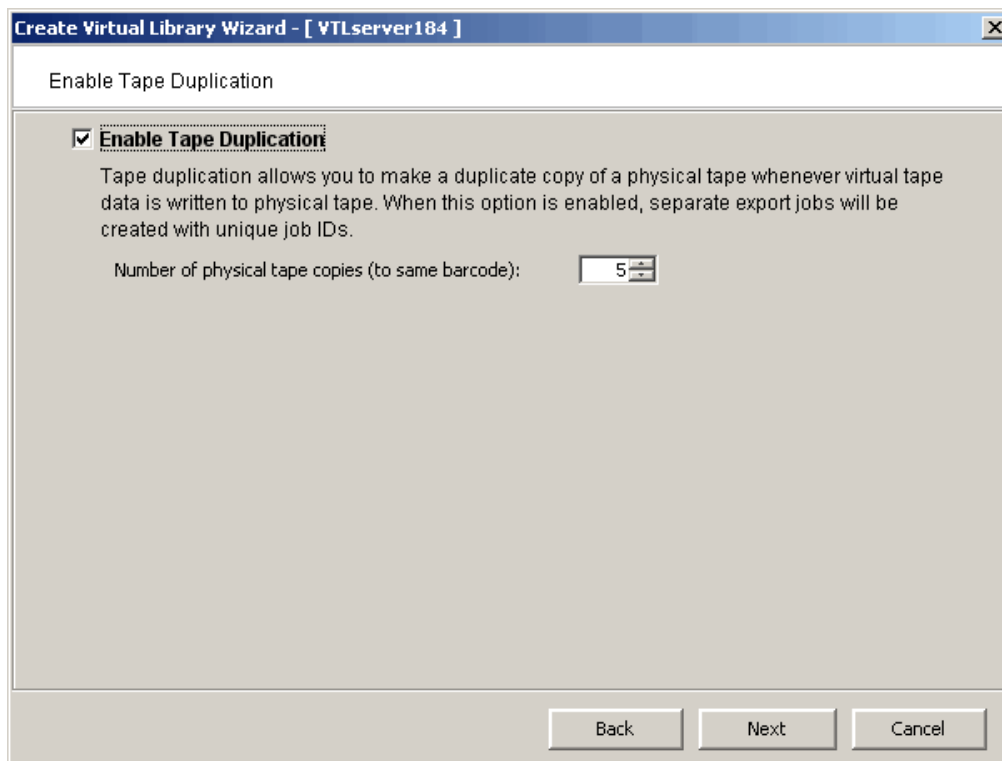
Target server name: VTLPlus (Local Server) [Add]

Back **L** Next Cancel

The Auto Archive option writes data to physical tape whenever a backup application or utility moves a virtual tape from a virtual library to an import/export slot. The physical tape library must support barcodes: the VTL software has to find a matching barcode in the physical library in order to export a virtual tape to a physical cartridge (you do not need to specify which physical library).

The Auto Replication option copies virtual tapes from a virtual library to another VTL server whenever a backup application or utility moves a virtual tape to an import/export slot.

## 7. Indicate if you want to use tape duplication.



Tape duplication allows you to make up to five duplicate copies of a physical tape whenever virtual tape data is exported to physical tape. You must have at least two identical physical libraries (same model, same number of drives, same tapes with the same barcodes). When data is exported, separate export jobs will be created for each physical library and each job will have a unique job ID.

The duplication job will look for a tape with a matching barcode in another library. If one is found, the data is duplicated to that physical library. If a matching tape is not found, but there are additional identical physical libraries, the system will look for a match there.

---

**Note** – You should not have duplicate physical tape barcodes in your system unless you are using tape duplication.

---

If this library is using Automated Tape Caching or if you selected the Move option for Auto Archive on the previous dialog, the virtual tape data will not be deleted until the duplication job finishes successfully.

**Next task:**

- If you are going to configure tape caching on this virtual library, go to “Configuring Automated Tape Caching” on page 47.
- If you are going to use the automatic archiving features, go to “Setting up the Auto Archive feature” on page 51.
- If you are going to use the automatic replication feature, go to “Setting up the Auto Replication option” on page 52
- Otherwise, go to “Generating the virtual library” on page 53.

## Configuring Automated Tape Caching

You configure Automated Tape Caching for the virtual library by defining a *migration policy* and a *reclamation policy*. A VTL policy is simply a set of criteria (*triggers*) that control how and when VTL software automatically moves data from its physical disk cache. Using the configuration dialogs, you can specify simple schedules or more complex state- and event-driven policies.

Migration policies control when VTL copies data from the disk cache to physical tape. Good migration policies maximize the performance and reliability of the disk cache by minimizing simultaneous reads and writes. Simultaneous reads and writes—cross I/O—force disk arrays to switch back and forth between multiple, competing I/O streams, reducing throughput and subjecting hardware to excessive wear. So best practice is to schedule migration as soon as possible after a backup AND at a time when other backup jobs are not running.

Reclamation policies control when VTL releases the disk space that is used by a data set that has already migrated to tape. Prompt and efficient reclamation prevents over-subscription of the disk and consequent backup failures and system down time, while minimizing investment in cache capacity. Best practice is to reclaim space as soon as the highest demand for restores has passed—typically after three to five days. This approach strikes the best balance between taking advantage of the speed and convenience of a disk-based restore and minimizing consumption of cache space.

To create a migration policy, select one of the following approaches:

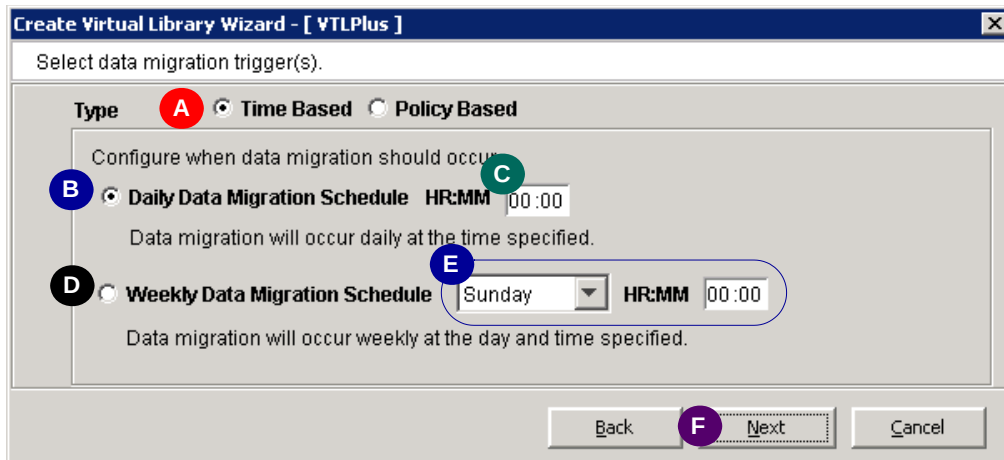
- “Creating simple schedule-driven migration policies” on page 48
- “Creating state- and event-based migration policies” on page 48.

Then go to “Creating a reclamation policy” on page 50.

## ▼ Creating simple schedule-driven migration policies

When the Please select migration trigger(s) dialog appears, proceed as follows.

1. Click the Time Based radio button (A below).
2. To migrate data every day, click the Daily Migration Schedule radio button (B below). Using the controls provided (C), enter the time when migration should begin.
3. To migrate data every week, click the Weekly Migration Check Schedule radio button (D below), and specify the day of the week and time of day when migration should begin (E).



4. Press Next (F above).

**Next task:** “Creating a reclamation policy” on page 50.

## ▼ Creating state- and event-based migration policies

When the Please select migration trigger(s) dialog appears, proceed as follows.

1. To migrate data based on the state of data and/or virtual storage, click the Policy Based radio button (A below).

2. To migrate data when ALL of the conditions specified are satisfied, click the And radio button (B below).

**Create Virtual Library Wizard - [ VTLPlus ]**

Select data migration trigger(s).

Type: ☐ Time Based ☒ Policy Based (A)

Relation: ☒ And (B) ☐ Or (C)

Policies:

- ☒ Age Based (D) 5 Day(s)  
Trigger data migration after a period of time for which data should be retained on disk.
- ☒ Disk Capacity Based (Triggered if disk usage is above 85%) (E)  
Trigger data migration when used disk space exceeds the threshold. This global threshold can be set from the Properties menu of the "VirtuaTape Library System" node.
- ☐ End of Backup (F)  
Trigger data migration when unloading a tape from a drive after some data is written to it.
- ☐ Only When Tape Is Full (G)
- ☒ Delay Migration Until (H) HH:MM 00:00  
Delay data migration operations until a specified time.

Back (J) Next Cancel

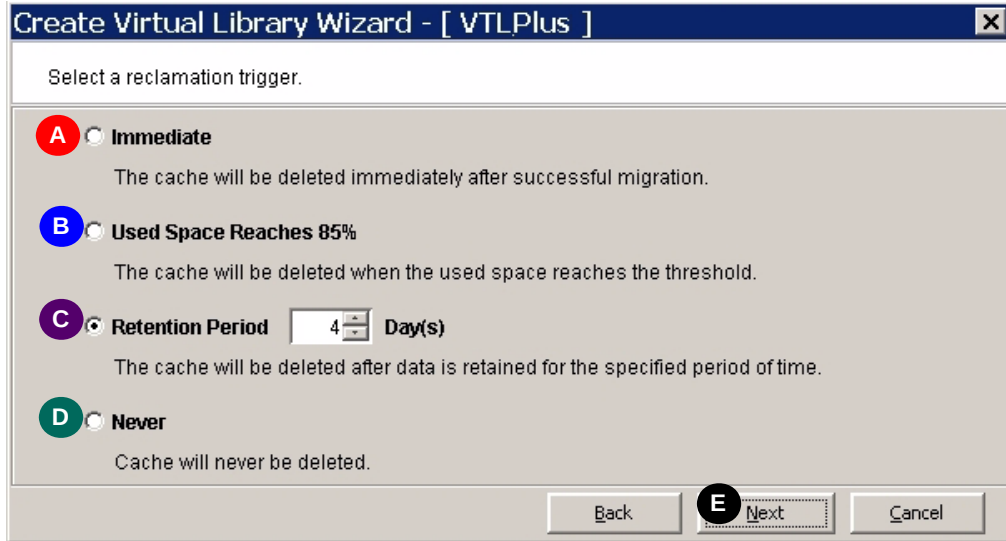
3. To migrate data when ONE OR MORE of the conditions specified is satisfied, click the the Or radio button (C above).
4. To trigger migration based on the age of the data, check the Age Based check box, and use the spinner control to select the desired number of days (D above).
5. To trigger migration based on disk usage, check the Disk Capacity Based check box (E above).
6. To trigger migration based on the end of a backup job, check the End of Backup check box (F above). If you want the end of a backp job to trigger migration only when a tape is full, also check the Only When Tape Is Full check box (G above).
7. To delay migration for a specified period following another triggering event, check the check Delay Migration Unitl check box, and enter the number of hours and minutes for the dealy in the box provided (H above).
8. Press Next (J above).

Next task: "Creating a reclamation policy" on page 50.

## ▼ Creating a reclamation policy

The reclamation policy determines when expired virtual volumes are released. Proceed as follows.

1. When the Please select a reclamation trigger dialog appears, click the radio button that corresponds to the desired triggering condition (A below).



2. If you choose to specify a Retention Period, use the spinner control (B above) to specify the number of Day(s).
3. Then press Next (C above).

**Next task:** “Generating the virtual library” on page 53.

## ▼ Setting up the Auto Archive feature

1. When the Auto Archive/Replication dialog appears, check the Auto Archive/Replication check box (A below).

2. Specify Auto Archive by clicking the Auto Archive radio button (B above).
3. Select the desired archiving behavior by clicking either the Move radio button (and setting the grace period using the spinner and list controls provided) or the Copy radio button (C above).  
The Copy option copies the virtual volume to physical media, leaving the virtual volume on disk. The Move option deletes the virtual volume from disk once the specified grace period has expired.
4. If you wish to eject tapes to import/export slots, check the Eject physical tapes to I/E slots after export check box (D above).
5. If you wish to encrypt the archived data, check the Encrypt data ... check box, and select a key from the list control provided (E above).
6. Press Next (F above).

**Next task:** “Generating the virtual library” on page 53.

## ▼ Setting up the Auto Replication option

1. When the Auto Archive/Replication dialog appears, check the Auto Archive/Replication check box (A below).

2. Click the Auto Replication radio button (B above).
3. To copy virtual media to the target library while leaving the source virtual media in the source library, click the Copy radio button (C above).
4. To move virtual media to the target library, deleting the source virtual media, click the Move radio button (D above). If you want to retain the source volumes in the source library for a specified period before deleting them, define a grace period using the spinner and list controls at right (E).
5. Select the Remote server name for the server that will host the replicated data. Select a name from the list control provided, or press Add to add a server to the list (F above).
6. Press Next (G above).

**Next task:** "Generating the virtual library" on page 53.

## ▼ Generating the virtual library

Using this procedure, you define the remaining characteristics of your virtual library and media. You supply a barcode range, slot count, and import/export slot count for the library and define the capacity of the media.

Setting the barcode range defines the set of barcodes that the virtual library will support. Each batch of cartridges that you subsequently create must be a subset of the range you define now—you cannot change it later. So Sun recommends setting this value to the widest range possible, 000000-ZZZZZZ. The virtual library can then support any barcoding scheme that you will ever need.

By default, the slot count for a virtual library is the maximum defined for the Sun L700 physical library that the Sun VTL virtual library emulates, 678. Sun recommends adjusting this value to the maximum possible—4096—so that you are not needlessly constrained by it later. Once a library is defined, you cannot change the number of slots that it contains.

Proceed as follows.

1. **When the Enter Virtual Library Information dialog appears, enter a Barcode Starts value in the text field provided (A below).**

The starting value shown, 000000, allows you the greatest range possible. But whatever you choose, enter exactly six (6) barcode characters when emulating Sun StorageTek libraries—neither more nor less.

2. **Enter a Barcode Ends value in the text field provided (B above).**

The ending value shown, ZZZZZZ, allows you the greatest range possible. But whatever you choose, enter exactly six (6) barcode characters when emulating Sun StorageTek libraries—neither more nor less.

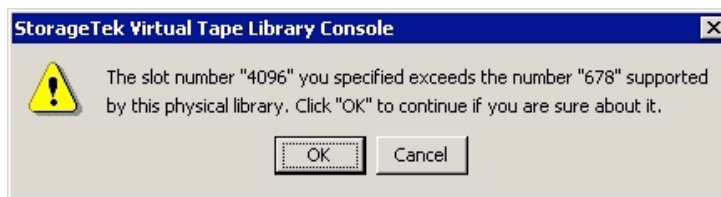
3. **Using the spinner control provided, adjust the Number of Slots to 4096, the maximum supported by major backup application software for a single virtual library (C above).**

In most cases, set the slot number to the maximum value. Once a library is defined, you cannot change the number of slots that it contains, so it makes sense to set this number as high as possible.

However, if you have to emulate a particular physical library (such as an IBM3590) rather than the Sun VTL library type, exercise care when changing the number of slots (or any other library properties). From an application or client point of view, virtual and physical instances of a given library type should generally be functionally identical. If they are not, clients and applications may behave in unanticipated ways.

Finally, if you set up multiple libraries, you will not be able to create more than 65536 tapes per VTL server node, regardless of the number of slots and libraries configured.

4. **Press Next (D above).**
5. If you changed the default Number of Slots, the VTL software displays the following warning. Press OK.



6. When the Enter virtual tape properties dialog appears, check the Tape Capacity On Demand check box (E below).

Sun recommends capacity on demand for most users.

7. If you are not using tape caching, use the Maximum Capacity spinner control (F above) to set the maximum size of your virtual tapes to 50-60 GB or to the average size of your backup jobs (whichever is larger).

This approach minimizes wasted space in the critical disk cache, where the first copy of each backup job is stored. It maximizes the number of cartridges available for backup jobs at any given time. Your copy/vault software can then consolidate these smaller volumes onto full-sized physical tape cartridges outside the backup window.

8. If you are using VTL data compression with tape caching, use the Maximum Capacity spinner control (F above) to reduce the Maximum Capacity to 85-90% of the encompassed capacity of the selected media.

In the example above, you would reduce maximum capacity to 42-43 GB when using compression.

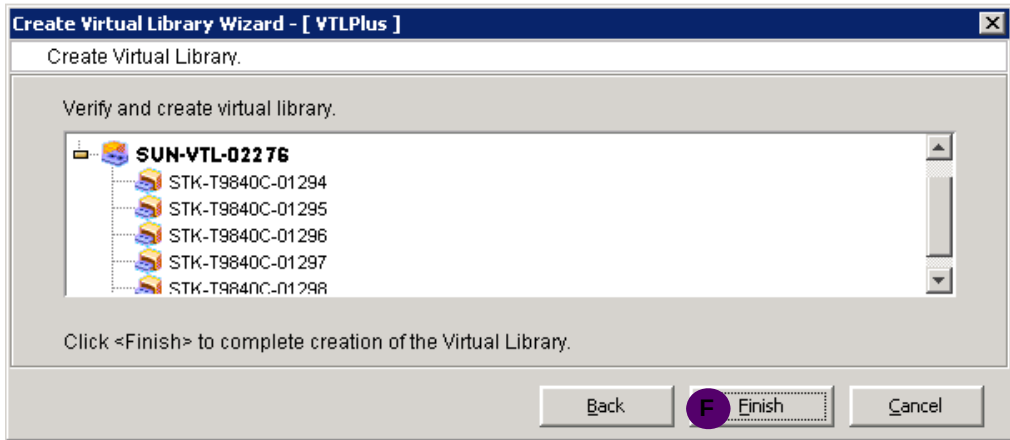
When you enable tape caching, a single virtual tape has two images, one in the disk cache and one in the tape cache. Both images must be logically identical. But when you use compression with tape caching, you cannot be sure that the disk and tape images will be identical. Different compression algorithms can produce slightly different compression ratios. So, unless you allow a 10-15% margin of safety, you might find that a compressed data set that fills a tape image on disk will not fit on a physical cartridge.

9. If you are using tape caching, leave the Maximum Capacity control set to the maximum capacity of the physical media, unless you are also using VTL data compression.

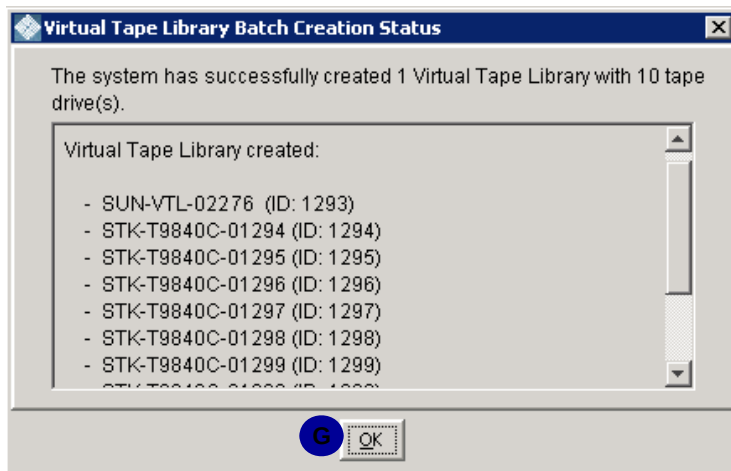
The disk and physical-tape images of a virtual tape must be logically identical when you enable tape caching. They cannot be different sizes.

10. Press **Next (E above)**.

11. When the confirmation screen appears, press **Finish (F below)**.



12. When the Batch Creation Status panel appears, press **OK (G below)**.

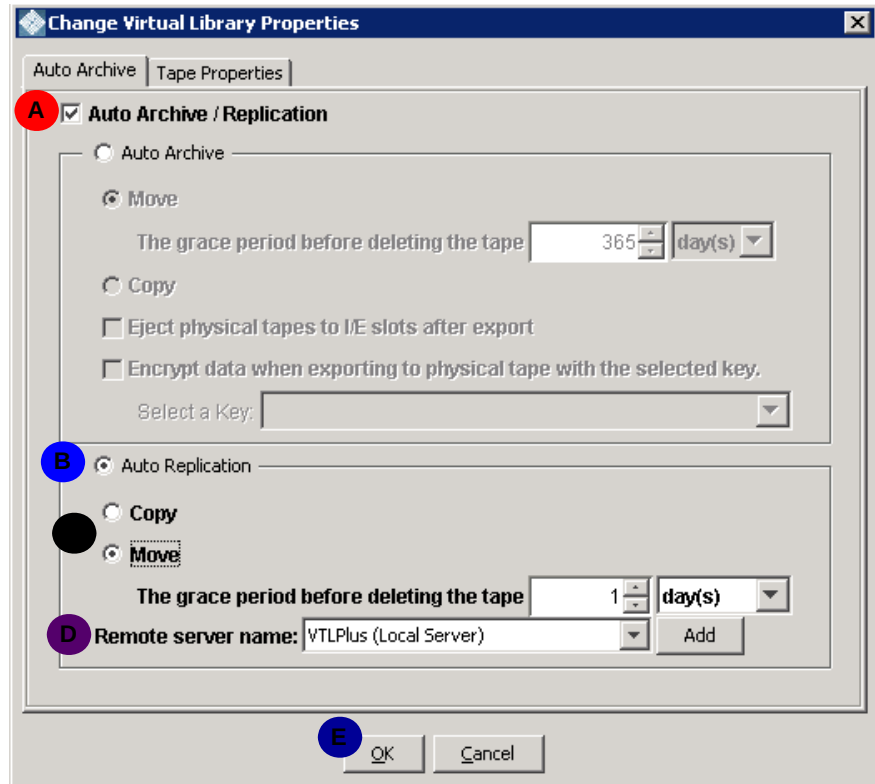


**Next task:** If you decided to create tapes, go to “Creating virtual tapes” on page 58.

## ▼ Enabling Auto Replication on an existing library

1. In the object tree of the VTL console, expand the node for the VTL server.
2. Under the VTL server, expand the Virtual Tape Library System and Virtual Tape Libraries nodes.

3. Under the Virtual Tape Libraries node, right-click on the virtual tape library that you want to enable, and select Properties.
4. When the Change Virtual Library Properties property sheet appears, check the Auto Archive/Replication check box (A below), and click the Auto Replication radio button (B).



5. Select the desired replication method by clicking the Copy radio button or by clicking the Move radio button and entering a grace period using the list and spinner controls provided (C above).
6. Select the Remote server name for the server that will host the replicated data. Selecting a name from the list control provided, or press Add to add a server to the list (D above).
7. Press OK (E above).

Stop here.

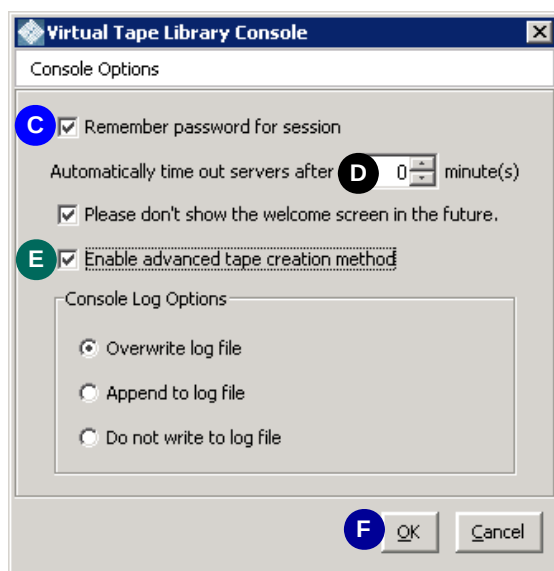
## Creating virtual tapes

Follow the procedures outlined below:

- “Enabling the advanced tape creation method” on page 58
- “Setting replication parameters for virtual tape volumes” on page 63
- “Launching the virtual tape batch creation process” on page 66.

### ▼ Enabling the advanced tape creation method

1. **If you have not already done so, from the console main menu, select Tools (A below), then select Console Options (B) from the submenu.**
2. **When the Console Options property sheet appears, make sure that the Enable advanced tape creation method check box (E above) is checked, and press OK (F).**



The advanced tape creation method is enabled by default starting with VTL Plus 2.0. Sun recommends the advanced tape-creation method because it makes it easier to avoid creating more virtual tapes than the available disk space can hold and makes it easier to manage multiple virtual tapes in multiple libraries.

When the advanced method is enabled, tape creation dialogs display the available disk space alongside the controls that specify initial tape size and the desired number of tapes. Using this value, you can calculate the maximum number of full cartridges that you can create without oversubscribing the disk. While VTL software

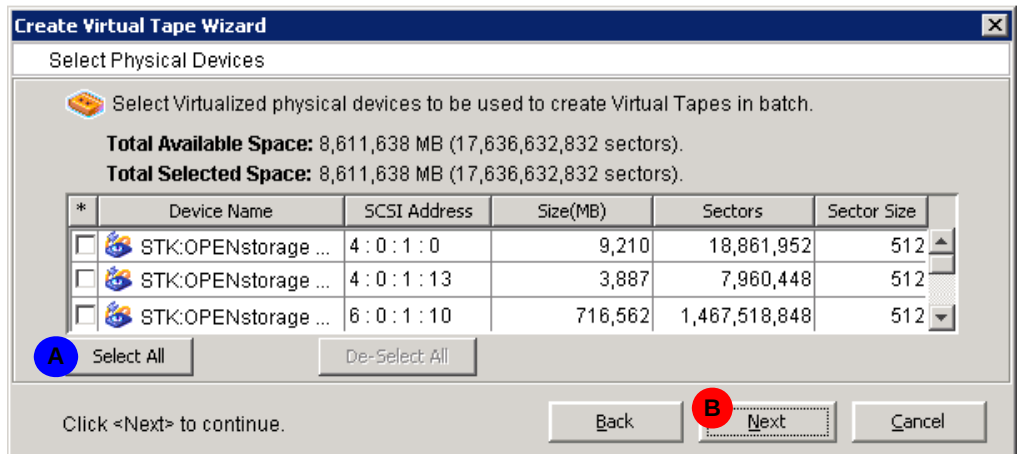
tries to calculate this value for you, it does so using the *currently allocated size* of the virtual tapes. If you are using the capacity on demand feature of the Sun VTL, the currently allocated size is the increment size (typically 5 GB), *not* the full capacity of the emulated media (for example, 40 GB for Sun StorageTek 9840C cartridges). As a result, the software will let you create as many *increment-sized* tapes as will fit in the available disk space, up to the maximum number of slots defined for the library (658 for the Sun VTL library type). If you accept this number and create the tapes, the system will run out of disk space long before the tapes appear to be full.

The advanced method also adds a control to the tape-creation interface that lets you assign prefixes to tape names. By assigning the same prefix to both the virtual library and each of its virtual tapes, you can greatly simplify subsequent library management.

**Next task:** “Selecting physical disk resources for use as virtual tape” on page 59.

## ▼ Selecting physical disk resources for use as virtual tape

1. When the **Select Physical Devices** dialog appears, press **Select All** (A below).



2. Press **Next** (B).

**Next task:** at this point, the behavior of the configuration wizard depends on the configuration of the virtual library:

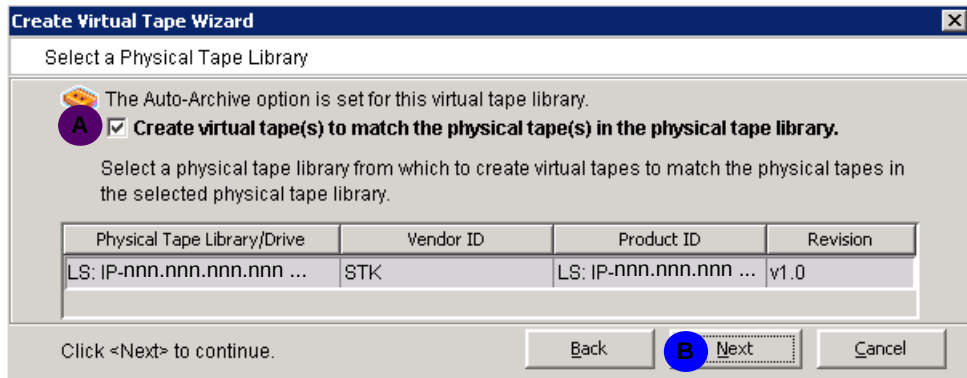
- If the new virtual tapes will reside in a library that has the Auto Archive option enabled, the wizard displays two additional dialogs at this point, **Select a Physical Tape Library** and **Select Physical Tapes**. So go to “Setting Auto Archive parameters for virtual tape volumes” on page 60.

- Otherwise, the wizard skips directly to the Specify Batch Mode Information dialog. So go to “Allocating disk space to virtual tapes” on page 62.

## ▼ Setting Auto Archive parameters for virtual tape volumes

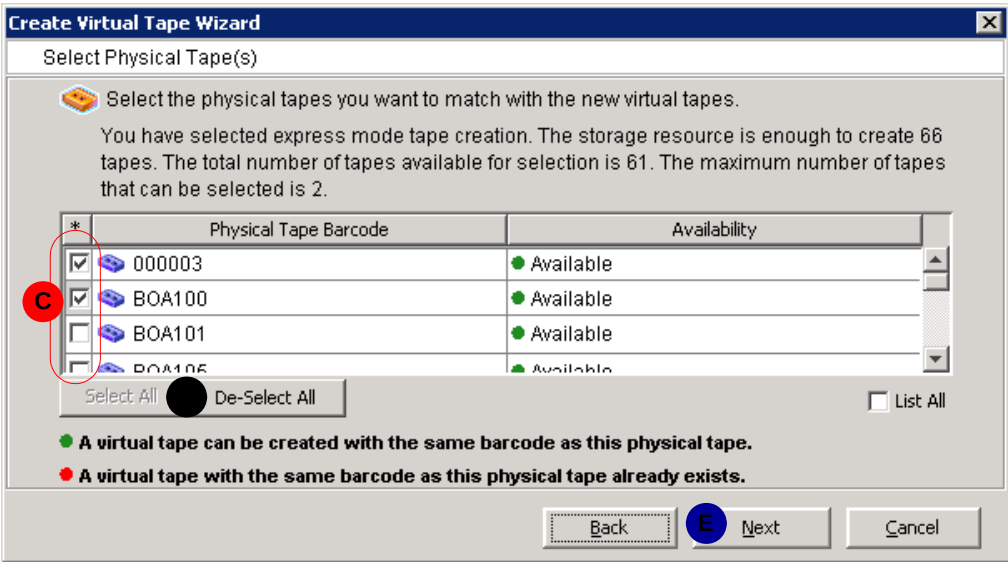
If the new virtual tapes will reside in a library that has the Auto Archive option enabled, proceed as follows.

1. **In the Select a Physical Tape Library dialog, check the Create virtual tape(s) to match physical tape(s) ... check box (A below). Press Next (B).**



Checking the Create virtual tape(s) to match physical tape(s) ... check box insures that the barcodes of the new virtual tapes will match those of the physical tapes, thus fulfilling an essential prerequisite for auto archiving.

2. In the Select Physical Tapes dialog , select physical tapes using the check boxes (C below) and/or button controls provided (D ). Then press Next (E).



Next task: “Allocating disk space to virtual tapes” on page 62.

## ▼ Allocating disk space to virtual tapes

1. When the Specify Batch Mode Information panel appears, enter a descriptive prefix for the virtual tape labels (A below).

Choose a meaning name prefix that shows the relationships between virtual tape volumes and virtual libraries.

**Create Virtual Tape Wizard**

Specify Batch Mode Information

Enter the information required to create the Virtual Tapes.

**Virtual Tape Name Prefix:** virtualLibraryName\_VTV **A**

Invalid characters for the Resource Name: < > " & \$ / \ '

**Virtual Tape Size:** 36 GB

**Starting Number:** 1 **Number of Virtual Tapes:** 1 (Maximum: 232)

**Total Selected Space:** 2,869,932 MB (5,877,620,096 sectors).

| Device Name          | SCSI Address | Size(MB) | Sectors       | Sector Size |
|----------------------|--------------|----------|---------------|-------------|
| STK:OPENstorage D... | 4:0:1:5      | 716,562  | 1,467,518,848 | 512         |
| STK:OPENstorage D... | 4:0:1:13     | 3,887    | 7,960,448     | 512         |
| STK:OPENstorage D... | 8:0:1:3      | 716,359  | 1,467,103,104 | 512         |

☒ Use default ID for Starting Number.

Back Next Cancel

2. If you only plan to create one virtual library for your VTL system, you can use all of the available disk capacity for tapes. Enter the Maximum (B below) as the new value for the Number of Virtual Tapes (C below).

**Create Virtual Tape Wizard**

Specify Batch Mode Information

Enter the information required to create the Virtual Tapes.

**Virtual Tape Name Prefix:** virtualLibraryName\_VTV **A**

Invalid characters for the Resource Name: < > " & \$ / \ '

**Virtual Tape Size:** 36 GB

**Starting Number:** 1 **Number of Virtual Tapes:** 1 (Maximum: 232) **B**

**Total Selected Space:** 2,869,932 MB (5,877,620,096 sectors).

| Device Name          | SCSI Address | Size(MB) | Sectors       | Sector Size |
|----------------------|--------------|----------|---------------|-------------|
| STK:OPENstorage D... | 4:0:1:5      | 716,562  | 1,467,518,848 | 512         |
| STK:OPENstorage D... | 4:0:1:13     | 3,887    | 7,960,448     | 512         |
| STK:OPENstorage D... | 8:0:1:3      | 716,359  | 1,467,103,104 | 512         |

☒ Use default ID for Starting Number. **D**

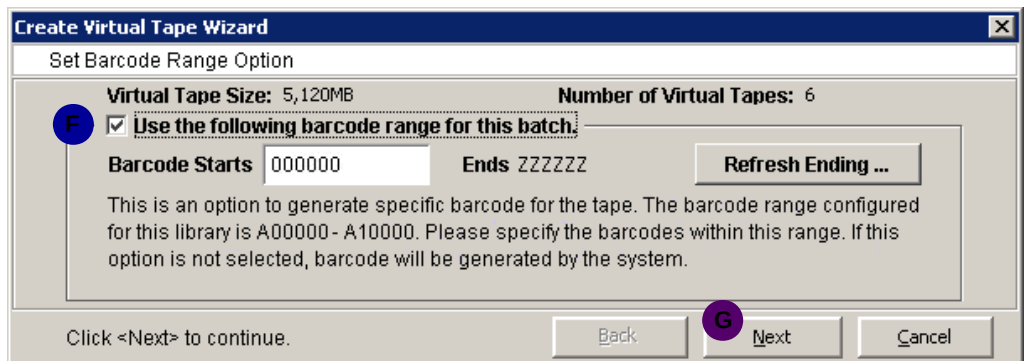
Back **C** Next Cancel

3. Otherwise, if you plan to create additional libraries later, divide the Maximum (B above) between the libraries, and enter the number allocated to this library as the Number of Virtual Tapes (C).

The new value has to be less than the Maximum, so that capacity is reserved for creating tapes for the additional libraries.

4. Check the Use Default ID for Starting Number check box (D above). Press Next (E).
5. When the Set Barcode Range Option panel appears, check the Use the following barcode range for this batch check box (F below), and press Next (G).

The Set Barcode Range Option panel defines the set of barcodes that the virtual library will support. Each batch of cartridges that you subsequently create must be a subset of the range you define now—you cannot change it later. So Sun recommends setting this value to the widest range possible, 000000-ZZZZZZ. The virtual library can then support any barcoding scheme that you will ever need.



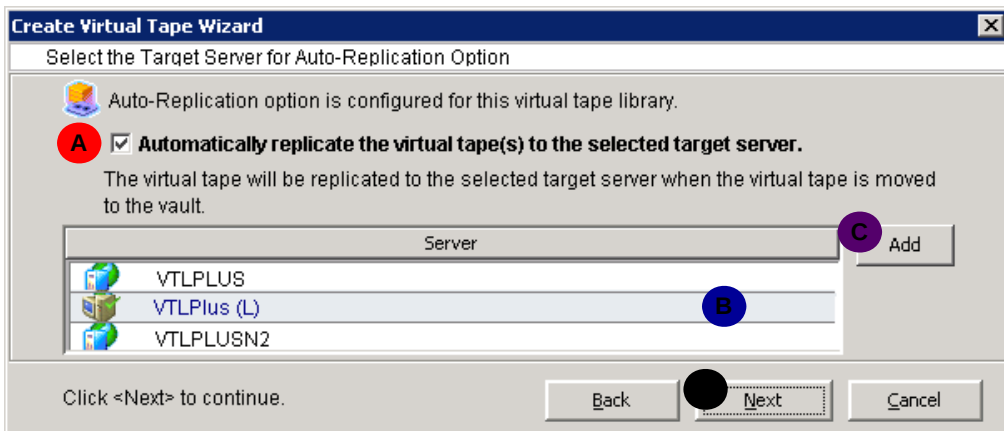
#### Next task:

- If you are using the Auto-Replication feature, go to “Setting up the Auto Replication option” on page 52.
- Otherwise, go to “Launching the virtual tape batch creation process” on page 66.

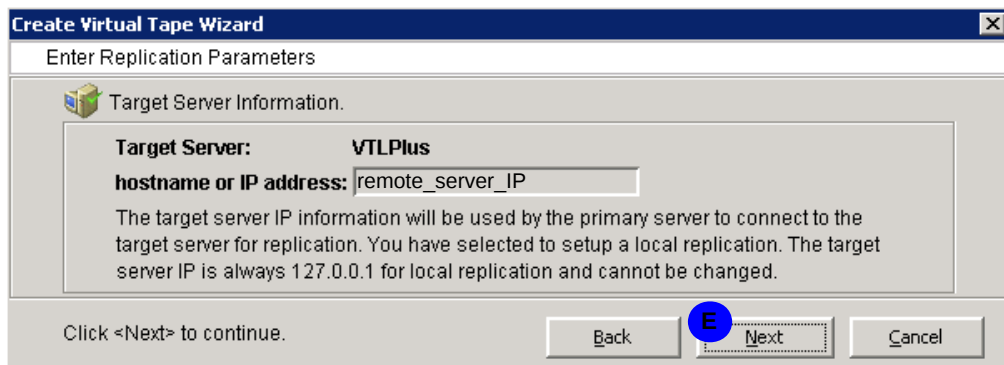
## ▼ Setting replication parameters for virtual tape volumes

If the new virtual tapes will reside in a library that has the Auto-Replication option enabled, proceed as follows.

1. When the Select Target Server for Auto-Replication Option dialog appears, check the Automatically replicate the virtual tape(s) to the selected target server check box (A below).



2. Select the remote server from the list (B above), or press Add to add a server to the list (C). Press Next (D).
3. When the Target Server Information panel appears, press Next (E below).



4. When the **Specify Replication Timeout and Retry Policy** property sheet appears, configure timeout and retry intervals using the spinner controls provided (F below). Then press **Next** (G).

**Create Virtual Tape Wizard**

Specify Replication Timeout and Retry Policy

Replication timeout and retry can be adjusted for different configuration.

Timeout replication in 60 seconds

Retry replication in 60 seconds when replication failed.

Retry replication for 1 times.

Replication will be timed out in the specified number of seconds. Replication can be retried automatically at a set interval for number of times specified when it failed.

Click <Next> to continue.

Back Next Cancel

5. When the **Specify the Options for Data Transmission** property sheet appears, check the **Compress Data** (H below) check box to enable compression.

Compression software can be valuable when transmitting replica data over slow links. However, assess requirements carefully. Consider the operational impact of the additional processor workload and consequent reductions in throughput before enabling this option.

**Create Virtual Tape Wizard**

Specify the Options for Data Transmission.

The following options can be specified to improve the performance and security.

☒ **Compress Data**

This option allows the data to be compressed to reduce the size for transmission. Compression option will take effect immediately. If the replication is in progress, compression option will be applied to the next data transmission.

☐ **Encrypt Data**

This option allows the data to be encrypted for secure transmission. Encryption option will not take effect when the replication is already in progress. It will be applied to the next replication session.

Click <Next> to continue.

Back Next Cancel

6. Check the **Encrypt Data** check box (J above) to enable encrypted transmissions.

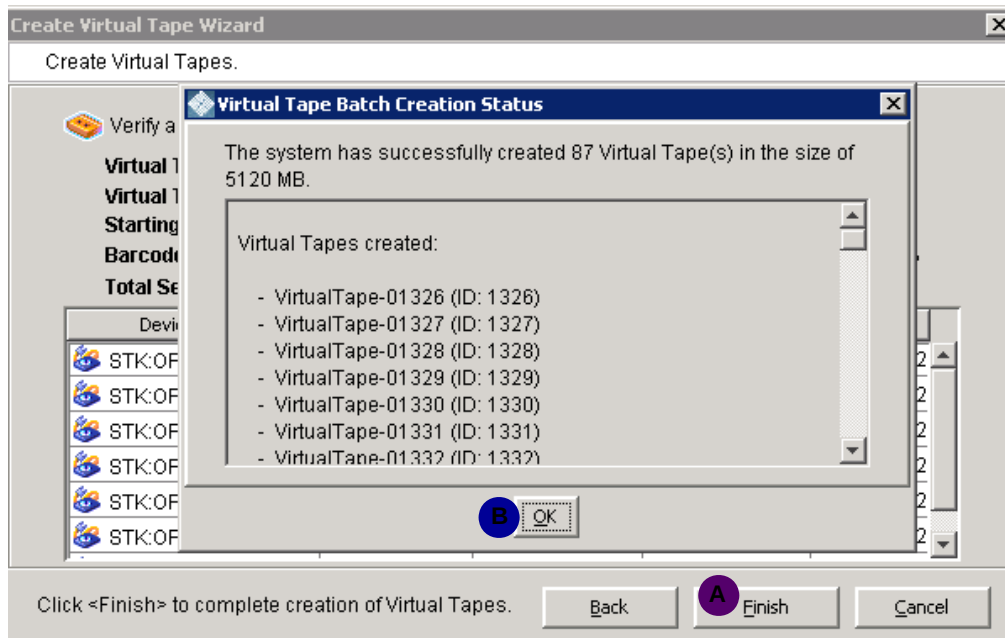
Encryption software is often necessary when replicating data over insecure links. However, assess requirements carefully. Consider the operational impact of the additional processor workload and consequent reductions in throughput before enabling this option.

7. Press **Next (K above)**.

**Next task:** “Launching the virtual tape batch creation process” on page 66.

## ▼ Launching the virtual tape batch creation process

1. When the **Create Virtual Tapes summary screen** appears, press **Finish (A below)**.



2. When the batch job finishes and the **Virtual Tape Batch Creation Status panel** appears, press **OK (B above)**.

Note that tape creation can take some time, so the status panel will not appear immediately.

**Stop here.**

## Connecting virtual libraries with storage clients

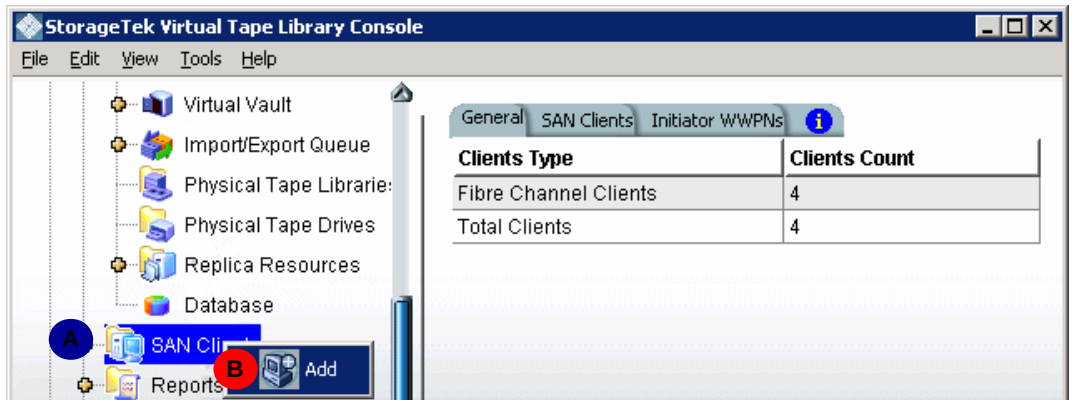
To connect virtual libraries with client machines (typically backup application or NDMP agent hosts), carry out the following tasks:

- “Starting the Add Client Wizard” on page 67

- “Adding Fibre Channel SAN clients” on page 68
- “Assigning virtual libraries to storage clients” on page 71.

## ▼ Starting the Add Client Wizard

1. In the tree menu of the VTL console, select the VTL server branch.
2. Right-click the SAN Clients branch (**A** below).
3. Select Add from the context menu (**B** below).



**Next task:** “Adding Fibre Channel SAN clients” on page 68.

## ▼ Adding Fibre Channel SAN clients

1. When the Enter the Generic Client Name dialog appears, enter the client name in the text field provided (A below). Press Next (B).

The client is typically an ACSLS server or a backup application host, such as a Symantec NetBackup master server.

**Add Client Wizard**

Enter the Generic Client Name

Enter the machine name of the client and verify the existence of the client.

**A** Client Name:

Client Machine Discovery

**Client IP address:**  **Find**

Click <Find> to discover the client machine. It is not required to have the client machine up in order to add the client to Virtual Tape Library server. It is for verification purposes

**Status:**

Click <Next> to continue.

**B** **Next** **Cancel**

2. When the Select Client Protocols dialog appears, check the Fibre Channel check box (C below), and press Next (D).

**Add Client Wizard**

Select Client Protocols

Select protocol(s) for the client you want to add.

**C** ☒ **Fibre Channel**

Fibre Channel clients communicate with Virtual Tape Library server via the Fibre Channel protocol.

☐ **iSCSI**

iSCSI clients communicate with Virtual Tape Library server via the iSCSI protocol.

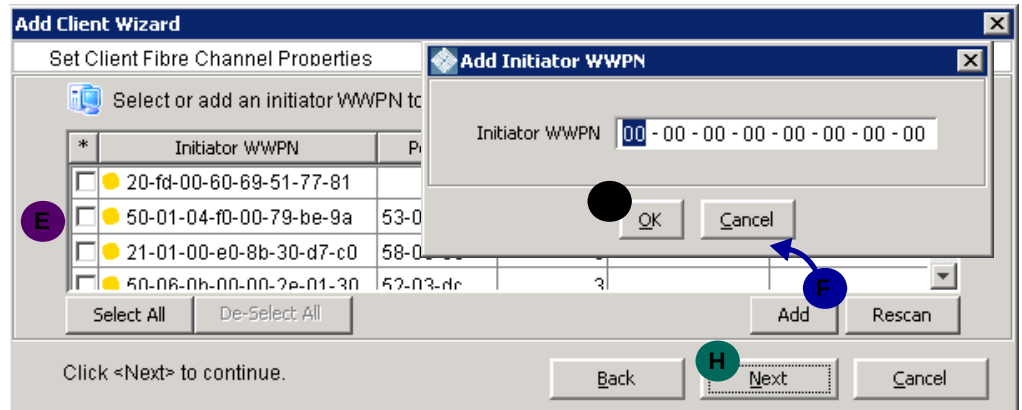
☐ **Create this iSCSI client as a mobile user.**

Mobile client can access from any machine after authentication.

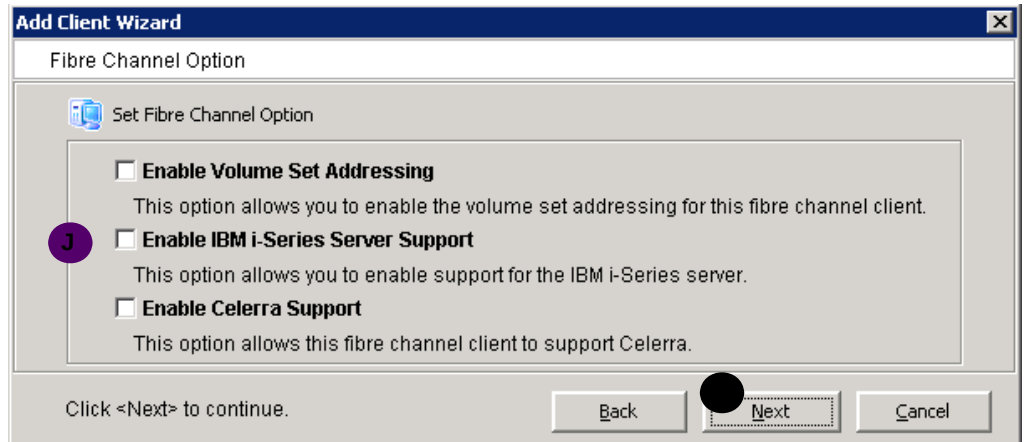
Click <Next> to continue.

**D** **Next** **Cancel**

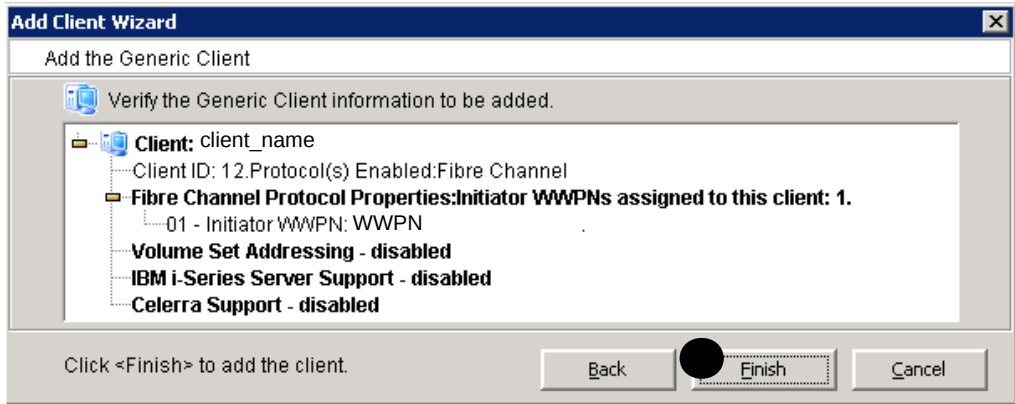
3. When the Set Client Fibre Channel Properties property sheet appears, select the World Wide Port Name (WWPN) of the initiator by checking the corresponding check box (E below), or press the Add button (F), enter a new Initiator WWPN, and press OK (G). Then press Next (H).



4. When the Fibre Channel Option panel appears, check the check boxes for any optional support that the client requires (J below). Then press Next (K).



5. When the Add the Generic Client summary screen appears, press Finish (L below) to add the client.

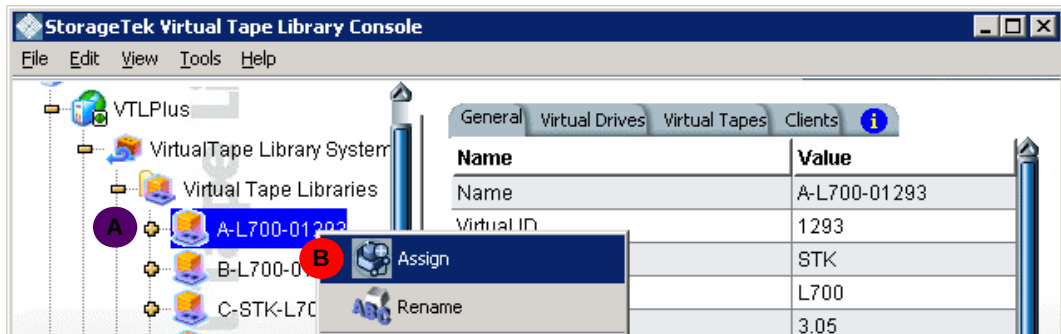


**Next task:** “Starting the Assign a Virtual Tape Library Wizard” on page 70.

## ▼ Starting the Assign a Virtual Tape Library Wizard

VTL storage clients are the backup application hosts that manage your backup jobs. To assign libraries to clients, proceed as follows.

1. Open the Assign a Virtual Tape Library Wizard by right-clicking on the object-tree node for virtual library, and selecting Assign from the context menu (A below).



2. Press Next (B above).

**Next task:** “Assigning virtual libraries to storage clients” on page 71

## ▼ Assigning virtual libraries to storage clients

1. **When the Assign a Virtual Tape Library Wizard appears, check the Assign the tape library and all drives... check box (A below), select a client (B), and press Next (C).**

As a general rule, assign one library per client.

2. **When the Select a Fibre Channel Target panel appears, select the Target WWPN that you will zone to the client from the list (D below), and press Next (E).**

To insure that the four target ports on the VTL appliance are fully and equally utilized, assign a minimum of four virtual tape drives per client.

3. When the Assign a Fibre Channel Client to the Virtual Tape Library confirmation screen appears, press Finish (F).

**Assign a Virtual Tape Library Wizard - [ VTLPlus ]**

Assign a Fibre Channel Client to the Virtual Tape Library

WWPN ports selected to be assigned to the Virtual Tape Library.

**Virtual Tape Library Name:** ● **virtual\_library\_name**

**Client Name:** client\_name

Fibre Channel Port Mapping Type: One to One

**The tape library and the tape drives in the library will be assigned to the selected clients.**

| Initiator WWPN          | Target WWPN             |
|-------------------------|-------------------------|
| 10-00-00-00-c9-2b-9d-e6 | 21-01-00-e0-8b-3e-72-e4 |

● This Virtual Tape Library is already assigned to other client(s).

● This Virtual Tape Library has not been assigned to any other client yet.

Click <Finish> to confirm the assignment

Back Finish Cancel

4. Log in to each VTL client (each backup server), and scan for new Fibre Channel devices.

Stop here.

## Controlling VTL virtual libraries with ACSLS

If you plan to administer VTL virtual libraries using the Sun ACSLS application, you need to carry out the following tasks:

- “Discovering SAN virtual libraries from the ACSLS host” on page 72
- “Creating ACSLS host driver instances for virtual libraries” on page 73
- “Adding virtual libraries to the ACSLS configuration” on page 75.

### ▼ Discovering SAN virtual libraries from the ACSLS host

1. Log in to the ACSLS server as root.
2. Configure all Fibre Channel-connected virtual libraries into the system with the devfsadm command:

```
[ACSLs_server]root:# ./devfsadm
```

3. Perform a configuration reboot:

```
[ACSLServer]root:# ./reboot -- -r
```

**Next task:** “Creating ACSLS host driver instances for virtual libraries” on page 73.

▼ Creating ACSLS host driver instances for virtual libraries

Once you have discovered the newly attached VTL virtual libraries, proceed as follows.

- 1. Log in to the ACSLS server as root.
- 2. Change to the the home directory of the ACSSS user, \$ACSSS\_HOME:

```
[ACSLServer]root:# cd $ACSSS_HOME
```

The default location of \$ACSSS\_HOME is /export/home/ACSSS.

- 3. Quiesce ACSLS with the kill command:

```
[ACSLServer]root:# ./kill.acsss
kill.acsss: Bringing down ACSLS
kill.acsss: ACSLS is down
```

A message that states that the PID file does not exist means that ACSLS was not running.

- 4. Obtain the World Wide Names (WWNs) for the remote Fibre Channel ports that connect the new virtual libraries. Run the cfgadm command with the show\_SCSI\_LUN option, and check the output for the WWNs of med-changer devices:

The WWNs are part of the Ap\_Id string, located between the controller number and the LUN number:

```
[ACSLServer]root:# ./cfgadm -o show_SCSI_LUN -al
```

| Ap_Id                     | Type        | Receptacle | Occupant     | Condition |
|---------------------------|-------------|------------|--------------|-----------|
| c2                        | fc-fabric   | connected  | configured   | unknown   |
| c2:: 202700a0b811158a ,0  | unavailable | connected  | configured   | unknown   |
| c2:: 210000e08b8a0bc2 ,0  | med-changer | connected  | unconfigured | unknown   |
| c2:: 210000e08b8affc2 ,1  | med-changer | connected  | unconfigured | unknown   |
| c2:: 202700a0b811158a ,31 | disk        | connected  | configured   | unknown   |
| c2:: 210000e08b8a0bc2 ,1  | disk        | connected  | configured   | unknown   |
| c2:: 210100e08ba57d7c ,2  | med-changer | connected  | unconfigured | unknown   |

**5. Edit the file `/usr/kernel/drv/mchanger.conf`, adding an entry for each virtual library that the operating system discovered.**

Each library entry includes a driver name (`mchanger`), a parent driver (`fp`, the Solaris Fibre Channel port driver), a driver class (`scsi`), a logical unit number (`lun`), and a World Wide Name for the remote Fibre Channel port (`fc-port-wwn`):

```
[ACSLServer]root:# vi /usr/kernel/drv/mchanger.conf
name="mchanger" class="scsi" target="is" lun="by"
name="mchanger" class="scsi" target=0 lun=0;
name="mchanger" class="scsi" target=0 lun=1;
name="mchanger" class="scsi" target=0 lun=2;
name="mchanger" parent="fp" class="scsi" lun=0 fc-port-wwn="210000e08b8a0bc2";
name="mchanger" parent="fp" class="scsi" lun=1 fc-port-wwn="210000e08b8affc2";
name="mchanger" parent="fp" class="scsi" lun=2 fc-port-wwn="210100e08ba57d7c";
:wq
[ACSLServer]root:#
```

**6. Unload the unattached driver `mchanger`:**

```
[ACSLServer]root:# ./rem_drv mchanger
```

**7. Change to the install subdirectory of the ACSSS home directory, `$ACSSS_HOME`, and execute the driver installation script, `install_scsi_sol.sh`.**

The default location of `$ACSSS_HOME` is `/export/home/ACSSS`.

```
[ACSLServer]root:# cd /export/home/ACSSS/install
[ACSLServer]root:# ./install_scsi_sol.sh
Installing 64-bit mchanger
Probing for libraries...
/export/home/ACSSS/Utils/probeFibre.sh[46]: test: argument expected
Unable to auto-sense any fibre-attached libraries.
```

**8. When the script fails to find libraries and asks if any are attached, enter `y` (yes).**

```
Are there additional libraries attached? (y or n): y
```

**9. Enter a space-delimited list of target:LUN pairs, one pair for each library.**

```
Enter the target:LUN pair corresponding to each library.
Separate target:LUN pairs with a space.
example: 4:0 5:0 5:1 5:2
==> 0:0 0:1 0:2# General form = Target:LUN e.g. 0:1
Use target 0 LUN 0
Use target 0 LUN 1
Use target 0 LUN 2
```

**10. When prompted, confirm your entries by entering `y` (yes).**

The script builds the driver instances for the specified libraries:

```
Is this correct? (y or n): y

Building an mchanger instance for each library...
Successfully built the following...
    /dev/mchanger0: STK L700 678-cells 10-drives
    /dev/mchanger1: STK L700 678-cells 10-drives
    /dev/mchanger2: STK L700 678-cells 10-drives
```

**11. Load the driver:**

```
[ACSLServer]root:# ./add_drv mchanger
```

**12. Change to the ACSLS home directory, and start ACSLS:**

```
[ACSLServer]root:# cd ../
[ACSLServer]root:# ./rc.acsss
Copyright 2007 Sun Microsystems, Inc. All rights reserved.
    Use is subject to license terms.
NOW IN SU - ACSLS.
Copyright 2007 Sun Microsystems, Inc. All rights reserved.
    Use is subject to license terms.
[ACSLServer]root:#
```

**13. Change to the `acsss` user account:**

```
[ACSLServer]root:# su - acsss
[ACSLServer]acsss:$
```

**Next task:** “Adding virtual libraries to the ACSLS configuration” on page 75.

## ▼ Adding virtual libraries to the ACSLS configuration

Once you have created driver instances for the VTL virtual libraries, add the libraries to the ACSLS host configuration using the following procedure.

**1. Start the `config acs new` utility:**

```
[ACSLServer]acsss:$ config acs new
2008-03-20 10:28:07
Enter the new ACS Configuration details
```

**2. When you are asked if the ACS (Automated Cartridge Subsystem) is in a partitioned library, enter n (no):**

```
Is ACS in a partitioned library? (y or n): n
Number of connections to ACS: 1
Device or host - ACS, connection #0:
2008-03-20 10:28:13
Obtaining Configuration details, please wait
2008-03-20 10:28:13
Configuration Details for ACS # 2
Partition ID                Not partitioned
Number of LSMs              1
Number of Ports             1
Port Name                   /dev/mchanger2
Port Status                 Communicating
LSM Details
Lsm # 2,0 :
-----
Lsm Type                    700
Number of CAPS              1
Number of PTPS              0
Number of Panels            4
Number of Drives            10
Number of Available cells   678
For details about this configuration change, please look in acsss_config.log.
```

**3. When you are prompted, confirm the changes by entering y (yes):**

```
Enter 'y' to confirm changes to the acs configuration for this ACS : y
2008-03-20 10:28:16
Please wait, Configuration update is in progress...
2008-03-20 10:28:18
ACS configuration updated.
```

- 4. Wait for 60 seconds (one minute), then start the ACSLS command preprocessor, cmd\_proc:**

```
$ cmd_proc

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-----ACSLS 7.2.0-----
ACSSA>
```

- 5. Audit the newly added libraries. At the ACSSA> prompt, enter audit:**

```
ACSSA> audit
    CAP identifier(acs,lsm,cap): 0,0,0
    Type(acs/lsm/panel/server/subpanel): acs
    ACS identifier(acs): 0
    ACS identifier(acs): 1
    ACS identifier(acs): 2
    ACS identifier(acs): 3
    ACS identifier(acs):
Audit: Audit completed, Multiple ACS audit.
Audit: Audit of ACS    0, Valid.
Audit: Audit of ACS    1, Valid.
Audit: Audit of ACS    2, Valid.
Audit: Audit of ACS    3, Valid.
```

- 6. Log the configuration events:**

```
ACSSA> log
```

**Stop here.** The VTL virtual libraries have been configured for ACSLS administration.

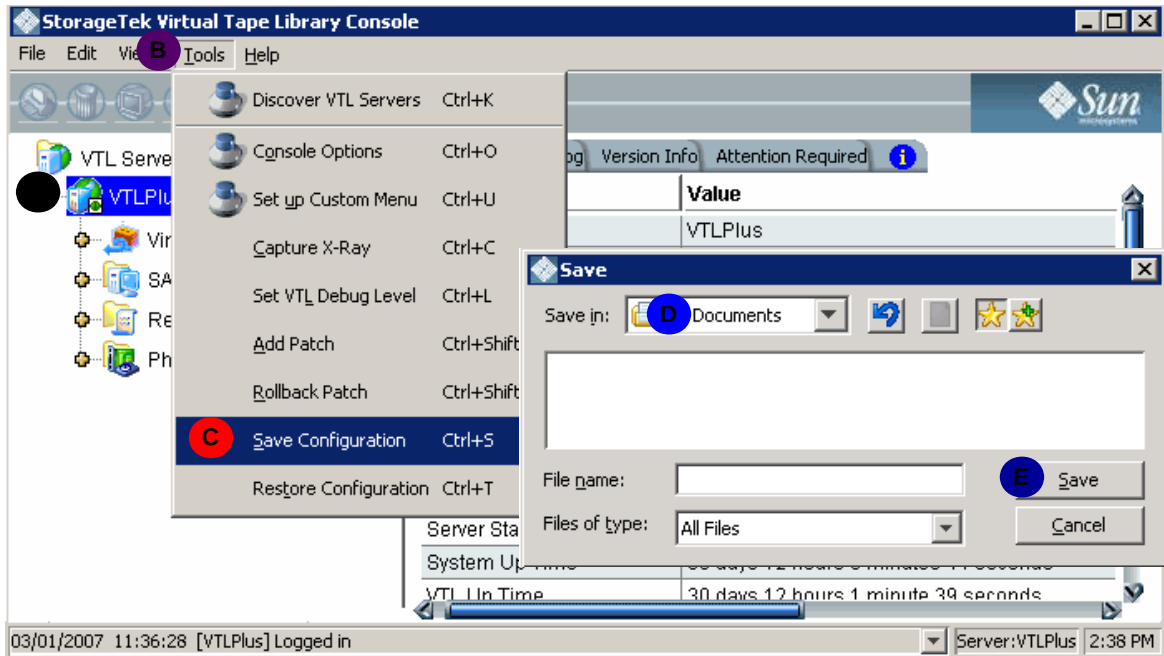
## Backing up the VTL system configuration

Whenever you change the VTL configuration, you should backup the configuration to a secure location on another machine. This process preserves the virtual tape libraries, virtual tape drives, clients, client assignments, replication configurations, and failover configurations for the server. You can do this in either of two ways:

- “Manually saving the VTL configuration” on page 78
- “Automatically backing up the VTL configuration” on page 78.

## ▼ Manually saving the VTL configuration

1. In the object tree of the VTL console, highlight the VTL server node (A below).



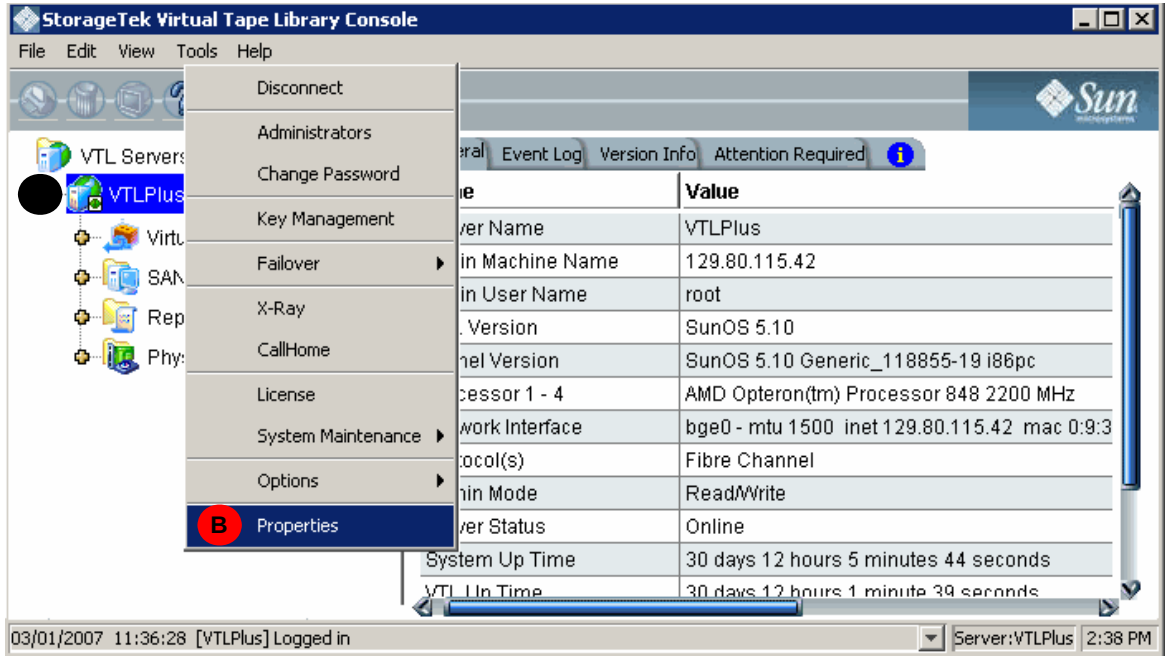
2. From the VTL main menu, select Tools (B above).
3. From the submenu, select Save Configuration (C above).
4. When the Save dialog appears, supply a filename (D above), and press Save (E).

Stop here.

## ▼ Automatically backing up the VTL configuration

To insure that the VTL configuration is always protected, use the Auto Save feature to periodically create a point-in-time snapshot of the VTL configuration on another server.

1. In the object tree of the VTL console, right-click on the the VTL server branch (A below).



2. From the context menu, select Properties (B above).

3. Select the Auto Save Config tab (C below).

Server Properties[ VTLPlus ]

Activity Database Maintenance

SNMP Maintenance **C** Auto Save Config Storage Monitoring

**D** ☒ Enable Auto Save Configuration File

Ftp Server Name: **E**

Ftp Port: 21

Target Directory: **F**

Username:

**G** Password:

Confirm Password:

Interval: **H** 1 Day(s)

Number of Copies: **J** 1

**K** OK Cancel

4. Check Enable Auto Save Configuration File check box (D above).

5. In the field provided, enter the Ftp Server Name for the machine that will host the backup configuration files (E above).

The target server must have FTP server installed and enabled.

6. Enter the relative path to the Target Directory in the field provided (F above).

The specified path should be relative to the root directory of the ftp server. Do not use an absolute path.

7. Enter host log on information for the remote server in the fields provided (G above).

The specified user must be an ftp user on the remote host and must have read/write access to the specified target directory.

8. Specify a replication Interval using the list controls provided (H above).

9. Specify the Number of Copies that should be retained using the spinner provided (J above).

10. Click OK (K above).

**Stop here.**

## Recovering the server configuration

If the VTL server configuration is lost or corrupt, you can recover it from a backup file using the procedure below.

---

**Caution** – This is a disaster recovery procedure only. Never execute it during day-to-day operation of the server. Restoring a configuration overwrites existing virtual device and client configurations and does not restore VTL partition information.

---

### ▼ Restoring the configuration

1. **In the object tree of the VTL console, select the branch for the VTL server that has lost its configuration information.**
2. **From the VTL main menu, select `Tools`.**
3. **From the submenu, select `Restore Configuration`.**
4. **Click `OK` to confirm.**
5. **When prompted, locate the backup configuration file.**

The VTL server restarts. Resources added after the configuration was saved will show up in the `Virtual Vault` after the configuration is restored. Deleted resources will be displayed in the virtual tape library with a red dot, indicating incomplete status.

**Stop here.**

## Protecting VTL metadata

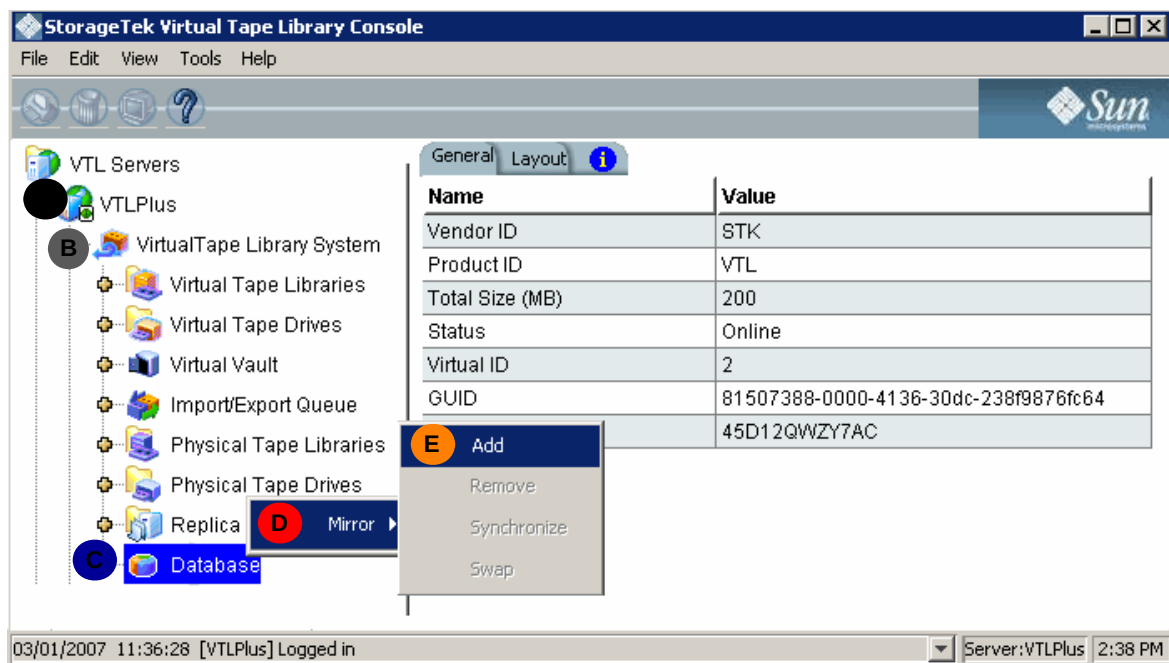
The VTL database holds the metadata that maps data stored on virtual tape to locations on the physical, random-access disk media. Without this critical information, virtual tape data cannot be recovered, so protecting it is essential.

Sun StorageTek VTL appliances protect this metadata by storing it on a RAID system, a set of storage disks configured to survive the loss of any single member of the set without loss of data.

Mirroring supplies an additional layer of protection. Mirrored databases maintain two separate, synchronized copies of the metadata, either of which can provide access to virtual tape data on its own.

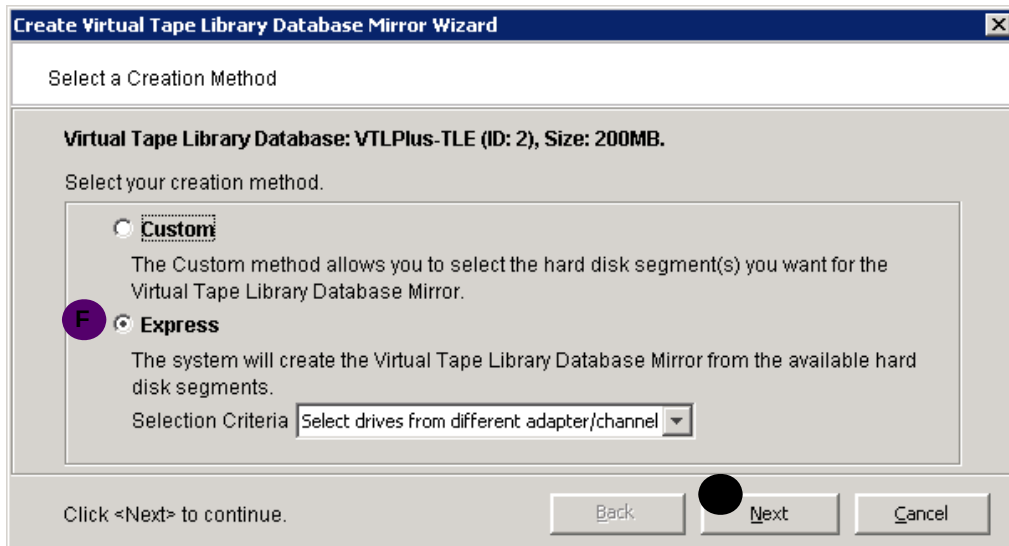
## ▼ Mirroring the VTL database

1. In the object tree of the VTL console, expand the branch for the VTL server (A below).
2. Expand the Virtual Tape Library System branch (B below).
3. Right-click on the Database object (C below).



4. From the context menus, select Mirror (D above) and Add (E).

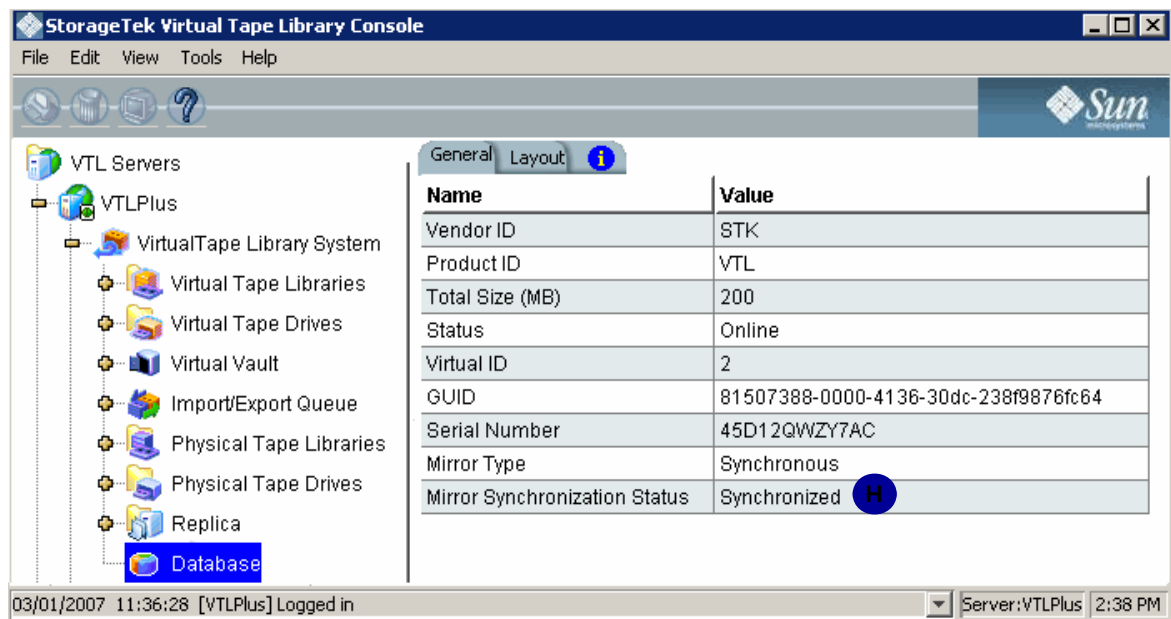
5. When the **Select a Creation Method** dialog appears, select **Express** (F below), and press **Next** (G).



The Express method takes advantage of the intelligence built in to the RAID subsystem to make best use of disk resources.

6. When the confirmation dialog appears, confirm that all information is correct, and then click **Finish** to create the mirrors.

The VTL software creates and synchronizes the mirror database. When the process completes, the value of the Mirror Synchronization Status field of the database property sheet becomes Synchronized (**H** below).



Stop here.

## ▼ Removing a mirror configuration

1. Right-click on the database.
2. Select **Mirror --> Remove** to delete the mirrored copy and cancel mirroring. You will not be able to access the mirrored copy afterwards.

Stop here.

## Administering user accounts and passwords

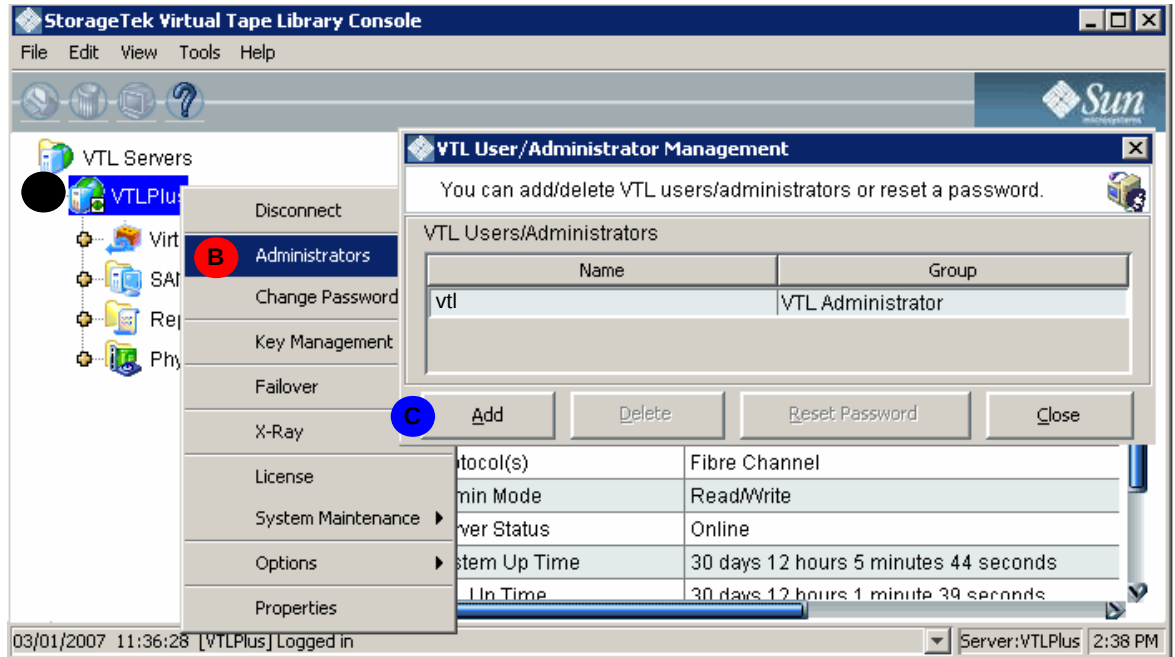
You can perform the following tasks from the VTL console:

- “Managing administrators” on page 85
- “Changing administrator passwords” on page 86.

## ▼ Managing administrators

Only the root user can add or delete a VTL administrator or change an administrator's password.

1. In the object tree of the VTL console, right click on the server name (A below), and select Administrators from the context menu (B).



There are two types of administrators:

- VTL Administrators are authorized for full VTL console access.
- VTL Read-Only Users are only permitted to view information in the Console. They are not authorized to make changes and they are not authorized for client authentication.

2. When the VTL User/Administrator Management dialog appears, use the controls provided to manage administrator accounts (C above).

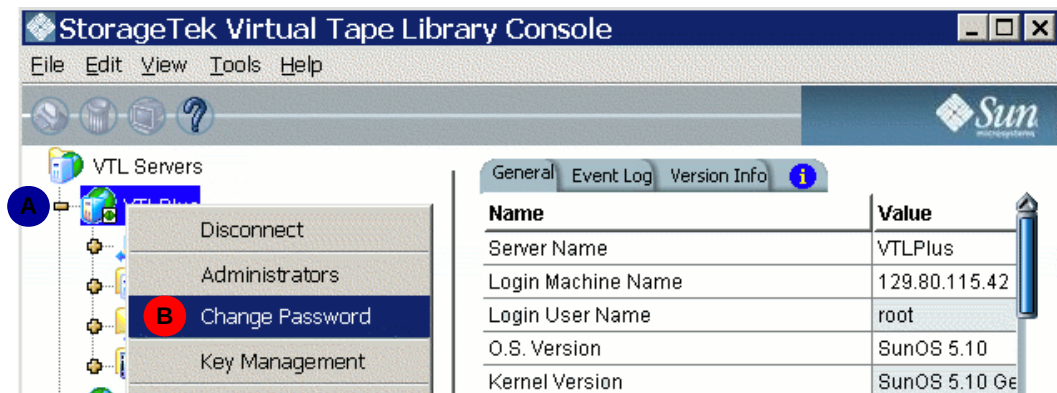
When you add an administrator, the name must adhere to the naming convention of the operating system running on your VTL Server. Refer to your operating system's documentation for naming restrictions.

You cannot delete the vtl user or change the vtl password from this screen. Use the Change Password option instead.

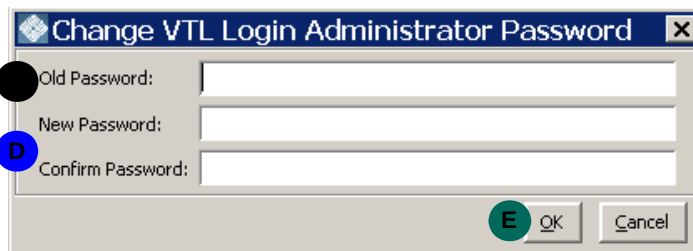
**Stop here.**

## ▼ Changing administrator passwords

1. Right-click on the VTL server node name (A below), and select Change Password from the context menu (B).



2. When the dialog appears, enter the password that you need to change in the Old Password text box (C below).



3. Enter the changed password in the New Password and Confirm Password text boxes (D above).
4. Press OK (E).

Stop here.

## Virtual tape drive compression

VTL's compression saves disk space by compressing files so that more data can be stored by a virtual tape drive. The increase in capacity is directly related to the compressibility of the data being backed up. If you can compress the data being backed up by a factor of up to 2:1, you can store up to twice as much information on the virtual tape. Disk compression can vary depending upon the dataset; certain file types (ZIP, PDF, GIF, RAR, etc.) are already compressed and cannot be compressed further.

VTL supports two types of compression:

- Hardware compression - uses a Hifn Express DR1000 (1 GB/sec compression) or DR600 (600 MB/sec) compression card. A license keycode is required for hardware compression.
- Software compression - uses an LZO algorithm that runs on the VTL server.

In order to use compression, you must also enable tape drive compression in your backup application.

---

**Note** – Note: If you are already using software compression that is supplied by your backup application, you should not use VTL's compression. Using both types of compression will cause VTL to try to compress already-compressed data and this can slow down your backups.

---

## ▼ To enable or disable compression:

1. **Enable tape drive compression in your backup application.**
2. **If you are using hardware compression, install a certified compression card in your VTL server.**

You can have up to two compression cards per VTL server.

The compression card(s) must be installed before compression begins. If you try to use hardware compression and a compression card is not available, VTL will send an error message to the console event log and uncompressed data will be written to the virtual tape drive.

3. **In the VTL Console, right-click on VirtualTape Library System and select Properties.**
4. **Select the Enable VirtualTape Library compression mode checkbox and specify whether you are using Software or Hardware compression.**

If you are upgrading a VTL system that previously used software compression to now use hardware compression, the compression mode will be switched to hardware when the tape is overwritten.

Both types of compression are global settings, which means that they will apply to all tapes in your system.

If compression is enabled on the VTL server, you can still disable or enable compression on each individual virtual tape drive in the same manner as real tape drives -- via your backup application or via SCSI commands which are sent by the operating system.

UNIX — On backup servers that run Solaris or other UNIX operating systems, specify a compressed tape device file such as `/dev/rmt/0cbn` to enable compression or `/dev/rmt/0ubn` to disable compression.

Windows — On Windows servers select the option in your backup software to enable or disable hardware tape drive compression. If global VTL compression is disabled, it is possible to enable individual drive compression, but it will have no effect.

You will see a compression icon next to each virtual tape drive with compression enabled.

---

## Managing tapes

This section addresses the following topics:

- Locating virtual tapes
- Copying a tape to a remote server.

### Locating virtual tapes

To locate a virtual tape, proceed as follows.

#### ▼ Searching for virtual tapes by barcode

1. **To locate a virtual tape, select `Edit` from the main menu.**
2. **Then select `Find` from the context menu.**
3. **When prompted, enter the full barcode for the virtual tape, and press `Search`.**

The console opens the object tree at the virtual tape.

**Stop here.**

### Replicating tapes

This section covers creating and working with synchronized replicas of virtual tapes on local and/or remote VTL servers. Topics include:

- “Setting up tape replication for multiple tapes” on page 89

- “Setting up replication for individual tapes” on page 94
- “Manually synchronizing replicas (manual replication)” on page 100
- “Stopping a replication that is already under way” on page 101
- “Manually synchronizing replicas (manual replication)” on page 100
- “Checking replication status from the target VTL server” on page 103
- “Checking replication status with a report” on page 103
- “Changing replication properties” on page 104
- “Deleting a replication configuration” on page 105
- “Promoting a replica resource” on page 105.

▼ Setting up tape replication for multiple tapes

1. Before continuing, make sure that you have write access to both the primary (local) and target (remote) VTL servers and that there is enough space available on the target for the replica resources you intend to create.
2. In the object tree of the VTL console, expand the VTL server node.
3. Under the VTL server, expand the Virtual Tape Library System and Virtual Tape Libraries nodes.
4. Under the Virtual Tape Libraries node, right-click on the virtual tape library for which you want to enable replication (A below).
5. From the context menus, select Replication (B below), Add (C).

The screenshot shows the VTL console interface. On the left, the object tree is expanded to 'Virtual Tape Libraries' > 'B-L700-01315'. A right-click context menu is open, with 'Replication' selected (labeled B) and its sub-menu 'Add' selected (labeled C). The 'Add' sub-menu also shows a 'Remove' option. To the right of the context menu is a table displaying the properties of the selected virtual tape library.

|                              |            |
|------------------------------|------------|
| Virtual ID                   | 1315       |
| Vendor ID                    | STK        |
| Product ID                   | L700       |
| Revision                     | 3.05       |
| Number of Slots              | 678        |
| Number of Drives             | 10         |
| Number of Tapes              | 13         |
| Serial No                    | 00C8U0020B |
| Barcode Begin                | B00000     |
| Barcode End                  | B99999     |
| Tape Capacity On Demand      | Yes        |
| Initial Allocation Size (MB) | 5,120      |
| Increment Size (MB)          | 5,120      |
| Maximum Capacity (MB)        | 200,704    |
| Archive                      | Disabled   |
| Replication                  | Disabled   |

6. When the Select Virtual Tapes to enable Replication... panel appears, use the check boxes (D below) and/or selection buttons (E) to select tapes (E). Press Next (F).

**Enable Replication for Virtual Tapes**

Select Virtual Tapes to enable Replication option.

Available Virtual Tapes

| *                                   | Name           | Sectors     | Size(MB) | Availability |
|-------------------------------------|----------------|-------------|----------|--------------|
| <input checked="" type="checkbox"/> | B-LTO-II-01415 | 411,041,792 | 200,704  | ● Available  |
| <input checked="" type="checkbox"/> | B-LTO-II-01425 | 411,041,792 | 200,704  | ● Available  |
| <input checked="" type="checkbox"/> | B-LTO-II-01429 | 411,041,792 | 200,704  | ● Available  |
| <input type="checkbox"/>            | B-LTO-II-01430 | 411,041,792 | 200,704  | ● Available  |

**D** ☒ **E** Select All De-Select All ☐ List All Virtual Tapes.

● Replication option is ready to be enabled.  
 ● Replication option, Auto Archive/Replication option or Automated Tape Caching option is already enabled.

**F**

7. When the Specify the Target server Type panel appears, click the radio button for a Remote or Local Server (G below). Then press Next (H).

**Enable Replication for Virtual Tapes**

Specify the Target server Type.

Select the target server type.

**F** ☒ **Remote Server**  
 This option allows you to select a remote server from a list as the replication target server. You will specify an IP address or host name for the selected remote target server for connection.

☐ **Local Server**  
 This option allows you to select the primary server as the replication target server. The primary virtual tape and virtual tape replica will be on the same server. The replication will be performed locally. The IP address of the local target server will always be 127.0.0.1 and cannot be changed.

Click <Next> to continue.

**H**

8. When the **Select Target Server** panel appears, use the list (J below) to select or server or press **Add (K)** to add one to the list. Press **Next (L)**.

**Enable Replication for Virtual Tapes**

Select the Target Server

Select the target server or add the server you want to the list.

| Server    |
|-----------|
| VTLPLUSN1 |
| VTLPLUSN2 |

Click <Next> to continue.

Back Next Cancel

9. If you chose the **Remote Server** option above, in Step 7, edit the IP address of the remote VTL server in the space provided (M below), if necessary, then press **Next (N)**.

**Enable Replication for Virtual Tapes**

Enter Replication Parameters

Target Server Information.

**Target Server:** VTLPLUSN1

**hostname or IP address:**

The target server IP information will be used by the primary server to connect to the target server for replication. If a hostname is entered, the primary server should be able to resolve the hostname via DNS. If an IP address is entered, we recommend using a static rather than a DHCP IP address.

Click <Next> to continue.

Back Next Cancel

10. If you chose the Local Server option above, in Step 7, press Next (O below).

**Enable Replication for Virtual Tapes**

Enter Replication Parameters

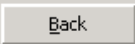
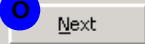
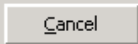
 Target Server Information.

**Target Server:** VTLPlus

**hostname or IP address:** 127.0.0.1

The target server IP information will be used by the primary server to connect to the target server for replication. You have selected to setup a local replication. The target server IP is always 127.0.0.1 for local replication and cannot be changed.

Click <Next> to continue.

11. When the Select the Replication Policy ... panel appears, use the check boxes, list boxes, and spinner controls provided to define the policy you want to apply (P below). Press Next (R).

**Enable Replication for Virtual Tapes**

Select the Replication Policy for the Virtual Tape

 Select one or more policies to trigger the replication.

 ☒ **Start replication when the amount of new data reaches** 1,024 MB

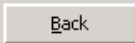
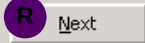
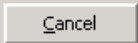
This option allows you to set a watermark based on the amount of new data to be replicated. The maximum size is the size of the primary virtual tape. The watermark policy will be triggered when the virtual tape is unloaded from the tape drive.

☒ **Start an initial replication on** 02/08/2007 **at** 12:00 AM

**and then every** 1 hour **thereafter**

This option allows you to start a replication initially at a certain time then repeat every certain interval. For example, initially today at noon, then repeat every 2 hours or every 30 minutes.

Click <Next> to continue.

12. When the **Select the Replication Timeout and Retry Policy** panel appears, use the spinner controls provided to define the policy you want to apply (S below). Press **Next (T)**.

**Enable Replication for Virtual Tapes**

Specify Replication Timeout and Retry Policy

Replication timeout and retry can be adjusted for different configuration.

Timeout replication in  seconds

Retry replication in  seconds when replication failed.

Retry replication for  times.

Replication will be timed out in the specified number of seconds. Replication can be retried automatically at a set interval for number of times specified when it failed.

Click <Next> to continue.

Back **T** Next Cancel

13. When the **Specify the Options for Data Transmission** panel appears, use the check boxes provided to select the options you want to use (U below). Press **Next (V)**.

Remember that compression and encryption are CPU-intensive software processes that reduce system throughput. Use them judiciously, when necessary.

**Enable Replication for Virtual Tapes**

Specify the Options for Data Transmission.

The following options can be specified to improve the performance and security.

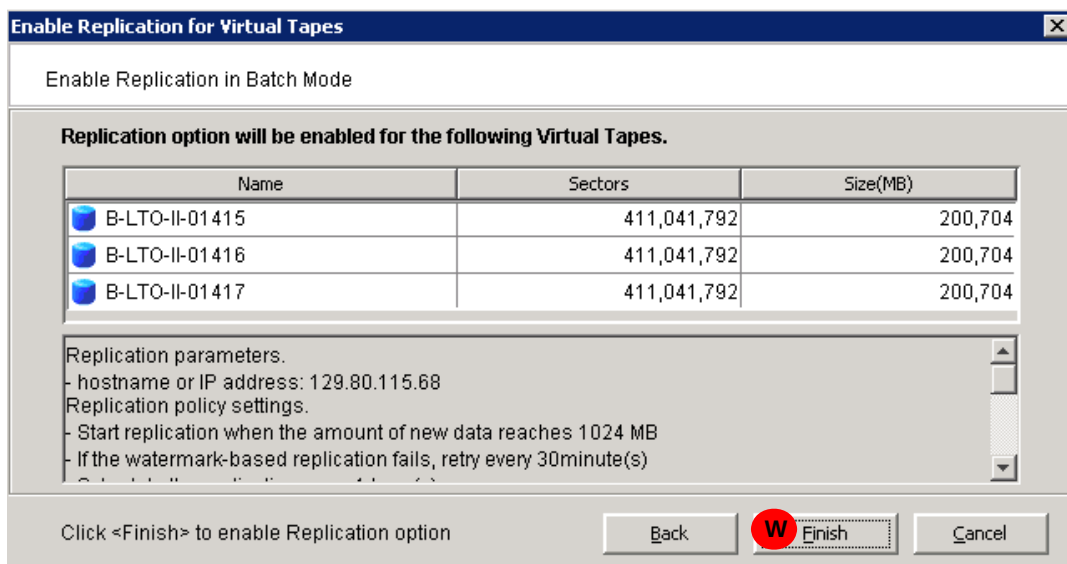
☐ **Compress Data**  
This option allows the data to be compressed to reduce the size for transmission. Compression option will take effect immediately. If the replication is in progress, compression option will be applied to the next data transmission.

☐ **Encrypt Data**  
This option allows the data to be encrypted for secure transmission. Encryption option will not take effect when the replication is already in progress. It will be applied to the next replication session.

Click <Next> to continue.

Back **V** Next Cancel

14. When the confirmation panel appears, press **Finish** (W below).

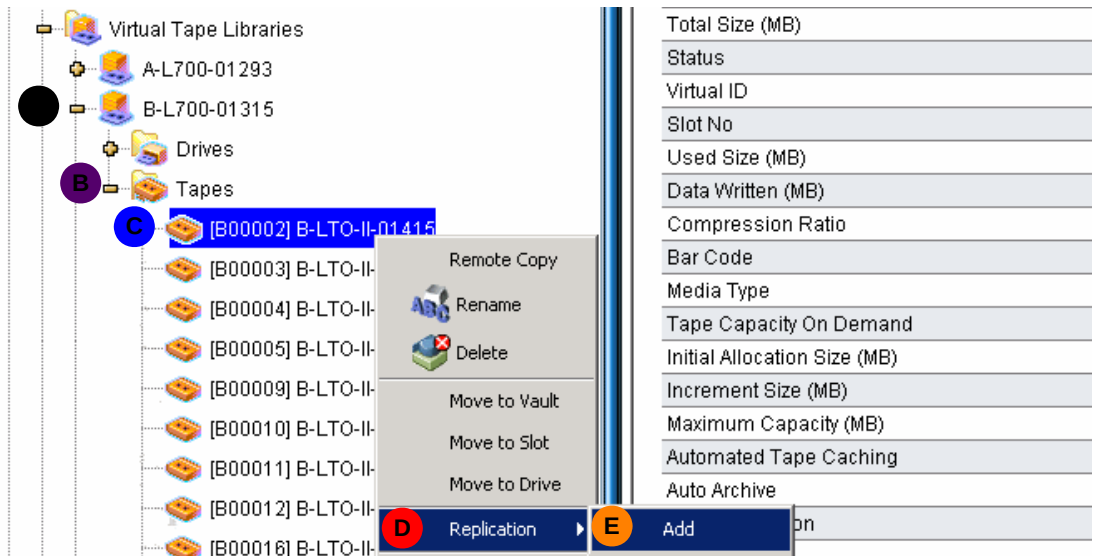


Stop here.

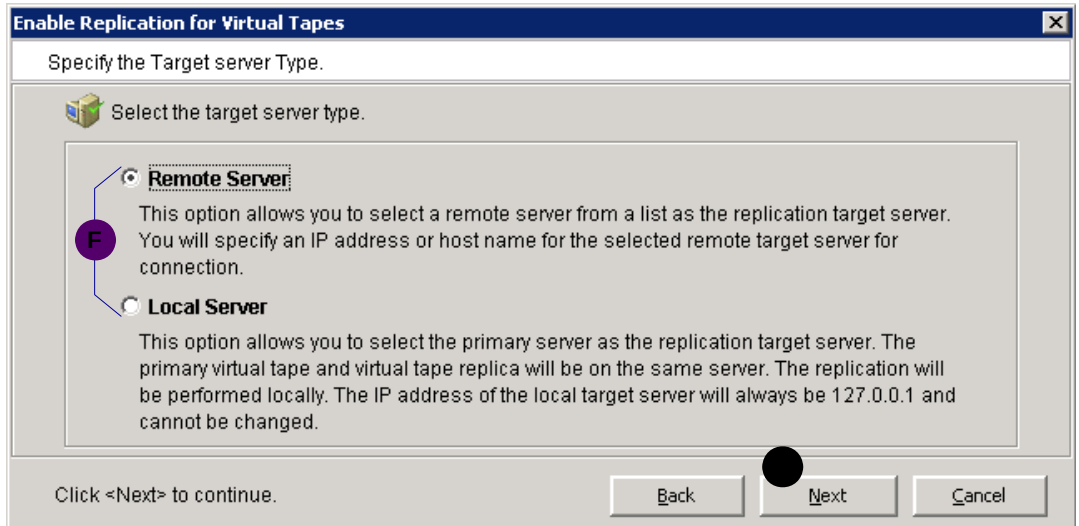
## ▼ Setting up replication for individual tapes

1. In the object tree of the VTL console, expand the **VTL server node**, the **Virtual Tape Library System node**, and the **Virtual Tape Libraries node**.

- Then open the node for the library that holds the tape you want to replicate (A below), and open the Tapes node (B).



- Right-click on the virtual tape for which you want to enable replication (C above).
- From the context menus, select Replication (D above), then select Add (E).
- When the Specify the Target server Type panel appears, click the radio button for a Remote or Local Server (F below). Then press Next (G).



6. When the **Select Target Server** panel appears, use the list (H below) to select or server or press **Add (J)** to add one to the list. Press **Next (K)**.

**Enable Replication for Virtual Tapes**

Select the Target Server

Select the target server or add the server you want to the list.

| Server    |
|-----------|
| VTLPLUSN1 |
| VTLPLUSN2 |

Click <Next> to continue.

Back Next Cancel

7. If you chose the **Remote Server** option above, in **Step 7**, edit the IP address of the remote VTL server in the space provided (L below), if necessary, then press **Next (M)**.

**Enable Replication for Virtual Tapes**

Enter Replication Parameters

Target Server Information.

**Target Server:** VTLPLUSN1

**hostname or IP address:**

The target server IP information will be used by the primary server to connect to the target server for replication. If a hostname is entered, the primary server should be able to resolve the hostname via DNS. If an IP address is entered, we recommend using a static rather than a DHCP IP address.

Click <Next> to continue.

Back Next Cancel

8. If you chose the Local Server option above, in Step 7, press Next (N below).

**Enable Replication for Virtual Tapes**

Enter Replication Parameters

 Target Server Information.

**Target Server:** VTLPlus

**hostname or IP address:** 127.0.0.1

The target server IP information will be used by the primary server to connect to the target server for replication. You have selected to setup a local replication. The target server IP is always 127.0.0.1 for local replication and cannot be changed.

Click <Next> to continue.

Back **N** Next Cancel

9. When the Select the Replication Policy ... panel appears, use the check boxes, list boxes, and spinner controls provided to define the policy you want to apply (N below). Press Next (P).

**Enable Replication for Virtual Tapes**

Select the Replication Policy for the Virtual Tape

 Select one or more policies to trigger the replication.

**N** ☒ **Start replication when the amount of new data reaches** 1,024 MB

This option allows you to set a watermark based on the amount of new data to be replicated. The maximum size is the size of the primary virtual tape. The watermark policy will be triggered when the virtual tape is unloaded from the tape drive.

☒ **Start an initial replication on** 02/08/2007 **at** 12:00 AM

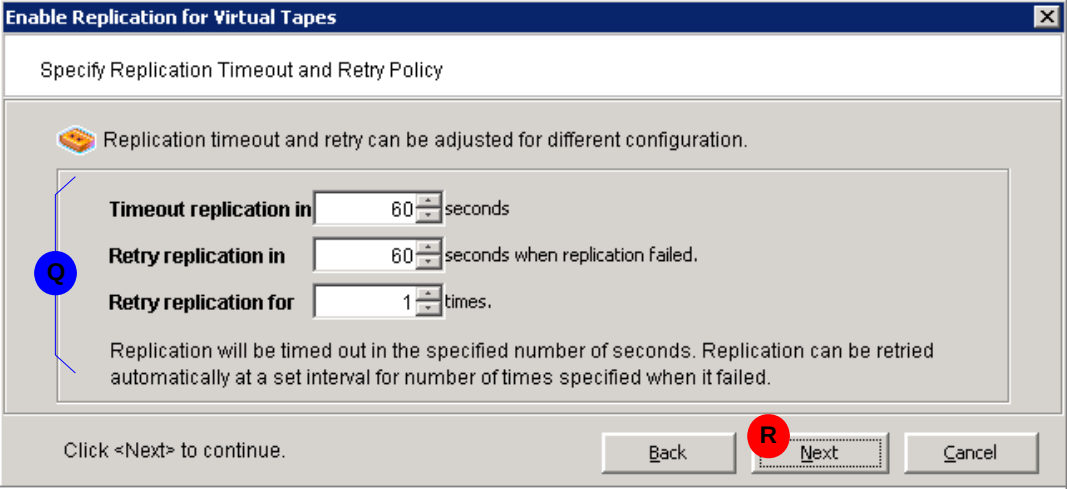
**and then every** 1 hour **thereafter**

This option allows you to start a replication initially at a certain time then repeat every certain interval. For example, initially today at noon, then repeat every 2 hours or every 30 minutes.

Click <Next> to continue.

Back **P** Next Cancel

10. When the **Select the Replication Timeout and Retry Policy** panel appears, use the spinner controls provided to define the policy you want to apply (Q below). Press **Next (R)**.



**Enable Replication for Virtual Tapes**

Specify Replication Timeout and Retry Policy

Replication timeout and retry can be adjusted for different configuration.

**Q** Timeout replication in  seconds

Retry replication in  seconds when replication failed.

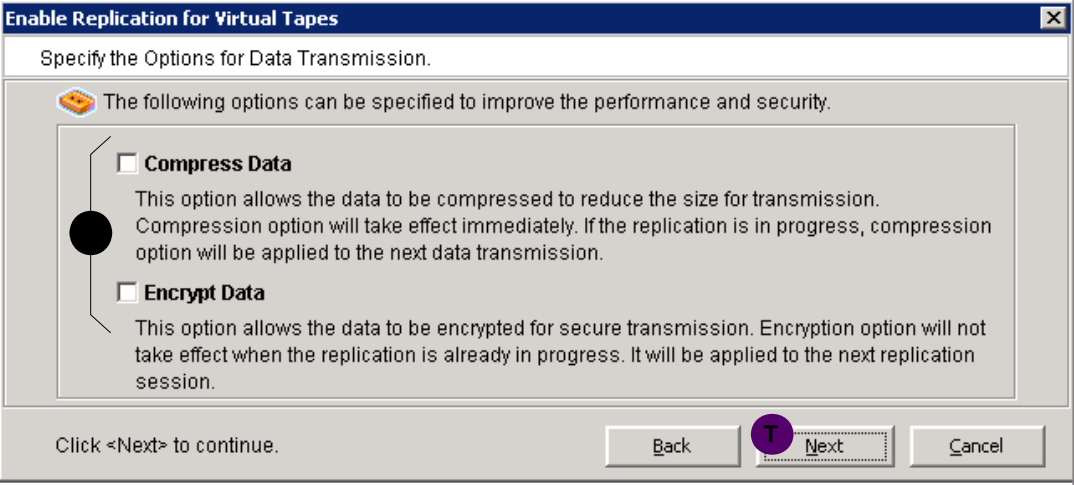
Retry replication for  times.

Replication will be timed out in the specified number of seconds. Replication can be retried automatically at a set interval for number of times specified when it failed.

Click <Next> to continue.

Back **R** Next Cancel

11. When the **Specify the Options for Data Transmission** panel appears, use the check boxes provided to select the options you want to use (S below). Press **Next (T)**.



**Enable Replication for Virtual Tapes**

Specify the Options for Data Transmission.

The following options can be specified to improve the performance and security.

☐ **Compress Data**  
This option allows the data to be compressed to reduce the size for transmission. Compression option will take effect immediately. If the replication is in progress, compression option will be applied to the next data transmission.

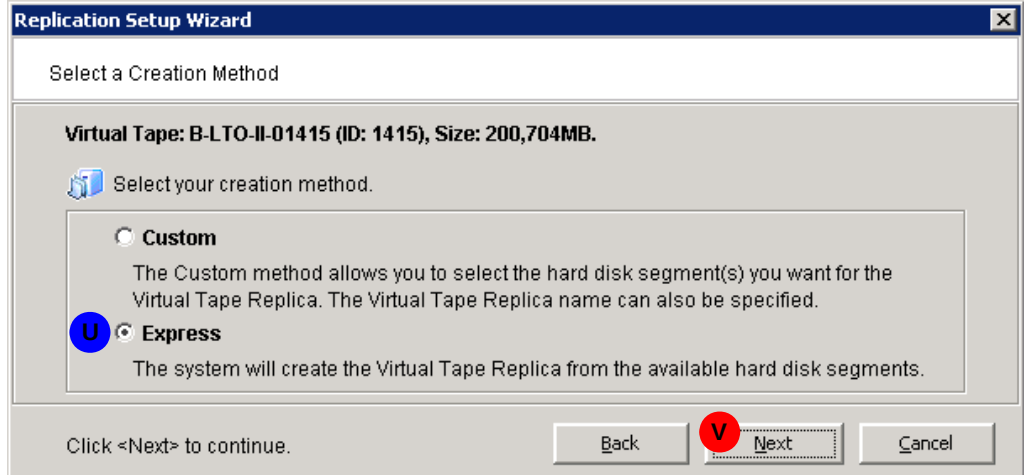
☐ **Encrypt Data**  
This option allows the data to be encrypted for secure transmission. Encryption option will not take effect when the replication is already in progress. It will be applied to the next replication session.

Click <Next> to continue.

Back **T** Next Cancel

Remember that compression and encryption are CPU-intensive software processes that reduce system throughput. Use them judiciously, when necessary.

12. When the **Select a Creation Method** panel appears, click the **Express** radio button (U below), and press **Next** (V).



**Replication Setup Wizard**

Select a Creation Method

**Virtual Tape: B-LTO-II-01415 (ID: 1415), Size: 200,704MB.**

Select your creation method.

☐ Custom  
The Custom method allows you to select the hard disk segment(s) you want for the Virtual Tape Replica. The Virtual Tape Replica name can also be specified.

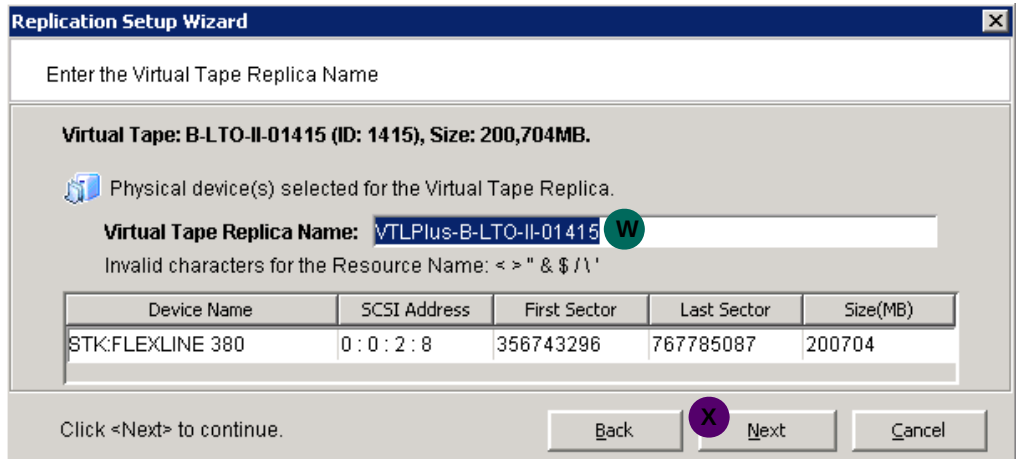
☒ **Express**  
The system will create the Virtual Tape Replica from the available hard disk segments.

Click <Next> to continue.

Back **V** Next Cancel

The Sun StorageTek VTL appliance includes an integrated RAID device, so there is no advantage to manually selecting target volumes using the Custom method. The Custom method may also result in load balancing problems and significantly greater management overhead.

13. When the **Enter the Virtual Tape Replica Name** panel appears, enter a name or accept the default (W below), and press **Next** (X).



**Replication Setup Wizard**

Enter the Virtual Tape Replica Name

**Virtual Tape: B-LTO-II-01415 (ID: 1415), Size: 200,704MB.**

Physical device(s) selected for the Virtual Tape Replica.

**Virtual Tape Replica Name:** VTLPlus-B-LTO-II-01415 **W**

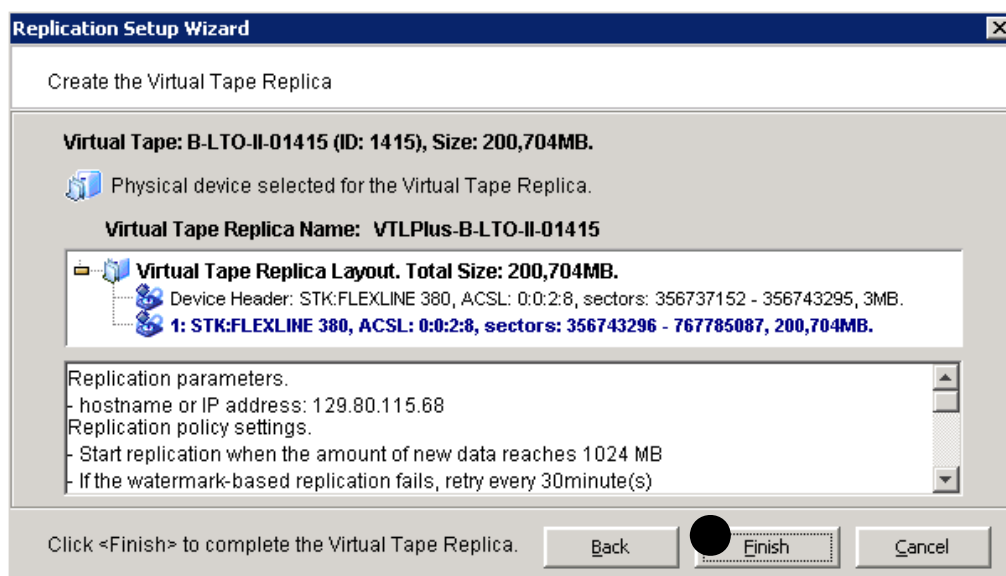
Invalid characters for the Resource Name: < > " & \$ / \ '

| Device Name      | SCSI Address  | First Sector | Last Sector | Size(MB) |
|------------------|---------------|--------------|-------------|----------|
| STK:FLEXLINE 380 | 0 : 0 : 2 : 8 | 356743296    | 767785087   | 200704   |

Click <Next> to continue.

Back **X** Next Cancel

14. When the confirmation panel appears, press **Finish** (Y below).




---

**Note** – Once you create your replication configuration, you should not change the hostname of the source (primary) server. If you do, you will need to recreate your replication configuration.

---

Stop here.

## ▼ Manually synchronizing replicas (manual replication)

You can synchronize replicas manually, when necessary. To do so, proceed as follows.

1. Right-click on the primary virtual tape, and select **Replication** from the context menu.
2. Select **Synchronize** from the following context menu.

Stop here.

## ▼ Suspending and resuming replication

You can manually suspend forthcoming replications that would otherwise be launched automatically from your replication policies (currently active replications are unaffected). To do so, proceed as follows.

1. **Right-click on the primary virtual tape, and select `Replication and Suspend` from the context menus.**
2. **If desired, you can synchronize replicas manually during the suspension period by right-clicking on the primary virtual tape, and selecting `Replication and Synchronize` from the context menus.**
3. **To continue with normal replication, right-click on the primary virtual tape, and select `Replication and Resume` from the context menus.**

**Stop here.**

## ▼ Stopping a replication that is already under way

1. **To stop a replication that is currently in progress, right-click on the primary virtual tape.**
2. **Select `Replication` from the context menu.**
3. **Select `Stop` from the following context menu.**

**Stop here.**

## ▼ Checking replication status from the primary VTL server

1. In the object tree of the VTL console, drill down to the Tapes node, and select the primary virtual tape (A below).

The screenshot shows the StorageTek Virtual Tape Library Console interface. On the left, the object tree is expanded to show the 'Tapes' node under 'Virtual Tape Libraries'. A red circle labeled 'A' highlights the primary virtual tape '[B00002] B-LTO-II-01415'. On the right, the 'Replication' tab is selected, indicated by a blue circle labeled 'B'. The 'Replication Status' row is highlighted, indicated by a purple circle labeled 'C', showing the status as 'Idle'.

| Name                        | Value               |
|-----------------------------|---------------------|
| Replica Server              | VTLPlus             |
| Replica Device ID           | 1630                |
| Replication Schedule        | On Schedule         |
| Watermark                   | 1024 MB             |
| Watermark Retry             | 30 minutes          |
| Replication Time            | 02/08/2007 12:00 AM |
| Replication Interval        | Every 1 hours       |
| Compression                 | Disabled            |
| Encryption                  | Disabled            |
| Timeout                     | 60 seconds          |
| Retry Interval              | 60 seconds          |
| Retry Count                 | 1                   |
| Replication Status          | Idle                |
| Last Replication Start Time | 02/09/2007 00:04:00 |

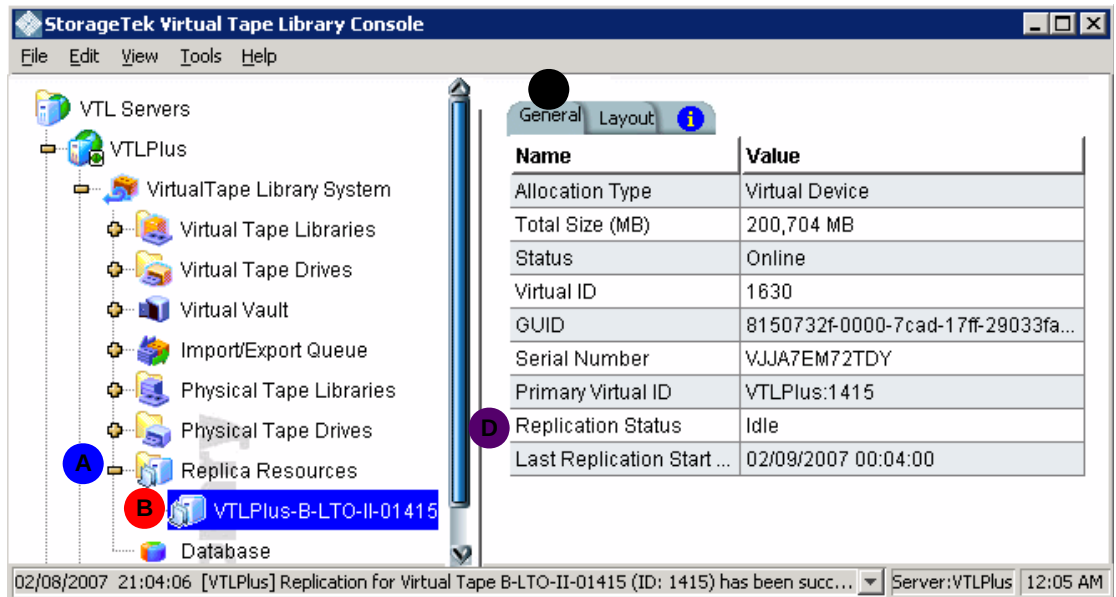
2. In the properties sheet at the right, select the Replication tab (B above).

3. Scan down the sheet until you see the Replication Status row (C above).

Stop here.

## ▼ Checking replication status from the target VTL server

1. In the object tree of the VTL console, drill down to the **Replica Resources** node (A below).



2. Select the replica resource corresponding to the primary virtual tape (B above)
3. In the properties sheet at the right, select the **General** tab (C above).
4. Scan down the sheet until you see the **Replication Status** row (D above).

Stop here.

## ▼ Checking replication status with a report

1. Use the procedure in "Creating a report" on page 125 to create a **Replication Status Report**

While a report can be generated for a single tape, it is most useful for assessing the replication status of multiple tapes. Reports can be created to fit a range of criteria, including:

- all tapes that have replication enabled
- all tapes replicated from a source server
- all tapes replicated to a target server
- all tapes in a given range of dates.

- all tapes on a group of servers

Reports can be filtered to exclude all but current replication configurations, all but deleted or prompted configurations, or any desired combination.

2. Examine the report for the status (A below) of the job or jobs you are interested in.

Replication Status

### Replication Status Report

Primary Server: *server\_name*, TAPE Resources  
*12/23/2006 - 12/23/2006*

Report Date: 12/23/2006  
Report Sort: Sort by target server name, then by target disk name, then by log date and time.

Primary Server: *server\_name* (*nnn.nnn.nnn.nnn*)  
Primary Disk: VirtualTape-00160 (ID: 160)  
Target Server: *target\_name* (*ppp.ppp.ppp.ppp*)  
Target Disk: STK:FLEXLINE380

Policy: Watermark: 100 MB, Retry: 0 Minutes, Interval: 0 Hours, Replication Time: N/A

| Log Time       | Status    | Last Replication Time               | Repl. Data(KB) | Trigger | Next Repl. Time | Next Trigger |
|----------------|-----------|-------------------------------------|----------------|---------|-----------------|--------------|
| Year 2004      | A<br>Idle |                                     |                |         |                 |              |
| 06/23 15:58:27 |           | 06/23/04 15:58:25-06/23/04 15:58:26 | 5120           | admin.  |                 | n/a          |

Stop here.

▼ Changing replication properties

You can change the following for your replication configuration:

- Static IP address of your target server
- Policies that trigger replication (watermark, interval, time)
- Timeout and retry policies
- Data transmission options (encryption, compression)

To change properties, proceed as follows:

1. Right-click on the primary virtual tape, and select Replication and Properties from the context menus.
2. Make the appropriate changes, and press OK.

Stop here.

## ▼ Deleting a replication configuration

1. **Right-click on the primary virtual tape, and select Replication from the context menu.**
2. **Select Remove from the following context menu.**

This allows you to remove the replication configuration on the primary and either delete or promote the replica resource on the target server at the same time.

**Stop here.**

## ▼ Promoting a replica resource

If a primary virtual tape is damaged or corrupted, administrators can restore the data by promoting the equivalent replica. After promotion, the virtual tape is placed in the virtual vault on the former target server (now the primary). An administrator can then:

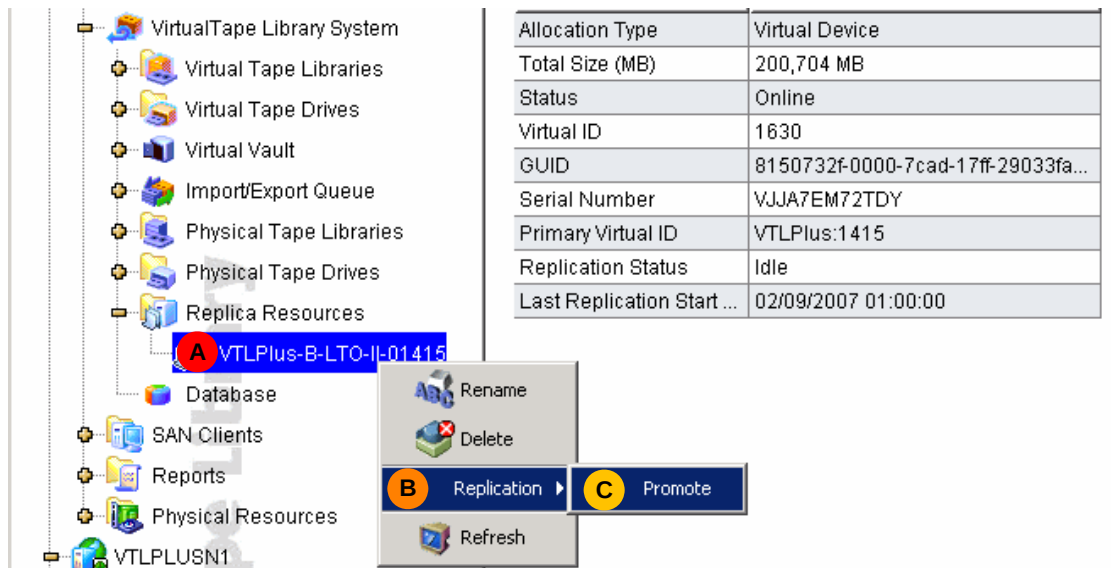
- move the virtual tape to a virtual library on the local server
- replicate the virtual tape back to the original source server.

Once promoted, a replica resource cannot revert to being a replica resource. You must create a new replication configuration for the new primary tape.

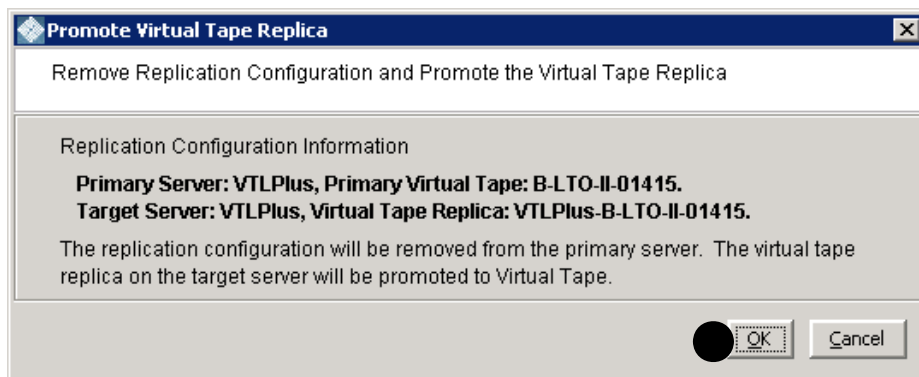
In order to maintain the integrity of restored data, the VTL software will not promote an invalid replica resource, such as a replica that has been damaged or left incomplete by a transmission fault. It will likewise refuse to promote a replica resource while a replication is still in progress.

1. **In the object tree of the VTL console, expand the VTL target server node, expand the Virtual Tape Library System and Replica Resources nodes.**
2. **Under the Replica Resources node, right-click on the replica that you want to promote (A below).**

3. From the context menus, select Replication (B below), Promote (C).



4. When the confirmation panel appears, press OK (D below).



5. Rescan devices from the SAN client or restart the client so that it can see the promoted virtual tape.

Stop here.

## Copying tapes

You can copy the contents of a single tape to a remote server, on demand, using the VTL Remote Copy feature. The Remote Copy feature replicates full tapes. It does not append data to existing virtual tapes or overwrite the contents of tapes.

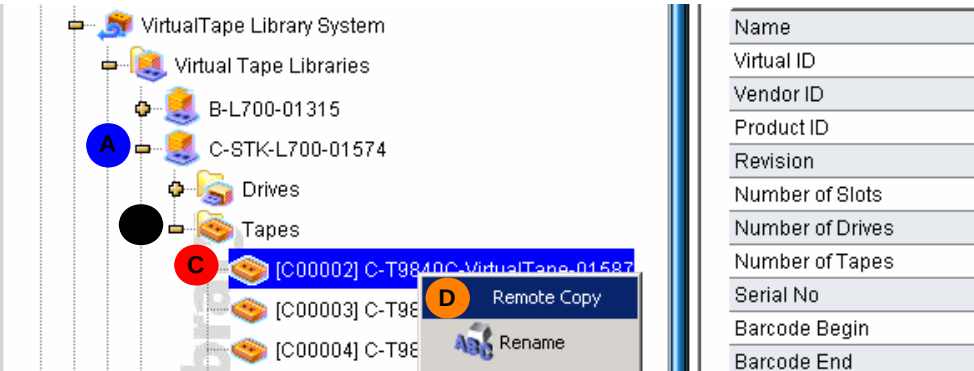
You can only copy tapes with barcodes that are not found on the remote server. If a copy exists and you wish to proceed, you must first delete the existing remote copy copy.

You cannot copy a tape that is configured to take advantage of the Replication, Auto Replication, or Auto Archive features.

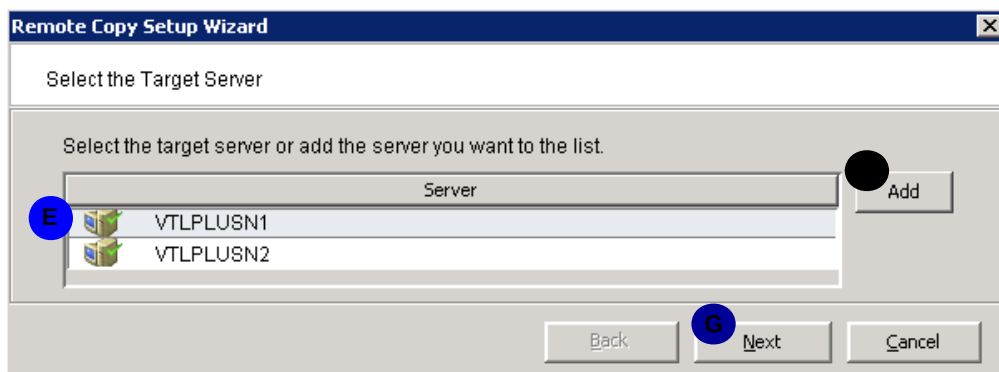
To copy tapes to a remote server, proceed as follows.

▼ Copying a tape to a remote server

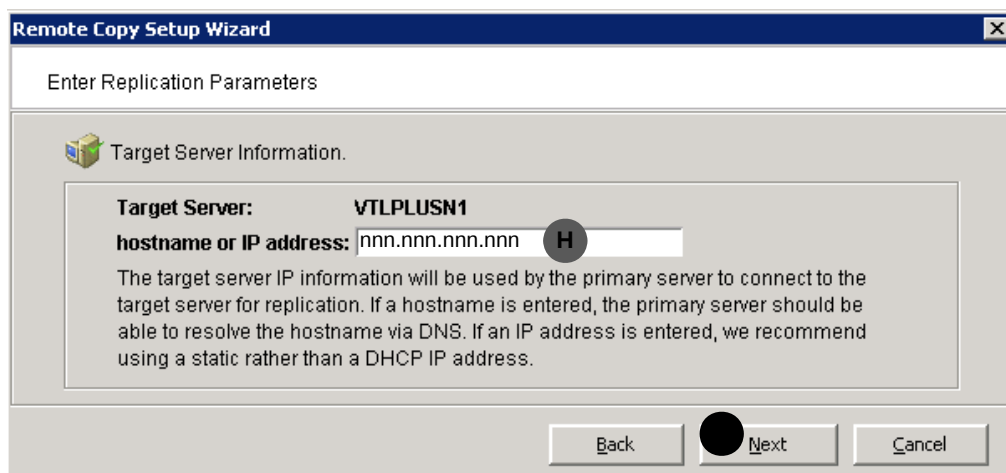
- 1. In the object tree of the VTL console, expand the VTL server node.
- 2. Under the VTL server, expand the Virtual Tape Library System and Virtual Tape Libraries nodes.
- 3. Under the Virtual Tape Libraries node, right-click on the virtual tape library that you want to enable (A below), and expand the Tapes node.
- 4. Right-click on the virtual tape that you want to copy (B below), and select Remote Copy from the context menu (D).



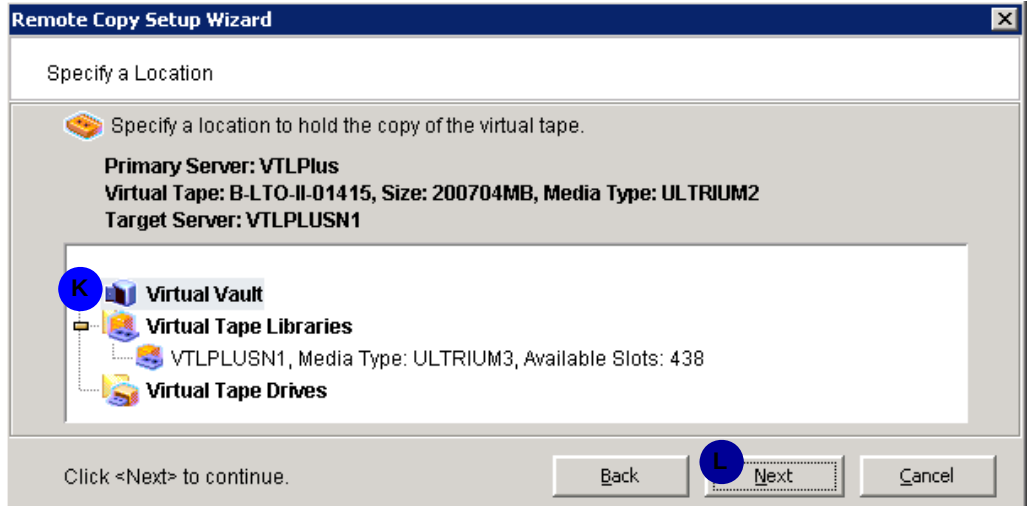
5. When the **Select the Target Server** panel appears, use the list to select the server where you want to copy the tape (E below) or press **Add (F)** to add a server to the list. Then press **Next (G)**.



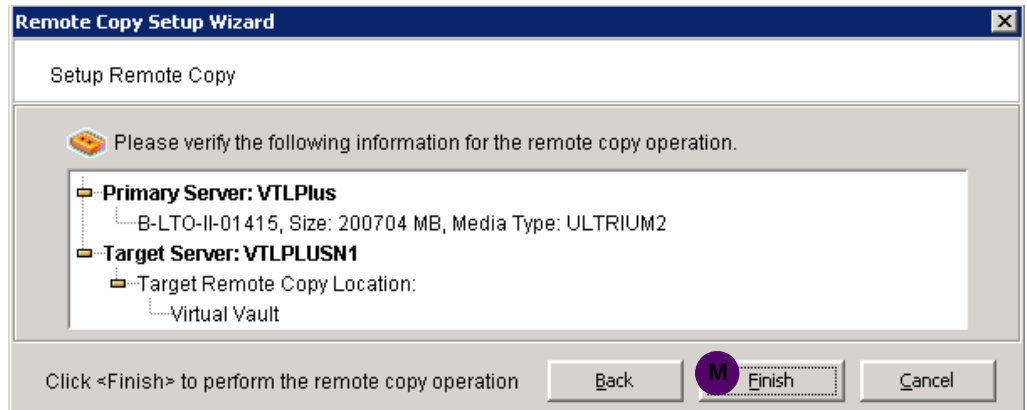
6. When the **Enter Replication Parameters** panel appears, edit the IP address if necessary (H below), then press **Next (J)**.



7. When the Specify a Location panel appears, select a location on the remote server (K below), and press Next (L).



8. When the confirmation panel appears, press Finish (M below).



Stop here.

## Moving tapes between virtual and physical libraries

VTL software can import a physical tape as a virtual tape or export virtual tape to physical tape, using an attached physical tape library or tape drive. You can thus use the import and export functions to:

- copy a physical tape to a virtual tape that emulates the same type of media
- directly access a physical tape without copying the entire tape
- recycle a physical tape after importing its contents to virtual media
- move data from a virtual tape to a physical tape of the same media type

VTL import/export capabilities are particularly useful when you are not using the Automated Tape Caching feature and want to move tapes from a virtual library to physical media for long term storage. Should you subsequently need to recover files, you can access the physical tape volume directly, in the physical library, by using the VTL import function. This gives the backup application immediate access to the tape data without waiting for a complete copy—a big advantage when you need to restore only a small amount of data.

You should note, however, that VTL software supports several of ways of moving data from virtual to physical storage, each of which has advantages in particular situations. In addition to VTL's export function, each of the following methods supports migration of data from virtual to physical media:

- copying virtual tape to physical tape using the functionality provided by your backup or copy-/vault-management application
- automatically cloning virtual volumes to physical media after each backup using the VTL Auto Archive function
- automatically cloning virtual volumes to physical media using the policy-driven VTL Automated Tape Caching option.

You should thus consider your options before deciding on a method. Automated Tape Caching and Auto Archive cannot be used together.

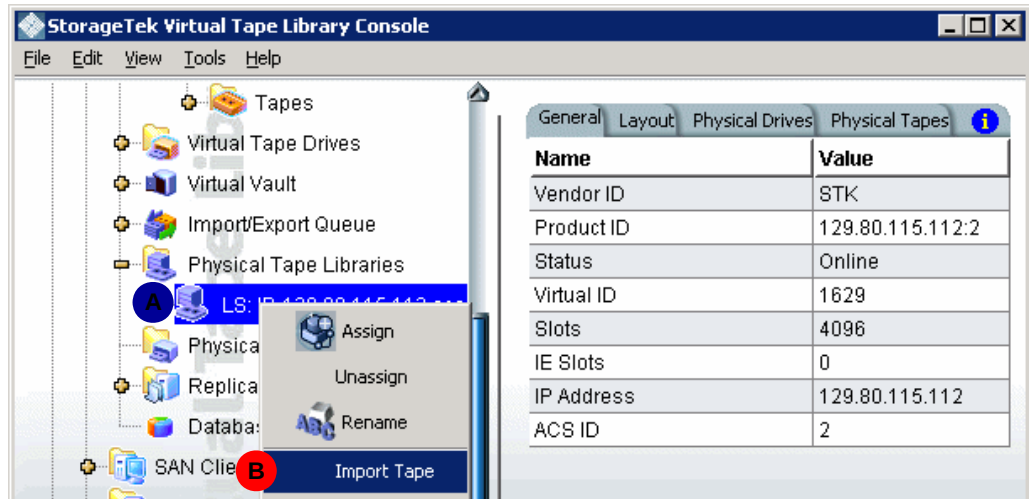
Up to 32 import/export jobs can run concurrently, although, in practice, this is generally limited to something less by the number of physical tape drives available on the attached library.

This section holds instructions for the following tasks:

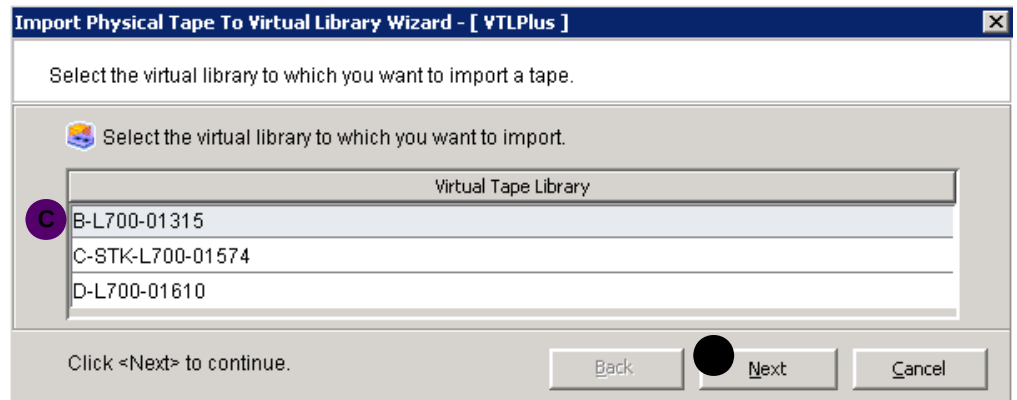
- "Importing a physical tape into a virtual library" on page 111
- "Importing cartridges in an IBM iSeries environment" on page 117
- "Exporting virtual tape to physical tape" on page 117
- "Exporting cartridges to the virtual vault in an IBM iSeries environment" on page 121.

## ▼ Importing a physical tape into a virtual library

1. In the object tree of the VTL console, right-click the node for the physical tape library or drive that holds the tape you wish to import (A below). Select **Import Tape** from the context menu (B).

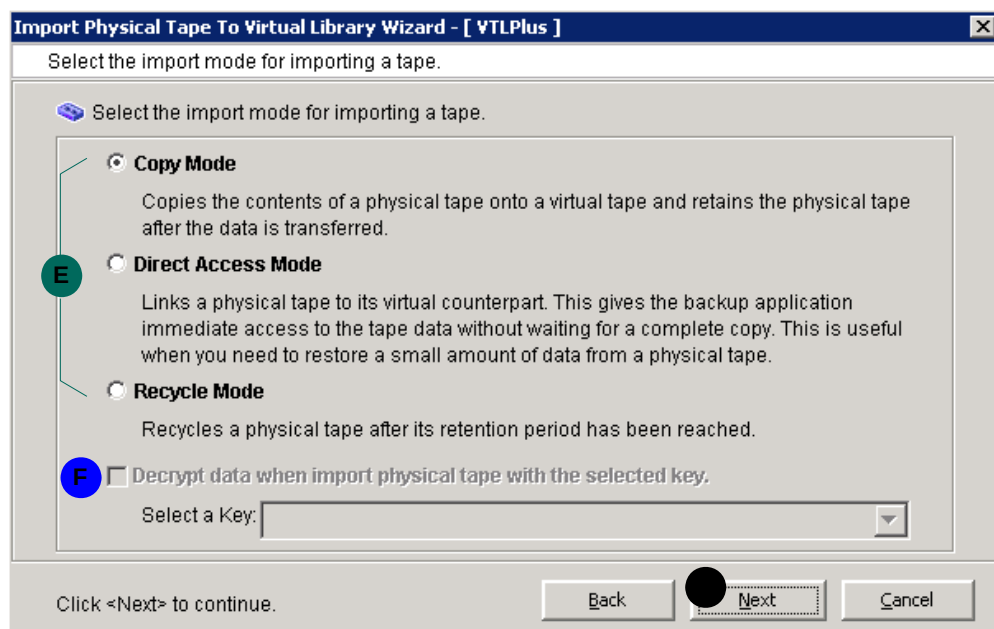


2. When the **Select virtual library ...** panel appears, use the list to select a virtual library that holds volumes of the same capacity as the volume you want to import (C below). Press **Next** (D).



VTL exports tapes to like media only. You cannot export to a dissimilar physical tape.

3. When the **Select the import mode ...** panel appears, click the radio button that corresponds to the behavior you want (E below).



4. If the tape is encrypted and you wish to decrypt it, check the **Decrypt data ...** check box (F above), and enter the correct key.

If the data was not previously encrypted, imported data is unusable. If you supply an incorrect key or if you enter an invalid password when challenged, the imported data is not decrypted.

5. Press **Next** (G above).

6. When the **Select the physical tape to import ... panel appears**, use the **check boxes and/or selection buttons provided to select the tape(s) that you want to import (H below)**. Then press **Next (J)**.

Select the physical tape to import to a virtual library

Virtual Tape Library: B-L700-01315. Import Mode: Copy Mode. Total Free Slots: 665.  
Maximum physical tapes that can be imported: 61.

| *                                   | Physical Tape Barcode | Location | Virtual Tape Barcode | Slot |
|-------------------------------------|-----------------------|----------|----------------------|------|
| <input checked="" type="checkbox"/> | 000003                | slot: 0  | 000003               | 0    |
| <input type="checkbox"/>            | BOA100                | slot: 1  | BOA100               | 1    |
| <input type="checkbox"/>            | BOA105                | slot: 6  | BOA105               | 14   |

Select All De-Select All

Click <Next> to continue.

Back Next Cancel

You can select a tape based on its barcode or slot location. You can then use the same barcode for the virtual tape or you can enter a new barcode. You can also select a slot for the virtual tape.

7. When the **Select Virtual Tape Creation Method panel appears**, click the **Express radio button (K below)**, and press **Next (L)**.

Select Virtual Tape Creation Method

Select your creation method.

☐ Custom  
The Custom method allows you to select the hard disk segment(s) you want for the Virtual Tape. The Virtual Tape name can also be specified.

☒ Express  
The express mode allows you to specify the size and number of the Virtual Tape to be created. The system will allocate the space from available hard disk segments based on the physical devices selected in the next screen.

Click <Next> to continue.

Back Next Cancel

The Sun StorageTek VTL appliance includes an integrated RAID subsystem, so there is no advantage to manually selecting target volumes using the Custom method. The Custom method may also result in load balancing problems and significantly greater management overhead.

8. When the **Select Physical Devices** panel appears, use the check boxes and/or selection buttons provided to select the LUNs that you wish to use (M below). Press **Next (N)**.

**Import Physical Tape To Virtual Library Wizard - [ VTLPlus ]**

Select Physical Devices

Select Virtualized physical devices to be used to create Virtual Tapes in batch.

**Total Available Space:** 2,731,202 MB (5,593,500,288 sectors).  
**Total Selected Space:** 2,731,202 MB (5,593,500,288 sectors).

| *                                   | Device Name         | SCSI Address | Size(MB) | Sectors     | Sector Size |
|-------------------------------------|---------------------|--------------|----------|-------------|-------------|
| <input checked="" type="checkbox"/> | STK:OPENstorage ... | 4:0:1:0      | 9,210    | 18,861,952  | 512         |
| <input checked="" type="checkbox"/> | STK:OPENstorage ... | 8:0:1:7      | 32,515   | 66,590,592  | 512         |
| <input checked="" type="checkbox"/> | STK:OPENstorage ... | 8:0:1:11     | 317,094  | 649,408,384 | 512         |
| <input checked="" type="checkbox"/> | STK:OPENstorage ... | 10:0:1:4     | 114,441  | 234,375,040 | 512         |

Select All De-Select All

Click <Next> to continue.

Back **N** Next Cancel

9. When the **Specify Batch Mode Information** panel appears, enter a **Virtual Tape Name Prefix** that matches the convention used in the rest of the virtual library (P below).

**Import Physical Tape To Virtual Library Wizard - [ VTLPlus ]**

Specify Batch Mode Information

Enter the information required to create the Virtual Tapes.

**Virtual Tape Name Prefix:** A-T9840C- **P**  
 Invalid characters for the Resource Name: < > " & \$ / \ ' "

**Virtual Tape Size:** 5 GB

**Starting Number:** 1630 **Number of Virtual Tapes:** 1 (Maximum: 533)

**Total Selected Space:** 2,869,932 MB (5,877,620,096 sectors).

| Device Name          | SCSI Address | Size(MB) | Sectors       | Sector Size |
|----------------------|--------------|----------|---------------|-------------|
| STK:OPENstorage D... | 4:0:1:5      | 716,562  | 1,467,518,848 | 512         |
| STK:OPENstorage D... | 4:0:1:13     | 3,887    | 7,960,448     | 512         |
| STK:OPENstorage D... | 8:0:1:3      | 716,359  | 1,467,103,104 | 512         |

☒ Use default ID for Starting Number.

Back Next Cancel

10. Set the Virtual Tape Size to the full size of the emulated media (Q below), and Tab to another field to recalculate the Maximum number of tapes possible with the available storage (S). Make sure that the Number of Virtual Tapes that you will create in order to import your specified number of physical tapes (R) does not exceed the recalculated Maximum (S).

**Import Physical Tape To Virtual Library Wizard - [ VTLPlus ]**

Specify Batch Mode Information

Enter the information required to create the Virtual Tapes.

**Virtual Tape Name Prefix:** A-T9840C-

Invalid characters for the Resource Name: < > " & \$ / \ '

**Virtual Tape Size:** 40 GB

**Starting Number:** 1630

**Number of Virtual Tapes:** 1 (Maximum: 66)

**Total Selected Space:** 2,869,932 MB (5,877,620,096 sectors).

| Device Name          | SCSI Address | Size(MB) | Sectors       | Sector Size |
|----------------------|--------------|----------|---------------|-------------|
| STK:OPENstorage D... | 4:0:1:5      | 716,562  | 1,467,518,848 | 512         |
| STK:OPENstorage D... | 4:0:1:13     | 3,887    | 7,960,448     | 512         |
| STK:OPENstorage D... | 8:0:1:3      | 716,359  | 1,467,103,104 | 512         |

☒ Use default ID for Starting Number.

Back Next Cancel

11. If the Number of Virtual Tapes that you will create in order to import your specified number of physical tapes (R above) exceeds the recalculated Maximum (S), stop here. You cannot import the number of tapes you specified.

12. Otherwise, reset the Virtual Tape Size to the default value for using capacity on demand with this type of media (T below). Check the Use default ID for Starting Number check box (U), and press Next (V).

**Import Physical Tape To Virtual Library Wizard - [ VTLPlus ]**

Specify Batch Mode Information

Enter the information required to create the Virtual Tapes.

**Virtual Tape Name Prefix:** A-T9840C-  
 Invalid characters for the Resource Name: < > " & \$ / \ '

**Virtual Tape Size:** 5 GB

**Starting Number:** 1630 **Number of Virtual Tapes:** 1 (Maximum: 66)

**Total Selected Space:** 2,869,932 MB (5,877,620,096 sectors).

| Device Name          | SCSI Address   | Size(MB) | Sectors       | Sector Size |
|----------------------|----------------|----------|---------------|-------------|
| STK:OPENstorage D... | 4 : 0 : 1 : 5  | 716,562  | 1,467,518,848 | 512         |
| STK:OPENstorage D... | 4 : 0 : 1 : 13 | 3,887    | 7,960,448     | 512         |
| STK:OPENstorage D... | 8 : 0 : 1 : 3  | 716,359  | 1,467,103,104 | 512         |

☒ Use default ID for Starting Number.

Back Next Cancel

- 13. Verify the information, and press Finish (W below) to import the tape.**

Import Physical Tape To Virtual Library Wizard - [ VTLPlus ]

Verify and import

Verify and import

- Virtual Library Name: B-L700-01315
  - Physical Tape
    - Barcode: 000003
    - Virtual Tape Barcode: 000003
    - Mode: Copy
    - Physical Tape In Slot: 0
    - To Slot: 0

Back Finish Cancel

**Next task:** If you are working in an IBM iSeries/AS400 environment, go to “Importing cartridges in an IBM iSeries environment” on page 117. Otherwise, stop here.

▼ Importing cartridges in an IBM iSeries environment

1. If you have not already done so, import tapes into the virtual library using the VTL console, as described in “Importing a physical tape into a virtual library” on page 111.
2. At the AS/400, re-inventory the tape library. In the option field next to the tape library, enter 9 (INVENTORY).
3. Add tapes to the inventory by entering either of the following at the command line:

```
ADDTAPCTG DEV(library_device_name ) CTG(cartridge_identifier ) CGY(*NOSHARE)
CHKVOL(*NO)
```

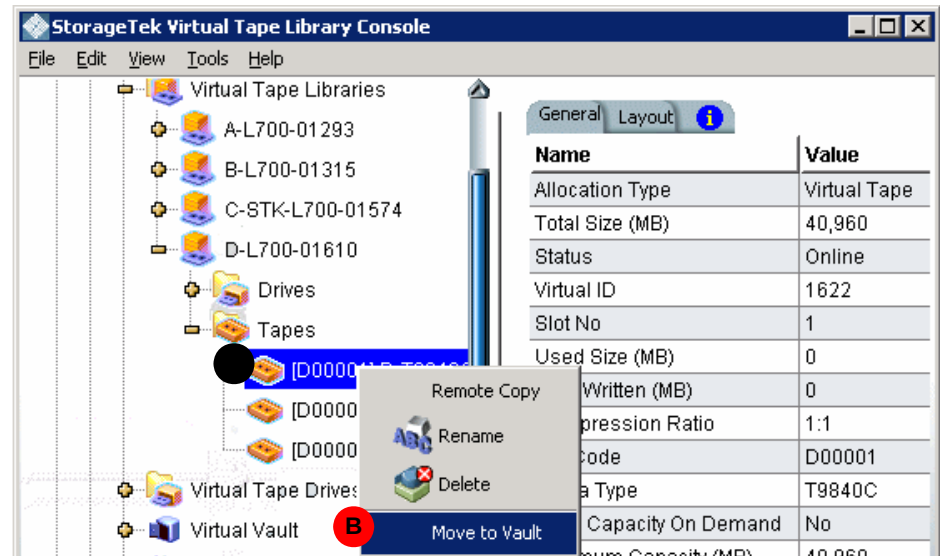
```
ADDTAPCTG DEV(library_device_name ) CTG(cartridge_identifier ) CGY(*SHARE400)
CHKVOL(*NO)
```

The tape status changes from INSERT to AVAILABLE.

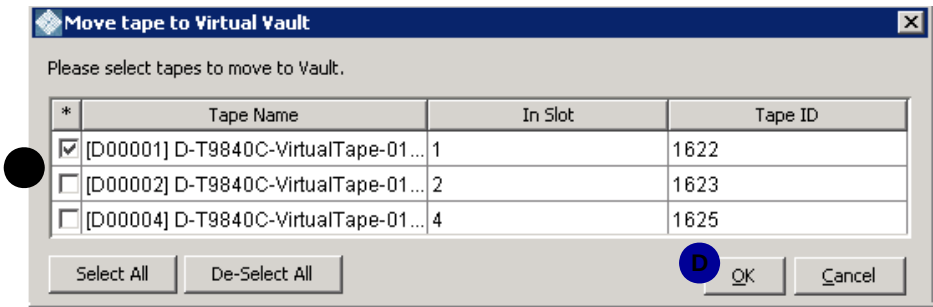
Stop here.

▼ Exporting virtual tape to physical tape

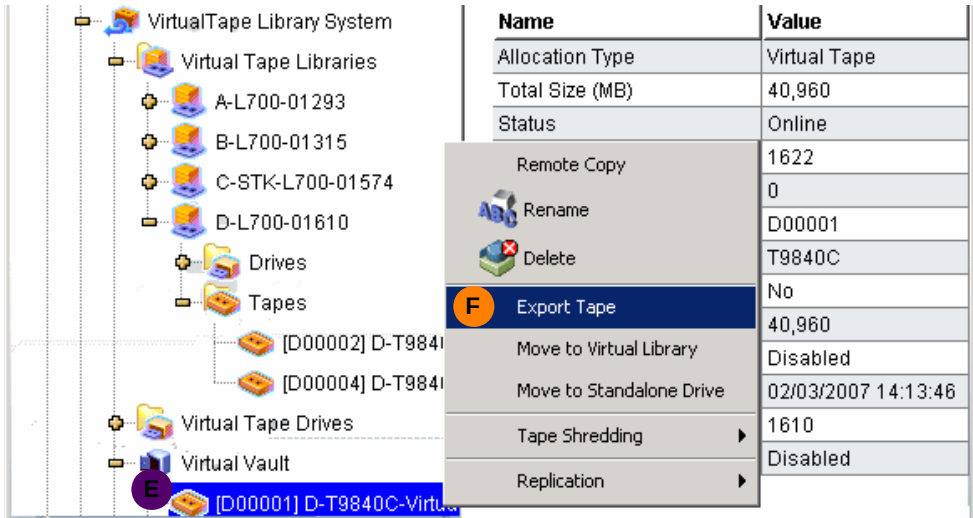
1. In the object tree of the VTL console, right-click on the virtual tape node that you want to export (A below), and select Move to Vault from the context menu (B).



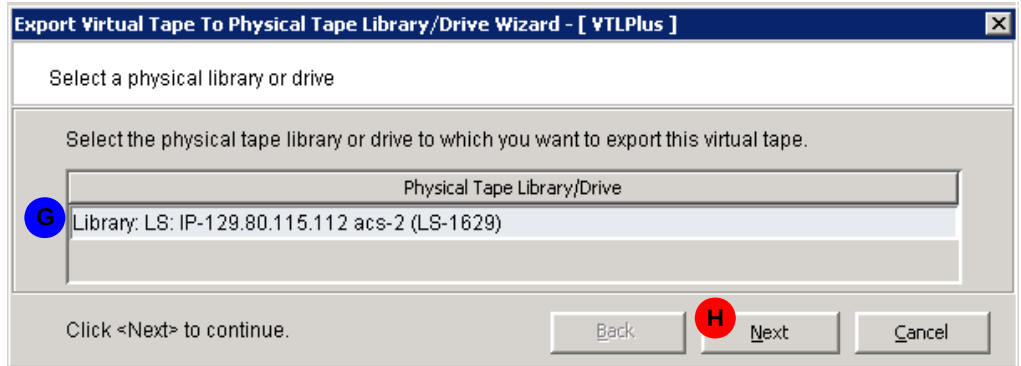
2. When the Move Tape to Virtual Vault dialog appears, select the tape(s) that you want to move using the check boxes and/or selection buttons provided (C below). Press OK (D).



3. Now, in the object tree of the VTL console, open the Virtual Vault node, and right-click the virtual tape that you want to export (E below). Select Export Tape from the context menu (F).

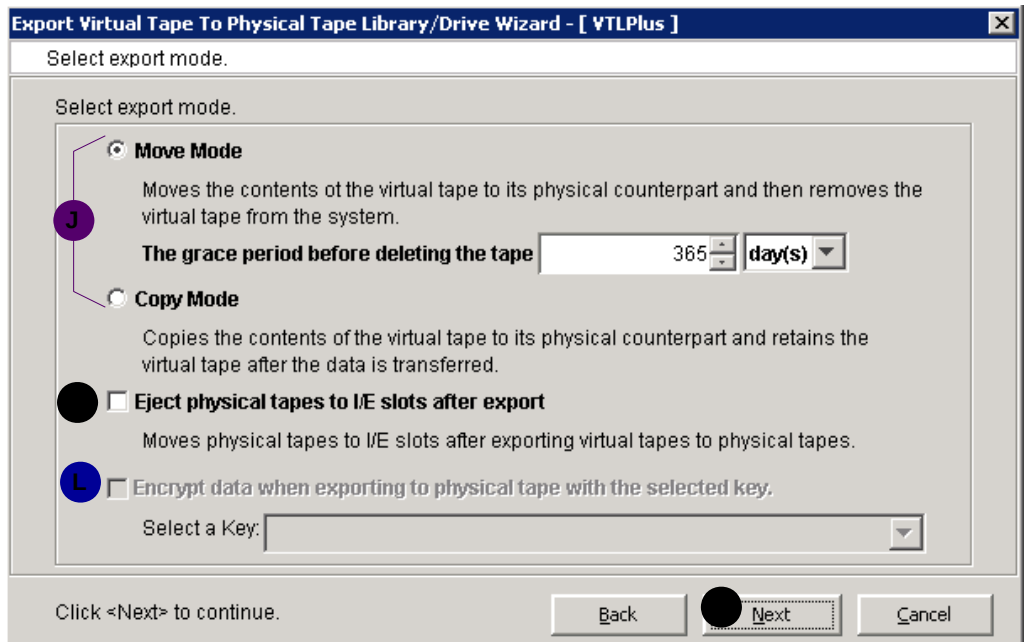


4. When the **Select a physical library or drive** panel appears, use the list to select the library or device to which you want to export virtual tape (G below). Press **Next (H)**.



5. Select how you want the data exported.

- **Move Mode** - Copies the contents of the virtual tape to its physical counterpart and then removes the virtual tape from the system. Specify a grace period if you want to keep the virtual tape for a time before deleting it. If you select **EnableTape Duplication** on the next dialog, the virtual tape data will not be deleted until the duplication job finishes successfully.
- **Copy Mode** - Copies the contents of the virtual tape to its physical counterpart and retains the virtual tape after the data is transferred.



6. **Select or clear the Eject physical tapes to I/E slots after export check box.**

7. **Select Encrypt data when exporting to physical tape with the selected key if you want to encrypt the data on the tape.**

You can select this option only if at least one key has been created. If you select this option, you must select the key to use. All the data on the tape will be indecipherable until is imported back to a virtual tape library and decrypted using the same key. Note that when you encrypt data, physical tape drive compression is disabled; it will be enabled if you do not encrypt data.

8. **Indicate if you want to enable tape duplication.**

Tape duplication makes a duplicate copy of the physical tape when data is exported. You must have at least two identical physical libraries (same mode).

9. **If you wish to move the physical tapes to an import/export slot after the export operation is complete, check the Eject physical tapes ... check box (K above).**

10. **If you wish to encrypt the physical tape, check the Encrypt data ... check box, and supply a key using the control provided (L above).**

11. **Press Next (M above).**

12. **When the Select Virtual Tape(s) panel appears, select each virtual tape that you want to export using the check boxes at left (N below) or use the selection buttons (P).**

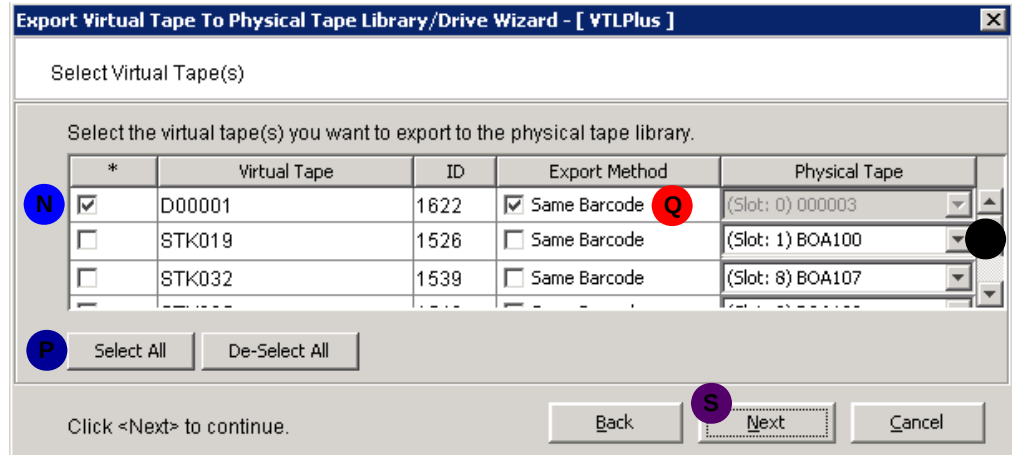
13. **For each tape, check the Same Barcode check box (Q below) unless you do not want to preserve the barcode.**

If you check the Same Barcode check box, the VTL software will automatically export to a physical cartridge with the same barcode as the virtual cartridge.

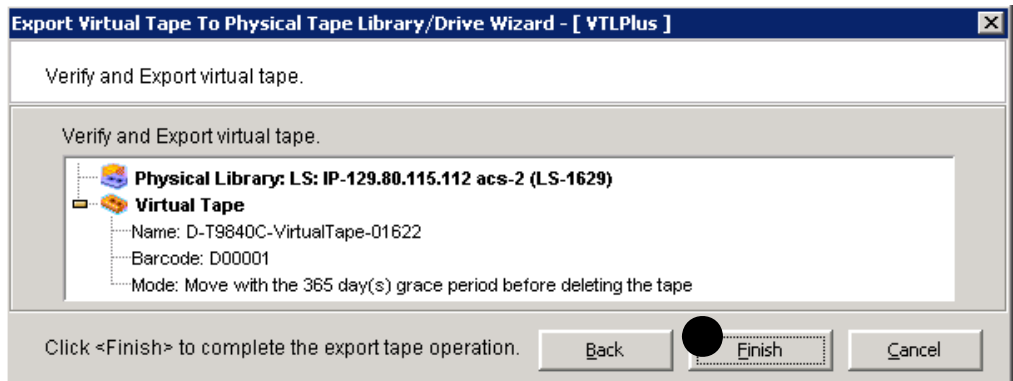
Your backup application may not be able to restore data from the physical backup tape if the barcode differs from that of the virtual tape.

14. **If you did not check the Same Barcode check box (Q below), use the Physical Tape spinner control (R) to select the physical tape that will hold the exported data.**

## 15. Press Next (S below).



## 16. When the Verify and Export ... panel appears, press Finish (T below).



Stop here.

## ▼ Exporting cartridges to the virtual vault in an IBM iSeries environment

### 1. Export a cartridge by entering the following at the command line:

```
RMVTAPCTG DEV(library_device_name ) CTG(cartridge_identifier)
```

### 2. If desired, use the VTL console to verify that the cartridges have been removed from the virtual library and placed in the virtual vault.

Stop here.

---

# Managing tape caching

In most circumstances, the Automated Tape Caching feature maintains tape caches and linkages automatically, provided that policies are suitably defined. However, when necessary, you can manage caching manually. This section explains:

- “Forcing migration to physical tape” on page 122
- “Manually freeing cache space” on page 122
- “Renewing cache for a directly linked tape” on page 122
- “Relinking physical tapes” on page 123

## ▼ Forcing migration to physical tape

To manually cause data in a cache to be migrated to physical tape, proceed as follows:

1. **In the object tree of the VTL console, right-click on a virtual tape cache.**
2. **Select `Migrate to Physical Tape` from the context menu.**

Note that all data on the physical tape is overwritten.

**Stop here.**

## ▼ Manually freeing cache space

1. **If you need to release space in a single cache, in the object tree of the VTL console, right-click on a virtual tape cache, and select `Reclaim Disk Space`.**

Note that all data in the cache is overwritten.

2. **To release space in multiple tape caches, in the object tree of the VTL console, right-click on the `Virtual Tape Library System` node, and select `Reclaim Disk Space` from the context menu.**

**Stop here.**

## ▼ Renewing cache for a directly linked tape

VTL software automatically recaches a direct link physical tape if the link is overwritten by a backup application. To manually renew the cache for a direct link tape, proceed as follows:

1. **In the object tree of the VTL console, right-click on the direct link tape that you wish to recache.**
2. **Select `Renew Cache` from the context menu.**

**Stop here.**

## ▼ Disabling a policy

To disable a tape caching policy:

1. **In the object tree of the VTL console, right-click on a virtual tape library, and select `Automated Tape Caching` from the context menu.**
2. **Clear the `Enable Tape Caching Policy` check box.**  
All the options that you previously set are retained, but data migration will not occur automatically until you select this check box again.
3. **Click `OK`.**

**Stop here.**

## ▼ Relinking physical tapes

If a directly linked physical tape is ejected from the physical tape library after the virtual tape has been released from cache, you have to relink the physical tape before you can access it from the VTL console.

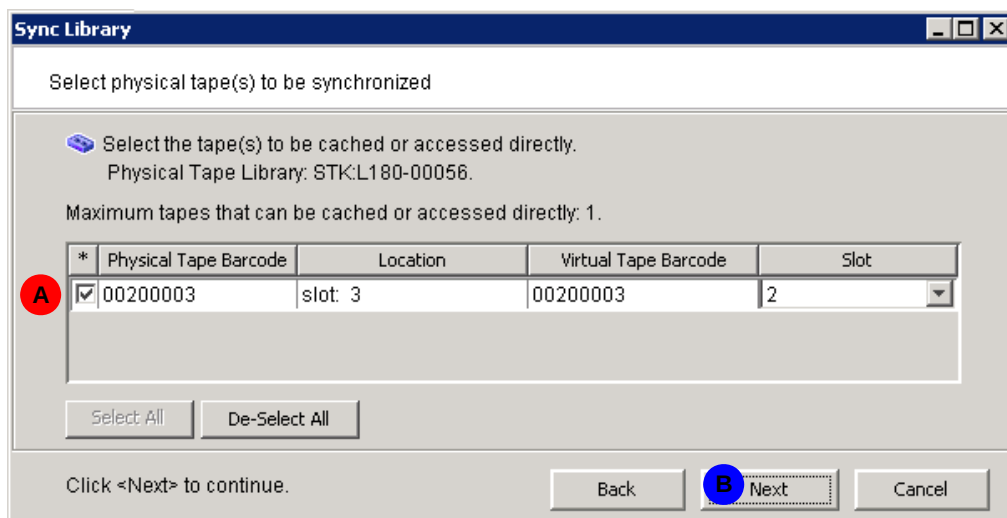
---

**Note** – Once the physical tape is reloaded in a library, the backup application can inventory access the library and access the tape directly, if necessary.

---

1. **In the object tree of the VTL console, right-click on the virtual tape library, and select `Sync Library` from the context menu.**
2. **If you have multiple libraries, select the appropriate physical library.**

3. When the **Sync Library** dialog appears, check the checkbox that corresponds to the physical tape that needs to be relinked (A below) or use the **Select-All** button.



**Sync Library**

Select physical tape(s) to be synchronized

Select the tape(s) to be cached or accessed directly.  
Physical Tape Library: STK:L180-00056.

Maximum tapes that can be cached or accessed directly: 1.

| *                                   | Physical Tape Barcode | Location | Virtual Tape Barcode | Slot |
|-------------------------------------|-----------------------|----------|----------------------|------|
| <input checked="" type="checkbox"/> | 00200003              | slot: 3  | 00200003             | 2    |

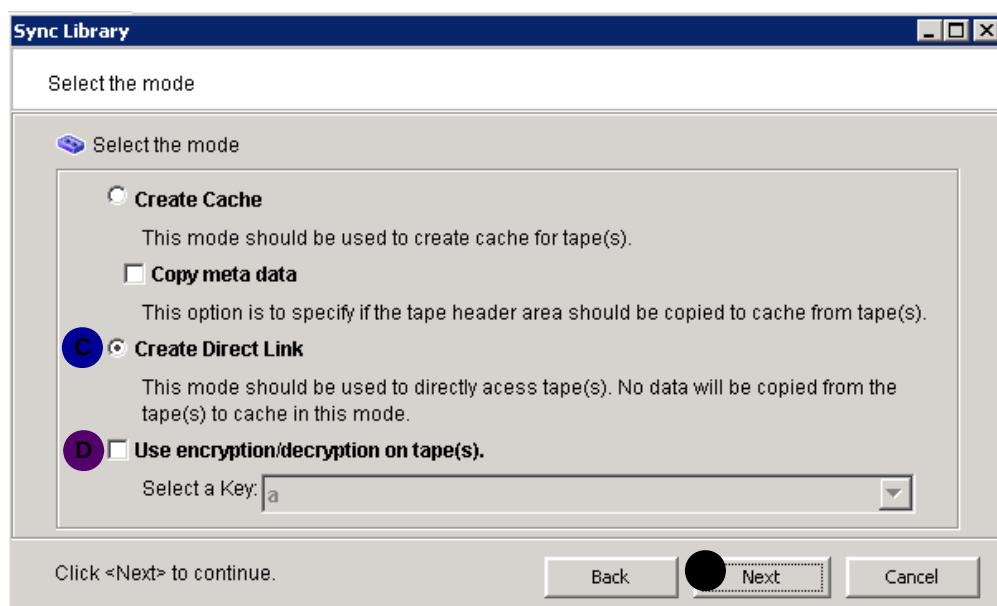
Select All De-Select All

Click <Next> to continue.

Back **B** Next Cancel

4. Press **Next** (B above).

5. When the select the mode panel appears, click the **Create Direct Link** radio button (C below).



**Sync Library**

Select the mode

Select the mode

☐ **Create Cache**  
This mode should be used to create cache for tape(s).

☐ **Copy meta data**  
This option is to specify if the tape header area should be copied to cache from tape(s).

**C** ☒ **Create Direct Link**  
This mode should be used to directly access tape(s). No data will be copied from the tape(s) to cache in this mode.

**D** ☐ **Use encryption/decryption on tape(s).**  
Select a Key: a

Click <Next> to continue.

Back **C** Next Cancel

6. If the data was encrypted before being migrated, check the **Use encryption/decryption on tape(s)** check box, and **supply the select the appropriate key using the list control provided (D above)**.
7. Press **Next (E above)**, then **Finish**.

**Stop here.**

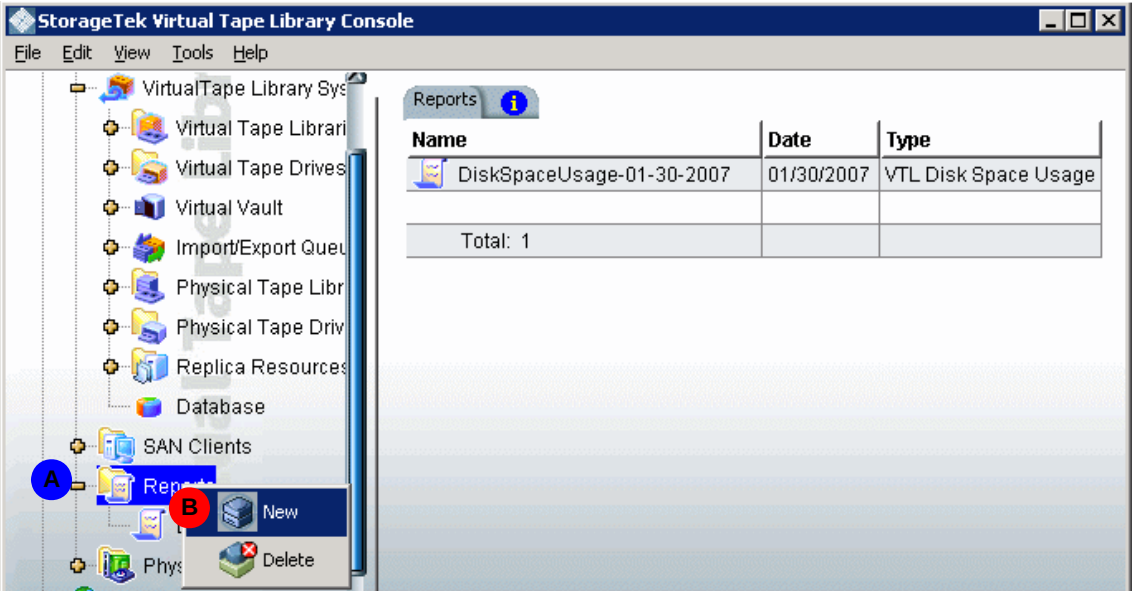
# Creating and viewing reports

You can work with reports using the VTL console. See:

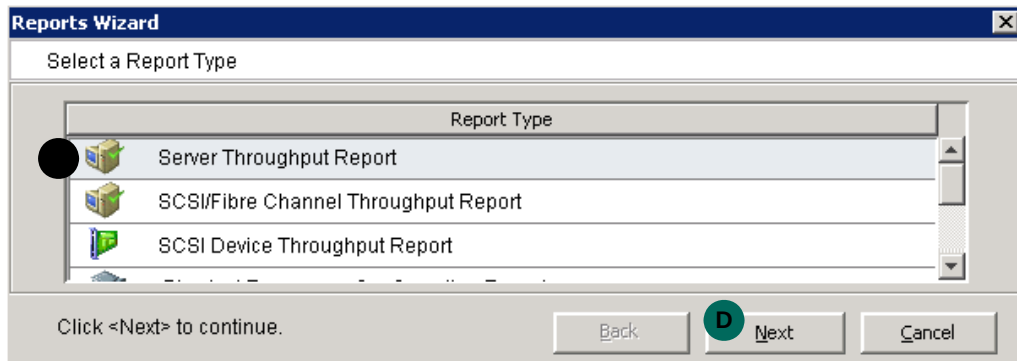
- “Creating a report” on page 125
- “Viewing a report” on page 128
- “Exporting data from a report” on page 129.

## ▼ Creating a report

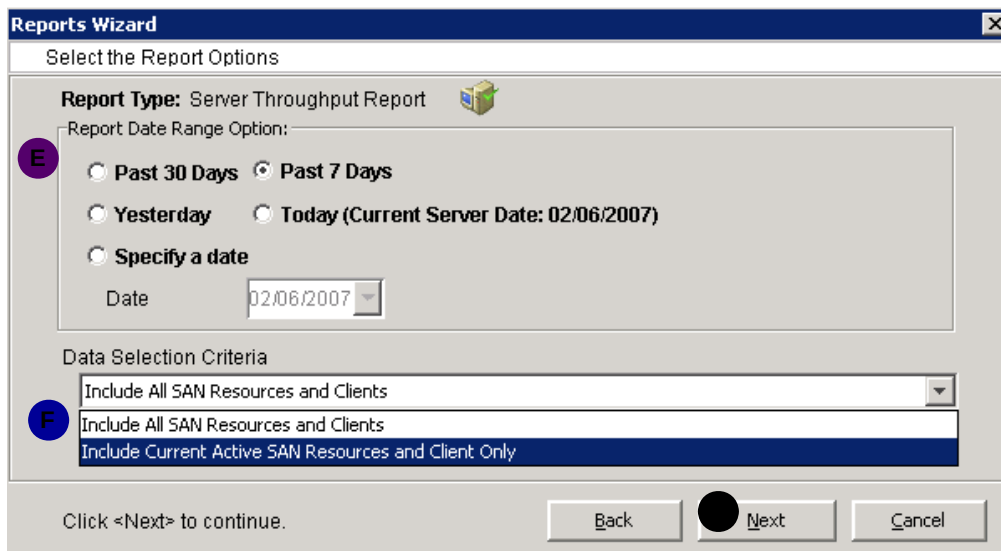
1. In the object tree of the VTL console, right-click on the **Reports** node (A below), and select **New** from the context menu (B).



2. When the Select a Report Type dialog appears, select a type from the list (C below). Press Next (D).



3. When the Select Report Options panel appears, select the desired report properties using the controls provided (E and F below). Press Next (G).



Note that different report types offer different options.

In the example above, the Include All SAN Resources and Clients option covers all current and previous configurations for the server (including physical tape libraries/drives and clients that you may have changed or deleted). The Include Current Active SAN Resources and Clients Only option covers only the physical tape libraries/drives and clients that are currently configured for this server.

4. When the Enter the Report Name dialog appears, for the report, enter the name in the field provided (H below), and press Next (J).

The screenshot shows the 'Reports Wizard' dialog box with the title 'Enter the Report Name'. The 'Report Type' is set to 'Server Throughput Report'. The 'Report Name' field contains 'ServerThroughput-02-06-2007'. A red circle with the letter 'H' is next to the 'Report Name' label. Below the field, it says 'Invalid characters for the Report Name: , / \'. The 'Selected Report Options and Filters' section shows 'Date Time Range: Past 7 Days ( 01/30/2007 - 02/05/2007 )' and 'Data Selection Criteria: Include All SAN Resources and Clients'. At the bottom, there are 'Back', 'Next', and 'Cancel' buttons. A blue circle with the letter 'J' is over the 'Next' button. The text 'Click <Next> to continue.' is on the left.

5. When the Create the Report panel appears, press Finish (K below).

The screenshot shows the 'Reports Wizard' dialog box with the title 'Create the Report'. The 'Report Type' is 'Server Throughput Report'. The 'Report Name' is 'ServerThroughput-02-06-2007'. The 'Selected Report Options and Filters' section is the same as in the previous step. At the bottom, there are 'Back', 'Finish', and 'Cancel' buttons. A blue circle with the letter 'K' is over the 'Finish' button. The text 'Click <Finish> to confirm the creation of the report.' is on the left.

Stop here.

## ▼ Viewing a report

1. In the object tree of the VTL console, expand the **Reports** node (A below) to view the list of current reports.

The screenshot shows the VTL console interface. On the left, the object tree is expanded to show the **Reports** node, which is highlighted with a blue circle labeled 'A'. Below it, the **DiskSpaceUsage-** report is selected, highlighted with a red circle labeled 'B'. The right-hand pane displays the **VTL Disk Space Usage Report** for **VTLPlus** on **01/30/2007**. The report includes summary statistics and a table of physical resources.

**VTL Disk Space Usage Report**  
VTLPlus  
01/30/2007

**Total Capacity:** 8,612,044 MB  
**Total Allocated Space:** 502,460 MB (5%)  
**Total Free Space:** 8,109,584 MB (95%)

| Physical Resource     | SCSI Address | Capacity(MB) | Allocated(MB) |
|-----------------------|--------------|--------------|---------------|
| qla2x00fs_0 Adapter:4 |              |              |               |
| STK:OPENstorage D280  | 4:0:1:0      | 9,210        | 5             |
| STK:OPENstorage D280  | 4:0:1:1      | 716,562      | 46            |
| STK:OPENstorage D280  | 4:0:1:5      | 716,562      | 40            |
| STK:OPENstorage D280  | 4:0:1:9      | 716,562      | 40            |

Page 1 Of 2

2. Select the current report that you wish to view (B above).

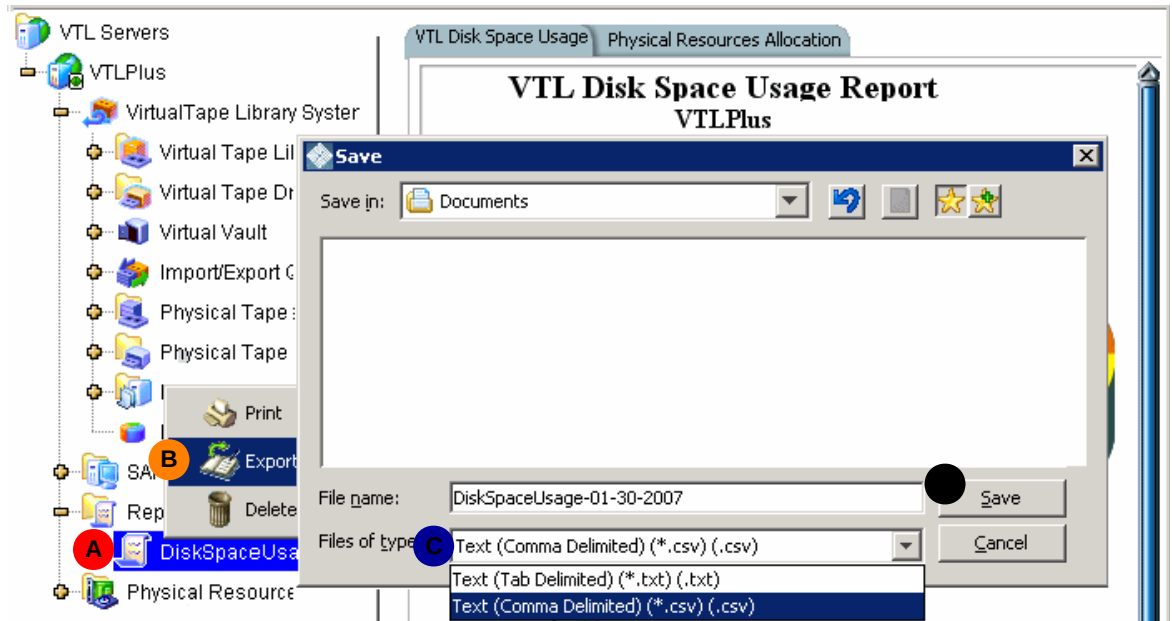
The desired report appears in the right-hand pane of the console (C above).

**Stop here.**

## ▼ Exporting data from a report

1. In the object tree of the VTL console, expand the Reports node and right-click the name of the report that you want to export (A below).

You can export server and device throughput and usage report data to comma-or tab-delimited text files.



2. In the context menu., select Export (B above).
3. When the Save dialog appears, use the Files of type list control to select the desired format (C above), and press Save (D).

Stop here.

## Encrypting and shredding data

To ensure that the data that you export to physical tape is confidential and secure, VTL offers a Secure Tape Option that uses the Advanced Encryption Standard (AES) algorithm published by the National Institute of Standards and Technology, an agency of the U.S. government. With this option, you can create one or more keys that can be used to encrypt the data when it is exported to physical tape and decrypt it when it is imported back to virtual tapes. The data on the tape cannot be read without being decrypted using the appropriate key.

Each key consists of a secret phrase. For additional security, each key is password-protected. You must provide this password in order to change the key name, password, or password hint, or to delete or export the key.

You can apply a single key to all virtual tapes when you export them to physical tape, or you can create a unique key for each one. Creating multiple keys provides more security; in the unlikely event that a key is compromised, only the tapes that use that key would be affected. However, if you use multiple keys, you must keep track of which key applies to each tape so that you use the correct key to decrypt the data when you import the physical tape back to virtual tape.

**Note:** If you apply an incorrect key when importing a tape, the data imported from that tape will be indecipherable.

Once you have created one or more keys, you can export them to a separate file called a key package. If you send encrypted tapes to other locations that run VTL, you can also send them the key package. By importing the key package, administrators at the other sites can then decrypt the tapes when they are imported back into virtual tape libraries managed by VTL.

You can enable encryption and specify which key to use when you either manually import or export a tape or when you use the auto-archive/replication feature.

For instructions, see the following:

- “Creating a key” on page 130
- “Changing a key name or password” on page 131
- “Deleting a key” on page 132
- “Exporting a key” on page 133
- “Importing a key” on page 134
- “Shredding a virtual tape” on page 135.

## ▼ Creating a key

1. **In the navigation tree, right-click the server name and click `Key Management`.**
2. **Click `New`.**
3. **In the `Key Name` text box (A below), type a unique name for the key (1–32 characters).**
4. **In the `Secret Phrase` text box (B below), type the phrase (25–32 characters, including numbers and spaces) that will be used to encrypt the data.**

Save your secret phrase. Once you have created a key, you cannot change the secret phrase associated with that key.

5. In the **New Password** and **Confirm Password** text boxes (C below), type a password for accessing the key (10–16 characters).

You will need to provide this password when changing the key name, password, or password hint and when deleting or exporting the key.

You do not have to provide a unique password for each key. In fact, if you use the same password for multiple keys, you have to provide the password only once when you export multiple keys that all use the same password.

6. In the **Password Hint** text box (D below), type a hint (0–32 characters) that will help you remember the password.

This hint appears when you type an incorrect password and request a hint.

**Create New Key**

Enter the following information and click <Ok> to create a new key.

**Key Name (1-32):** A NYoffice

**Secret Phrase (25-32):** B Backup tapes sent to Connecticut  
A unique phrase with minimum of 25 characters to be used to generate the key.

**New Password (10-16):** C \*\*\*\*\*

**Confirm Password (10-16):** C \*\*\*\*\*

**Password Hint (0-32):** D Where my mother was born  
A description up to 32 characters to be used as a hint to help the user to remember the password.

E OK Cancel

7. Click **OK** (E above).

Stop here.

## ▼ Changing a key name or password

Once you have created a key, you cannot change the secret phrase associated with that key. However, you can change the name of the key, as well as the password used to access the key and the hint associated with that password.

If you rename a key, you can still use that key to decrypt data that was encrypted using the old key name. For example, if you encrypt data using `Key1`, and you change its name to `Key2`, you can decrypt the data using `Key2`, since the secret phrase is the same.

To change a key name or password:

1. **In the navigation tree, right-click the server name, and click `Key Management`.**
2. **From the `Key Name` list, click the key you want to change.**
3. **Click `Edit`.**
4. **If you closed the `Key Management` dialog box after creating the key, type the current password for accessing this key in the `Password` text box.**

If you just created the key, did not close the `Key Management` dialog box, and subsequently decided to change the key, you are not prompted for the password.
5. **Make the desired changes:**
6. **Click `OK`.**

**Stop here.**

## ▼ Deleting a key

**Caution:** Once you delete a key, you can no longer decrypt tapes that were encrypted using that key unless you subsequently create a new key that uses the exact same secret phrase, or import the key from a key package.

1. **In the navigation tree, right-click the server name and click `Key Management`.**
2. **From the `Key Name` list, click the key that you want to delete.**
3. **Click `Delete`.**
4. **In the `Password` text box, type the password for accessing this key.**
5. **Type `YES` to confirm.**
6. **Click `OK`.**

**Stop here.**

## ▼ Exporting a key

When you export a key, you create a separate file called a `key package` that contains one or more keys. You can then send this file to another site that uses VTL, and administrators at that site can import the key package and use the associated keys to encrypt or decrypt data.

Creating a key package also provides you with a backup set of keys. If a particular key is accidentally deleted, you can import it from the key package so that you can continue to access the data encrypted using that key.

1. **In the navigation tree, right-click the server name and click `Key Management`.**
2. **Click `Export`.**
3. **In the `Package Name` text box, type the file name to use for this key package (1–32 characters).**
4. **In the `Decryption Hint` text box, type a three-character hint.**

When you subsequently attempt to import a key from this key package, you are prompted for a password. If you provide the correct password, the decryption hint specified here appears correctly on the `Import Keys` dialog box. If you provide an incorrect password, a different decryption hint appears. You can import keys using an incorrect password, but you will not be able to decrypt any files using those keys.

5. **From the `Select Keys to Export` list, select the key(s) that you want to include in the key package.**

When you select a key or click `Select All`, you are prompted to provide the password for each key. (If multiple selected keys use the same password, you are prompted for the password only once, when you select the first key that uses that password.)

After you type the password in the `Password` text box, that password appears in the `Password for All Keys in Package` area on the `Export Keys` dialog box. By default, the password is displayed as asterisks. To display the actual password, select the `Show clear text` check box.

If you selected a key and subsequently decide not to include it in the key package, you can clear the key. You can also clear all selected keys by clicking `De-Select All`.

**6. Select Prompt for new password for all keys in package if you want to create a new password for the key package.**

If you select this option, you will be prompted to provide the new password when you click OK on the Export Keys dialog box. You will subsequently be prompted for this password when you try to import a key from this package. In addition, all keys imported from this package will use this new password rather than the password originally associated with each key.

If you clear this option, this package will use the same password as the first selected key (which appears in the Password for All Keys in Package area), and you must provide this password when you try to import a key from this package. You must also provide this password when you subsequently change, delete, or export any key imported from this package.

**7. In the Save in this directory text box, type the full path for the file.**

**8. Click OK.**

If you selected the Prompt for new password for all keys in package check box, type the new password (10–16 characters) in the New Password and Confirm Password text boxes, type a hint for that password (0–32 characters) in the Password Hint text box.

A file with the specified package name and the extension .key is created in the specified location.

**Stop here.**

## ▼ Importing a key

Once you have created a key package, you can open that package and specify which keys to import into VTL. Once you import a key, you can use that key to encrypt or decrypt data.

To import a key:

- 1. In the navigation tree, right-click the server name and click Key Management.**
- 2. Click Import.**
- 3. In the Find Package text box, type the full path to the key package.**
- 4. Click View.**
- 5. Type the password for accessing the key package in the Password text box.**

Note: After you provide the password, make sure that the displayed Decryption Hint matches the decryption hint specified when the key package was created. If the hint is not correct, click Password and provide the correct password for accessing

the key package. If you provide an incorrect password, you will still be able to import the keys in the package, but you will not be able to use them to decrypt any data that was previously encrypted using those keys.

**6. From the Select Keys to Import list, select the keys that you want to import.**

You can select only those keys that have a green dot and the phrase `Ready for Import` in the `Status` column. A red dot and the phrase `Duplicate Key Name` indicates that a key of the same name already exists in this instance of VTL and cannot be imported.

If you selected a key and subsequently decide not to import it, you can clear the key. You can also clear all selected keys by clicking `De-Select All`. (You can click this button only if the `Show All Keys` check box is cleared.)

Note: A key of the same name might not necessarily have the same secret phrase. For example, you might have a key named `Key1` with a secret phrase of `ThisIsTheSecretPhraseForKey1`. If the key package was created by another instance of VTL, it might also have a key named `Key1`, but its secret phrase might be `ThisIsADifferentSecretPhrase`. Since the key names are the same, you will not be able to import the key in the key package unless you rename the existing `Key1`. After you rename the key, you can continue to use it to decrypt tapes that were encrypted using that key, and you can also import the key named `Key1` from the key package and use it to decrypt tapes that were encrypted using that key.

**7. Click OK.**

The imported keys appear in the `Key Name` list on the `Key Management` dialog box. When you subsequently export or import a tape, these key names also appear in the `Select a Key` list.

**Stop here.**

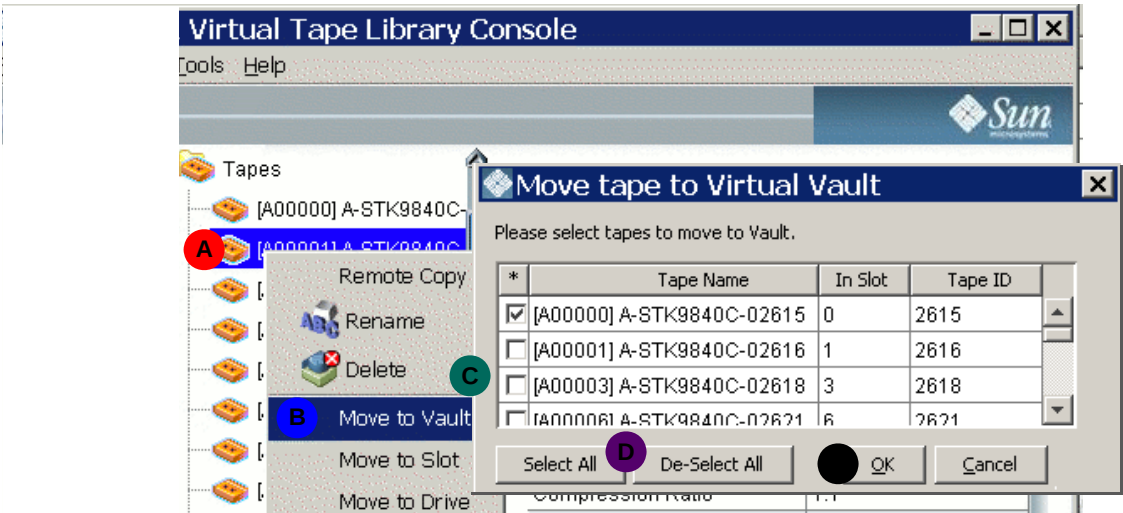
## ▼ Shredding a virtual tape

Just as deleting a file from your hard drive does not completely destroy the file, deleting a virtual tape does not completely destroy the data on the tape. If you want to ensure that the data is unrecoverable, you must shred the tape.

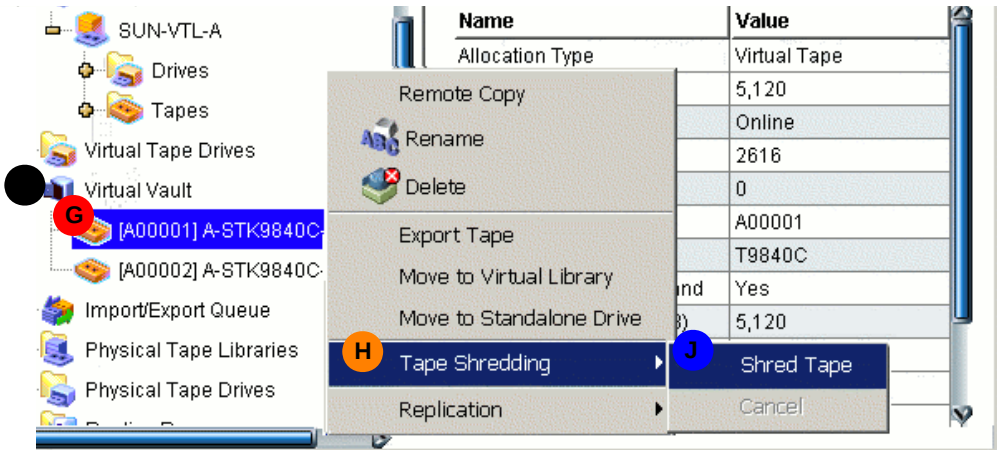
Shredding a virtual tape destroys all data on the tape, making it impossible to recover the data. Tape shredding uses a military standard to destroy data on virtual tapes by overwriting it with a random patterns of bits, rendering the data unreadable.

To shred tapes:

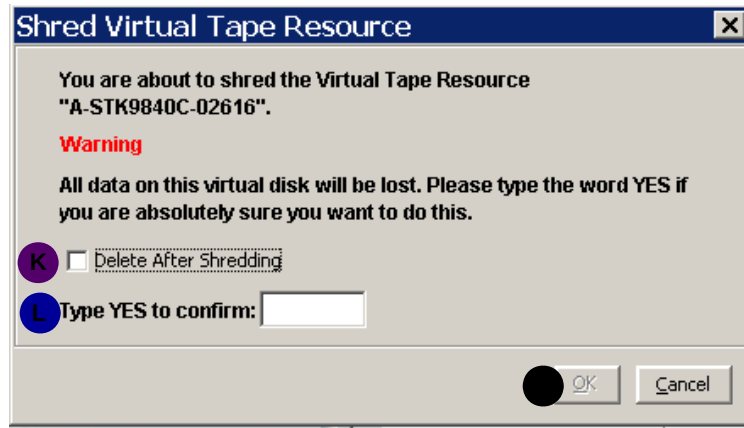
1. Move the tape(s) you want to shred to the virtual vault. In the object tree of the VTL console, start by right-clicking on a tape that you want to shred (A below), and select Move to Vault (B) from the context menu.



2. When the Move tape to Virtual Vault dialog appears, use the check boxes (C above) and selection buttons (D) to select the tapes you want to shred. Press OK (E).
3. Select the tape(s) you want to shred. In the object tree of the VTL console, click on the Virtual Vault (F below).



4. Right-click on one of the tapes that you want to shred (G above), and select Tape Shredding (H) and Shred Tape (J) from the context menus.



5. When the Shred Virtual Tape Resource dialog appears, check the Delete After Shredding check box (K above) if you wish to delete the tape after shredding.
6. In the space provided, type YES (L above) to confirm the shredding operation, and press OK (M).

You can view the status by highlighting the virtual tape in the vault. The status bar displays the progress.

If you want to cancel the shredding process, right-click on the tape or the Virtual Vault object and select Tape Shredding > Cancel.

---

**Note** – Tape shredding may adversely affect backup performance. We recommend that you perform tape shredding when there are no backups running.

---

Stop here.

## Working with the Event Log

The Event Log details significant occurrences during the operation of the VTL Server. The Event Log can be viewed in the VTL Console when you highlight a server in the tree and select the Event Log tab in the right pane.

The columns displayed are:

|               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type          | <p><b>I:</b> This is an informational message. No action is required.</p> <p><b>W:</b> This is a warning message that states that something occurred that may require maintenance or corrective action. However, the VTL system is still operational.</p> <p><b>E:</b> This is an error that indicates a failure has occurred such that a device is not available, an operation has failed, or a licensing violation. Corrective action should be taken to resolve the cause of the error.</p> <p><b>C:</b> These are critical errors that stop the system from operating properly.</p> |
| Date          | The date on which the event occurred.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Time          | The time at which the event occurred.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| ID            | This is the message number.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Event Message | This is a text description of the event describing what has occurred.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

The VTL console lets you work with logs in the following ways:

- “Viewing an event log” on page 138
- “Sorting an event log” on page 138
- “Quickly printing an event log” on page 139
- “Filtering, exporting, purging, and printing an event log” on page 139

## ▼ Viewing an event log

1. In the object tree of the VTL console, select the server that you want to check.
2. In the panel on the right side of the VTL console, click on the **Event Log** tab.

Stop here.

## ▼ Sorting an event log

1. On the **Event Log** tab, click on the column head that you want to use as a sort key.
2. If you want to reverse the sort order, click on the column heading again.

Stop here.

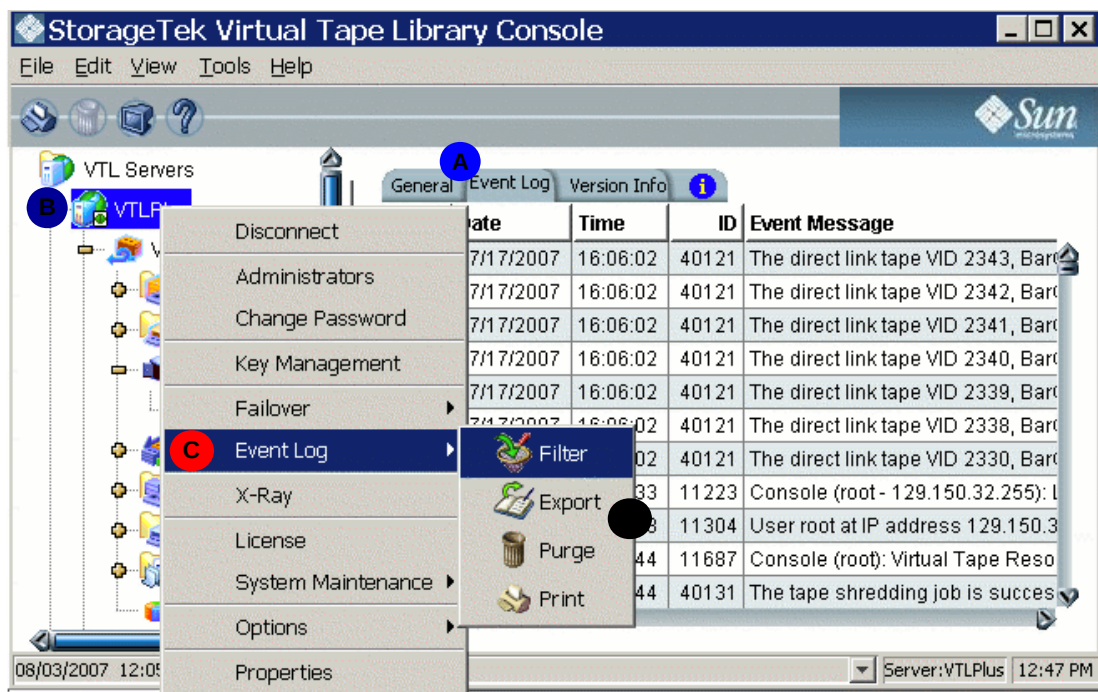
## ▼ Quickly printing an event log

1. From the VTL console main menu, select `File`.
2. From the submenu, select `Print`.

Stop here.

## ▼ Filtering, exporting, purging, and printing an event log

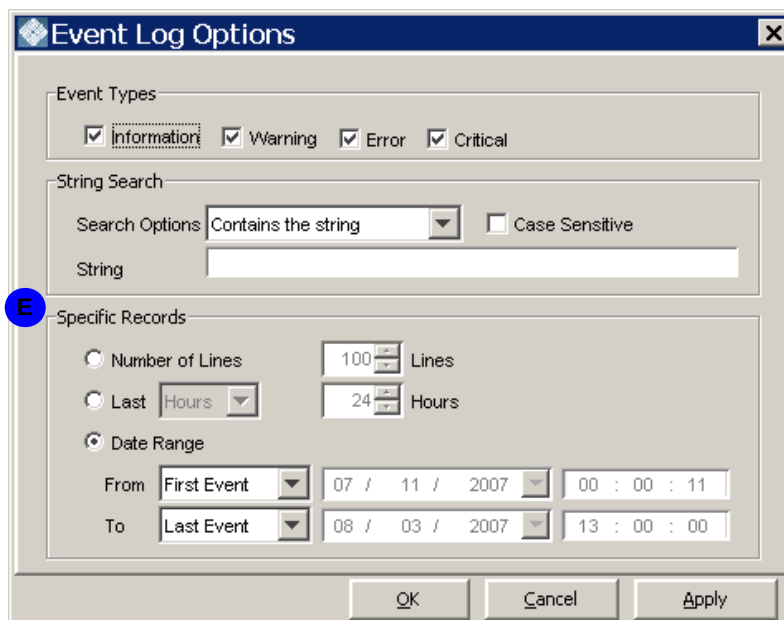
1. With the `Event Log` tab (A below) of the server open, right-click on the server icon in object tree of the VTL console (B).



2. From the context menu, select `Event Log` (C above).

3. From the submenu, select the operation that you wish to perform (D above).

If you wish to search or filter the log, the Event Log Options dialog (E below) lets you set up and apply your criteria.



Stop here.

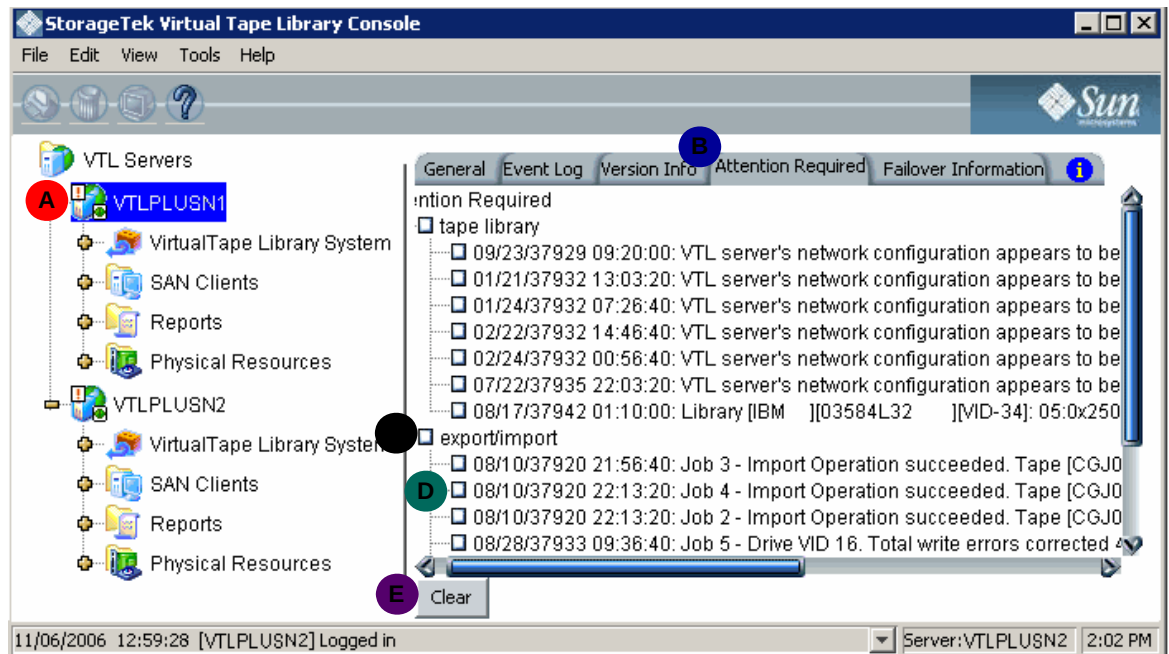
## Using the Attention Required tab

When events that may require user intervention occur, the VTL console flags the server icon with an exclamation point (!) and displays notifications in the Attention Required tab of the server properties sheet. Typical events include physical library failures, appliance hardware errors, replication errors, and completed import/export jobs. The VTL console lets you manage Attention Required notifications in the following ways:

- “Accessing the Attention Required tab” on page 141
- “Clearing issues from the Attention Required list” on page 141.

## ▼ Accessing the Attention Required tab

1. In the VTL object tree, locate the flagged server (A below).



2. In the right-hand pane, select the Attention Required tab of the server property sheet (B above).

Stop here.

## ▼ Clearing issues from the Attention Required list

1. If you want to clear an entire class of events from the list, check the check box for the event type (C above).
2. If you want to clear an individual event, check the corresponding check box (D above)
3. Click the Clear button (E above).

Stop here.

# Managing VTL servers

The VTL console lets you manage the server node by:

- “Setting server properties” on page 142
- “Configuring SNMP traps” on page 142.

## ▼ Setting server properties

1. **Right-click on the server and select Properties.**
2. **On the Activity Database Maintenance tab, indicate how often the VTL activity data should be purged.**

The Activity Log is a database that tracks all system activity, including all data read, data written, number of read commands, write commands, number of errors etc. This information is used to generate information for the VTL reports.

3. **On the SNMP Maintenance tab, VTL to send traps to your SNMP manager.**  
Refer to “Configuring SNMP traps” on page 142 for more information.
4. **On the Auto Save tab, enter information to replicate your VTL configuration to another server.**  
This protects your configuration if the VTL server is lost. Refer to “Automatically backing up the VTL configuration” on page 78 for more information.
5. **On the Storage Monitoring tab, enter the maximum amount of storage that can be used by VTL before you should be alerted.**

When the utilization percentage is reached, a warning message will be sent to the Event Log.

**Stop here.**

## ▼ Configuring SNMP traps

VTL provides Simple Network Management Protocol (SNMP) support to integrate VTL management into an existing enterprise management solution, such as HP OpenView, CA Unicenter, IBM Tivoli NetView, or BMC Patrol.

By default, event log messages will not be sent, but you may want to configure VTL to send certain types of messages. To do this:

1. **In the Console, right-click on your VTL server appliance and select Properties.**

**2. Select the SNMP Maintenance tab.**

**3. Indicate the information that should be included in traps sent to your SNMP manager.**

`SysLocation` - Enter the location that should be included in traps.

`SysContact` - Enter any contact information that should be included in traps. This could be a name or an email address.

**4. Specify the type of message that should be sent.**

Five levels of messages are available:

- None: no messages will be sent.
- Critical: only critical errors that stop the system from operating properly will be sent.
- Error: errors (failure such as a resource is not available or an operation has failed) and critical errors will be sent.
- Warning: warnings (something occurred that may require maintenance or corrective action), errors, and critical errors will be sent.
- Information: informational messages, errors, warnings, and critical error messages will be sent.

**5. Click Add to enter the name of your SNMP server and a valid SNMP community name.**

**6. To verify that SNMP traps are set up properly, set the level to Informational and then do anything that causes an entry to be added to the event log (such as logging into the VTL console or creating a new virtual tape library or virtual tape drive).**

You should see an SNMP trap for the event.

**Stop here.**



## Installing the VTL console

---

The Virtual Tape Library console application can be installed on a full range of operating platforms. In most cases, a Sun service representative installs the console on one customer-provided server as part of the initial deployment. Customers can install as many additional instances as required on other machines. Note, however, that no more than two (2) instances of the console can access the same VTL server at the same time.

To install the console, follow the instructions for the selected host type:

- “For information on the text-based, VTL command line user interface, see Appendix A, “VTL command line reference” on page 171.” on page 145
- “Installing the console on Linux platforms” on page 146
- “Installing the console on Microsoft Windows platforms” on page 146.

---

**Note** – For information on the text-based, VTL command line user interface, see Appendix A, “VTL command line reference” on page 171.

---

### ▼ Installing the console on Solaris platforms

On Solaris systems, you install the console using the procedure below.

1. **Log in to the host as the `root` user.**
2. **Using Secure File Transfer Protocol (`sftp`), download the installation files to the client.**

For x86 platforms, select the `i386` package:

```
% sftp vtladmin@appliance_IP-address  
sftp> get /software/Solaris/vtlconsole-n.nn-n.nnn.i386.pkg
```

For SPARC platforms, select the `sparc` package:

```
% sftp vtladmin@appliance_IP-address  
sftp> get /software/Solaris/vtlconsole-n.nn-n.nnn.sparc.pkg
```

3. If you are installing the console software on an x86 platform, enter the following command, and respond to the on-screen prompts:

```
% pkgadd -d vtlconsole-n.nn-n.nnn.i386.pkg
```

4. If you are installing the console software on a SPARC platform, enter the following command, and respond to the on-screen prompts:

```
% pkgadd -d vtlconsole-n.nn-n.nnn.sparc.pkg
```

5. To launch the console, enter the following command:

```
% /usr/local/vtlconsole/vtlconsole &
```

Stop here.

## ▼ Installing the console on Linux platforms

On Linux systems, you install the console manually, using the procedure below.

1. To install the console software, log in to the host as the **root** user.
2. Using Secure File Transfer Protocol (sftp), download the installation files to the client:

```
% sftp vtladmin@appliance_IP-address  
sftp> get /software/Linux/vtlconsole-n.nn-n.nnn.i386.rpm
```

3. To install the console software, enter the following command, and respond to the on-screen prompts:

```
% rpm -i vtlconsole-n.nn-n.nnn.i386.rpm
```

The console will install in the /user/local/vtlconsole directory.

4. To launch the console, enter the following command:

```
% /usr/local/vtlconsole/vtlconsole &
```

Stop here.

## ▼ Installing the console on Microsoft Windows platforms

The VTL installation directory on the server includes a setup program that installs the console software on Windows computers.

1. If you are not a member of the **Power User** or **Administrator** groups on the host, obtain the required level of permissions or stop here.

You must be a **Power User** or **Administrator** to install software on a Windows host.

2. Using Secure File Transfer Protocol (sftp), log on to the VTL server, change to the `usr/vtl/packages/build/Windows/` directory, and download all listed installation files to a temporary directory on the client:

```
% sftp vtladmin@appliance_IP-address
sftp> cd /software/Windows/
sftp> ls
data1.cab      ikernel.ex_   layout.bin    Setup.ini
data1.hdr      ISInstall.exe setup.bmp      setup.inx
data2.cab      ISInstall.ini Setup.exe
sftp> get *.*
```

sftp software is not standard with most versions of Microsoft Windows, but various, compatible, third-party sftp implementations are available, notably the one that comes with the PuTTY open-source terminal-emulation application.

3. Using Explorer, change to the temporary directory, and double-click on `setup.exe` to launch the console installation program.

Stop here.

## ▼ Launching the VTL console on a remote host

1. To launch the console on a Sun Solaris workstation, open a terminal window and enter the command shown below:

```
% /usr/local/vtlconsole/vtlconsole &
```

2. On a Microsoft Windows system, press the Start bar to access the main menu system, and select All Programs > Sun Microsystems> VTL 5.0> VTL Console.

3. To launch the console on a Linux workstation, open a terminal window and enter the command shown below:

```
% /usr/local/vtlconsole/vtlconsole &
```

Stop here.



## Recovery following a system failure

---

To recover a VTL high-availability system following a failure on one node, carry out the following tasks:

- “Failback” on page 149
- “Resuming backups following a failover/failback” on page 159.

---

### Failback

For best results, run failback as a manual process, using the procedure outlined below.

#### ▼ Initiating failback

For the purposes of this description, the current, active node is *VTLPLUSN2*, the failover node for *VTLPLUSN1*, the failed/offline node.

1. **Open a terminal window on the management host, and ssh to the IP address of the currently active node, *VTLPLUSN2*:**

```
[VTL_Plus]vtladmin# ssh vtladmin@nnn.nnn.nnn.nny
Connecting to nnn.nnn.nnn.nny ...
Password:
```

where *nnn.nnn.nnn.nny* is the management or “server” IP address of *VTLPLUSN2*, the node that took over for the failed server node, *VTLPLUSN1* and *vtladmin* is the VTL administrator account user ID.

2. **Make sure that you are logged in to the actual, active node:**

```
[VTL_Plus]vtladmin# uname -a
SunOS VTLPLUSN2 n.nn Generic_mnnnnn-nn i86pc i386 i86pc
```

The system should display the expected node name.

3. If you are not logged in to the correct system, you may have accidentally logged into the service (“monitoring”) IP address of the failed node. Close the `ssh` session, and `ssh` to the other IP address for the current, active node.

4. Change to the directory that holds the VTL executables:

```
[VTL_Plus]vtladmin# cd /usr/local/vtl/bin
```

5. Run the `vtl status` command:

```
[VTL_Plus]vtladmin# vtl status

Sun Microsystems VTL Server vn.nn (Build nnnn)
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Status of VTL SNMPD Module..... [RUNNING]
Status of VTL QLogic Module..... [RUNNING]
Status of VTL Authentication Module..... [RUNNING]
Status of VTL Server (Compression) Module. [RUNNING]
Status of VTL Server (FSNBase) Module..... [RUNNING]
Status of VTL Server (Upcall) Module..... [RUNNING]
Status of VTL Server (Event) Module..... [RUNNING]
Status of VTL Server (Path Manager) Module [RUNNING]
Status of VTL Server (Application)..... [RUNNING]
Status of VTL FC Target Module..... [RUNNING]
Status of VTL Server VTL Upcall Module.... [RUNNING]
Status of VTL Server VTL Upcall Daemon.... [RUNNING]
Status of VTL Server VTL Module..... [RUNNING]
Status of VTL Communication Module..... [RUNNING]
Status of VTL Logger Module..... [RUNNING]
Status of VTL Self Monitor Module..... [RUNNING]
Status of VTL Failover Module..... [RUNNING]
```

6. If one or more VTL processes are not `RUNNING`, stop the server software and then restart:

```
[VTL_Plus]vtladmin# vtl stop all
...
[VTL_Plus]vtladmin# vtl start
```

## 7. Run the `sms` command. The results should look like those shown.

```
[VTL_Plus]vtladmin# sms
Usage: sms {force|nas|nasc|fm|sm|bmr|bmrreset|setroot
(sm/fm)|clearreboot(sm/fm)
} {value}

      bmr - to set the BMR health status
      bmrreset - to reset BMR value
      nas - to reset the NAS failure status
      nasc - to set nas health check
      force - enable force up fm - to set ipstorfm debug level
      sm - to set ipstorsm debug level
Last Update by SM: Sun Jan 28 15:32:39 2007
Last Access by RPC: Sun Jan 28 15:32:35 2007
FailOverStatus: 3(UP)
Status of IPStor Server (Transport) : OK
Status of IPStor Server (Application) : OK
Status of IPStor Authentication Module : OK
Status of IPStor Logger Module : OK
Status of IPStor Communication Module : OK
Status of IPStor Self-Monitor Module : OK
Status of IPStor NAS Modules: OK(0)
Status of IPStor Fsnupd Module: OK
Status of IPStor ISCSI Module: OK
Status of IPStor BMR Module: OK( 0)
Status of FC Link Down : OK
Status of Network Connection: OK
Status of force up: 0
Broadcast Arp : NO
Number of reported failed devices : 0
NAS health check : NO
XML Files Modified : NO
IPStor Failover Debug Level : 0
IPStor Self-Monitor Debug Level : 0
Do We Need To Reboot Machine(SM): NO
Do We Need To Reboot Machine(FM): NO
Nas Started: NO
```

## 8. Open a terminal window on the management host, and `ssh` to the service (“monitoring”) IP address of the failed node, `VTLPLUSN1`:

```
[mgt_host]user# ssh vtladmin@nnn.nnn.nnn.nnw
Connecting to nnn.nnn.nnn.nnw ...
Password:
```

where `nnn.nnn.nnn.nnw` is the service IP address of the failed node, and `vtladmin` is the VTL administrator account user ID. We use the service/monitoring address because it stays with the host following failover (the management IP address of a failed node transfers to the remaining active node during failover).

**9. Make sure that you are logged in to the actual, failed node:**

```
[VTL_Plus]vtladmin# uname -a  
SunOS VTLPLUSN1 n.nn Generic_nnnnnn-nn i86pc i386 i86pc
```

The system should display the expected node name.

- 10. If you are not logged in to the correct system, you have accidentally logged into the management IP address (which always connects to the active node) rather than the service (“monitoring”) address. Close the `ssh` session, and `ssh` to the other IP address for the failed node.**

**11. Change to the directory that holds the VTL executables:**

```
[VTL_Plus]vtladmin# cd /usr/local/vtl/bin
```

- 12. Before proceeding further, make sure that no I/O is being sent to the failed node. Make sure that all backup jobs have completed and that failover has completed successfully. Stop I/O, if necessary.**

If host I/O is not stopped, data may be lost.

- 13. Run the `sms` command, and make sure that the `FailOverStatus` is `DOWN` (failed over to the standby server):**

```
[VTL_Plus]vtladmin# sms
Usage: sms {force|nas|nasc|fm|sm|bmr|bmrreset|setroot
(sm/fm)|clearreboot(sm/fm)
} {value}

bmr - to set the BMR health status
bmrreset - to reset BMR value
nas - to reset the NAS failure status
nasc - to set nas health check
force - enable force up fm - to set ipstorfm debug level
sm - to set ipstorsm debug level

Last Update by SM: Sun Jan 28 15:32:39 2007
Last Access by RPC: Sun Jan 28 15:32:35 2007
FailOverStatus: 3 (DOWN)
Status of IPStor Server (Transport) : OK
Status of IPStor Server (Application) : OK
Status of IPStor Authentication Module : OK
Status of IPStor Logger Module : OK
Status of IPStor Communication Module : OK
Status of IPStor Self-Monitor Module : FAIL
Status of IPStor NAS Modules: OK(0)
Status of IPStor Fsnupd Module: OK
Status of IPStor ISCSI Module: OK
Status of IPStor BMR Module: OK( 0)
Status of FC Link Down : OK
Status of Network Connection: OK
Status of force up: 0
Broadcast Arp : NO
Number of reported failed devices : 0
NAS health check : NO
XML Files Modified : NO
IPStor Failover Debug Level : 0
IPStor Self-Monitor Debug Level : 0
Do We Need To Reboot Machine(SM): NO
Do We Need To Reboot Machine(FM): NO
Nas Started: NO
```

- 14. Restart the failed server node gracefully, using the `init6` command:**

```
[VTL_Plus]vtladmin# init6
```

- 15. Once the restart has completed, open a terminal window on the management host, and `ssh` to the IP address of the restarted node, `VTLPLUSN1`:**

```
[mgt_host]user# ssh vtladmin@nnn.nnn.nnn.nnx
Connecting to nnn.nnn.nnn.nnx ...
Password:
```

where *nnn.nnn.nnn.nnn* is the service (“monitoring”) IP address of the restarted node, and *vtladmin* is the VTL administrator account user ID.

**16. Make sure that you are logged in to the actual, restarted node:**

```
[VTL_Plus]vtladmin# uname -a
SunOS VTLPLUSn1 n.nn Generic_nnnnnn-nn i86pc i386 i86pc
```

The system should display the expected node name.

**17. If you are not logged in to the correct system, you have accidentally logged into the management IP address (which always connects to the active node) rather than the service (“monitoring”) address. Close the `ssh` session, and `ssh` to the other IP address for the failed node.**

**18. Change to the directory that holds the VTL executables:**

```
[VTL_Plus]vtladmin# cd /usr/local/vtl/bin
```

**19. Run the `vtl status` command:**

```
[VTL_Plus]vtladmin# vtl status

Sun Microsystems VTL Server vn.nn (Build nnnn)
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Status of VTL SNMPD Module..... [RUNNING]
Status of VTL QLogic Module..... [RUNNING]
Status of VTL Authentication Module..... [RUNNING]
Status of VTL Server (Compression) Module. [RUNNING]
Status of VTL Server (FSNBase) Module.... [RUNNING]
Status of VTL Server (Upcall) Module..... [RUNNING]
Status of VTL Server (Event) Module..... [RUNNING]
Status of VTL Server (Path Manager) Module [RUNNING]
Status of VTL Server (Application)..... [RUNNING]
Status of VTL FC Target Module..... [RUNNING]
Status of VTL Server VTL Upcall Module.... [RUNNING]
Status of VTL Server VTL Upcall Daemon.... [RUNNING]
Status of VTL Server VTL Module..... [RUNNING]
Status of VTL Communication Module..... [RUNNING]
Status of VTL Logger Module..... [RUNNING]
Status of VTL Self Monitor Module..... [RUNNING]
Status of VTL Failover Module..... [RUNNING]
```

**20. If one or more VTL processes are not RUNNING, stop the server software and then restart:**

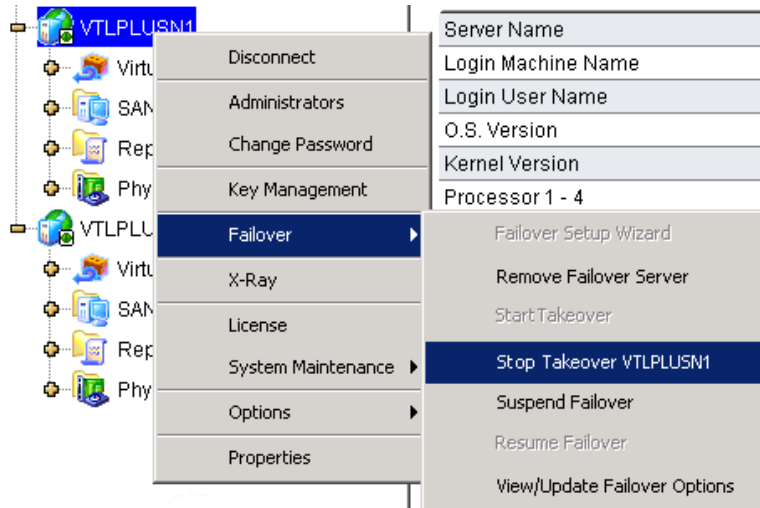
```
[VTL_Plus]vtladmin# vtl stop all
...
[VTL_Plus]vtladmin# vtl start
```

## 21. Run the sms command, and make sure that the FailOverStatus is READY for failback:

```
[VTL_Plus]vtladmin# sms
Usage: sms {force|nas|nasc|fm|sm|bmr|bmrreset|setroot (sm/fm)|clearreboot (sm/fm)
} {value}
    bmr - to set the BMR health status
    bmrreset - to reset BMR value
    nas - to reset the NAS failure status
    nasc - to set nas health check
    force - enable force up fm - to set ipstorfm debug level
    sm - to set ipstorsm debug level
Last Update by SM: Sun Jan 28 15:32:39 2007
Last Access by RPC: Sun Jan 28 15:32:35 2007
FailOverStatus: 2(READY)
Status of IPStor Server (Transport) : OK
Status of IPStor Server (Application) : OK
Status of IPStor Authentication Module : OK
Status of IPStor Logger Module : OK
Status of IPStor Communication Module : OK
Status of IPStor Self-Monitor Module : OK
Status of IPStor NAS Modules: OK(0)
Status of IPStor Fsnupd Module: OK
Status of IPStor ISCSI Module: OK
Status of IPStor BMR Module: OK( 0)
Status of FC Link Down : OK
Status of Network Connection: OK
Status of force up: 0
Broadcast Arp : NO
Number of reported failed devices : 0
NAS health check : NO
XML Files Modified : NO
IPStor Failover Debug Level : 0
IPStor Self-Monitor Debug Level : 0
Do We Need To Reboot Machine(SM): NO
Do We Need To Reboot Machine(FM): NO
Nas Started: NO
```

## 22. Log in using the VTL management console.

23. In the object tree of the VTL console, right-click the restarted server node, **VTLPLUSN1**, and select **Failover > Stop Takeover** from the context menu.



24. Open a terminal window on the management host, and again ssh to the management ("server") IP address of the restarted node, **VTLPLUSN1**:

```
[mgt_host]user# ssh vtladmin@nn.nnn.nnn.nnx
Connecting to nn.nnn.nnn.nnx ...
Password:
```

where *nnn.nnn.nnn.nnx* is the as-configured IP address of the restarted node, and *vtladmin* is the VTL administrator account user ID.

25. Make sure that you are logged in to the actual, restarted node:

```
[VTL_Plus]vtladmin# uname -a
SunOS VTLPLUSN1 n.nn Generic_nnnnnn-nn i86pc i386 i86pc
```

The system should display the expected node name.

26. If you are not logged in to the correct system, you may have accidentally logged into the service IP address of the other node rather than the management ("server") address. Close the telnet session, and telnet to the other IP address for the restarted node.

27. Change to the directory that holds the VTL executables:

```
[VTL_Plus]vtladmin# cd /usr/local/vtl/bin
```

**28. Run the vtl status command:**

```
[VTL_Plus]vtladmin# vtl status

Sun Microsystems VTL Server vn.nn (Build mnnn)
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Status of VTL SNMPD Module..... [RUNNING]
Status of VTL QLogic Module..... [RUNNING]
Status of VTL Authentication Module..... [RUNNING]
Status of VTL Server (Compression) Module. [RUNNING]
Status of VTL Server (FSNBase) Module.... [RUNNING]
Status of VTL Server (Upcall) Module..... [RUNNING]
Status of VTL Server (Event) Module..... [RUNNING]
Status of VTL Server (Path Manager) Module [RUNNING]
Status of VTL Server (Application)..... [RUNNING]
Status of VTL FC Target Module..... [RUNNING]
Status of VTL Server VTL Upcall Module.... [RUNNING]
Status of VTL Server VTL Upcall Daemon.... [RUNNING]
Status of VTL Server VTL Module..... [RUNNING]
Status of VTL Communication Module..... [RUNNING]
Status of VTL Logger Module..... [RUNNING]
Status of VTL Self Monitor Module..... [RUNNING]
Status of VTL Failover Module..... [RUNNING]
```

**29. If one or more VTL processes are not RUNNING, stop the server software and then restart:**

```
[VTL_Plus]vtladmin# vtl stop all
...
[VTL_Plus]vtladmin# vtl start
```

### 30. Run the `sms` command, Make sure that the FailOverStatus is now UP:

```
[VTL_Plus]vtladmin# sms
Usage: sms {force|nas|nasc|fm|sm|bmr|bmrreset|setroot
(sm/fm)|clearreboot(sm/fm)
} {value}

    bmr - to set the BMR health status
    bmrreset - to reset BMR value
    nas - to reset the NAS failure status
    nasc - to set nas health check
    force - enable force up fm - to set ipstorfm debug level
    sm - to set ipstorsm debug level
Last Update by SM: Sun Jan 28 15:32:39 2007
Last Access by RPC: Sun Jan 28 15:32:35 2007

Status of IPStor Server (Transport) : OK
Status of IPStor Server (Application) : OK
Status of IPStor Authentication Module : OK
Status of IPStor Logger Module : OK
Status of IPStor Communication Module : OK
Status of IPStor Self-Monitor Module : OK
Status of IPStor NAS Modules: OK(0)
Status of IPStor Fsnupd Module: OK
Status of IPStor ISCSI Module: OK
Status of IPStor BMR Module: OK( 0)
Status of FC Link Down : OK
Status of Network Connection: OK
Status of force up: 0
Broadcast Arp : NO
Number of reported failed devices : 0
NAS health check : NO
XML Files Modified : NO
IPStor Failover Debug Level : 0
IPStor Self-Monitor Debug Level : 0
Do We Need To Reboot Machine(SM): NO
Do We Need To Reboot Machine(FM): NO
Nas Started: NO
```

### 31. In the object tree of the VTL console, make sure that neither node name is shown in red, indicating an error.

In normal operations, server node names are displayed in black. Red indicates that the server has failed over to its primary. Green indicates that the server has taken over for a failed primary server node. A yellow marker indicates that the administrator has suspended failover.

### 32. For each server, select the server node in the object tree of the VTL console, select the Failover Information tab in the window at right, and make sure that the failback was successful.

Failover events are also available via the primary server's Event Log.

**Next task:** “Resuming backups following a failover/failback” on page 159.

---

## Resuming backups following a failover/failback

Failover/failback take approximately three minutes to complete. During this period, I/O is not possible, and any backup, import/export, replication jobs that are launched fail.

Thereafter, you may or may not need to restart backup operations, depending on the application used and the backup host operating system.

Resuming backups following a failover/failback

## Configuring email alerts

You can configure VTL appliances to send automatic notifications to local system administrators via email whenever system problems arise.

### ▼ Configuring email alerts

1. In the object tree of the VTL console, right-click on the VTL server node, and select **Options > Enable CallHome**.
2. When the **Configure Email Alerts Wizard** appears, enter the name of the outgoing mail server (A below), the email address that the VTL appliance will use when sending notifications (B), the email address(es) that will receive notifications for the desired configuration (C).

**Configure Email Alerts Wizard**

Set Email Alerts General Properties

Email Alerts General Configuration

**A** SMTP Server  SMTP Port

☐ SMTP Server supports authentication

SMTP User Name

SMTP Password  Retype Password

From **B**

To **C**

CC

Subject

Interval **D**  day  hour  minute

Note: Interval indicates how frequently the Email Alerts triggers and the System Log will be checked.

Click <Next> to continue.   **E**

Note that email notifications cannot use an SSL connection. If the email server requires SSL, configure email notification to use the local host SMTP server, and make sure that DNS and SMTP are set up and running on the VTL server node.

The email account password is stored in plain text, so set up an account that the SMTP server will use exclusively for email notification.

3. Use the **Interval** controls provided (D above) to specify the frequency with which notifications are sent. Then press **OK** (E).
4. When the **Set Email Alerts Signature Properties** panel appears, enter the email signature that should appear in each notification, and press **Next**.
5. When the **Set Email Alerts Trigger Properties** panel appears, check the check boxes for the scripts that should trigger an email (F below). Then press **Next** (G).

Configure Email Alerts Wizard

Set Email Alerts Trigger Properties

Email Alerts Trigger

| Enabled                             | Trigger              | Email | Subject           | Comment |
|-------------------------------------|----------------------|-------|-------------------|---------|
| <input checked="" type="checkbox"/> | chkcore.sh 10        |       | chkcore.sh report | ▶       |
| <input type="checkbox"/>            | memchk.sh 5          |       |                   | ▶       |
| <input checked="" type="checkbox"/> | syslogchk.sh         |       |                   | ▶       |
| <input checked="" type="checkbox"/> | diskusagechk.sh / 95 |       |                   | ▶       |
| <input checked="" type="checkbox"/> | vtlstatus.sh         |       |                   | ▶       |

Add Edit Delete

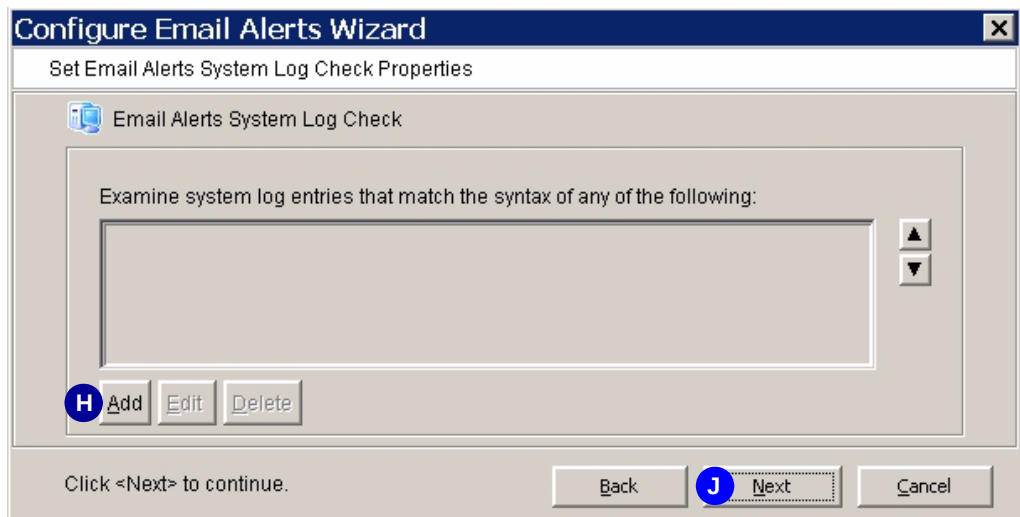
Click <Next> to continue.

Back Next Cancel

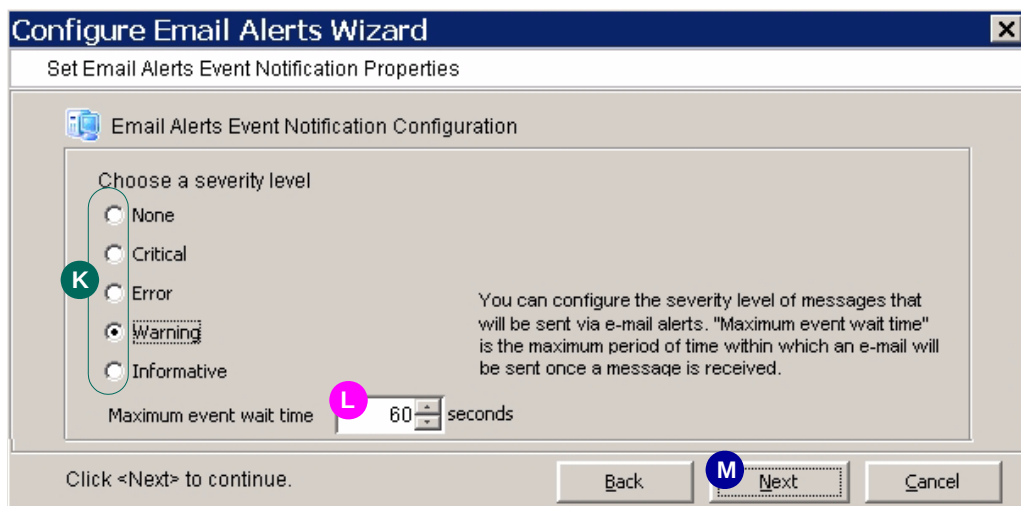
Default scripts include the following:

- `chkcore.sh 10` notifies the administrator if a new core file is found in the VTL `bin` directory. New core files are compressed and the originals are deleted, along with older compressed core files that exceed the maximum (10 is the default).
- `kfsnmem.sh 10` notifies the administrator if the maximum number of memory pages has not been set or if the number of available pages fall below a predefined percentage.
- `memchk.sh 5` notifies the administrator if the available system memory falls below a pre-defined percentage.
- `ipstorsyslogchk.sh` notifies the administrator if any instances of a pre-defined set of messages appear in the system log

- `ipstorckcfg check ipstor.conf` (VTL configuration check) notifies the administrator if the VTL software's XML configuration file, `ipstor.conf`, changes. If changes are found or if no previous version exists, the script creates a copy of the current file under the name `ipstorconf.diff.nnn`, where `nnn` is the script-generated version number of the file.
  - `diskusagechk.sh / 95` notifies the administrator if root file system utilization exceeds a pre-defined percentage. If the current percentage is over the specified percentage (by default, 95%). Copies of the script can be modified to monitor any chosen mount point.
  - `defaultipchk.sh eth0 10.1.1.1` notifies the administrator if the IP address for the specified NIC does not match a specified value. Copies of the script can be modified to monitor additional NICs.
  - `ipstorstatus.sh` runs the `vtl status` command and notifies the administrator if one or more VTL software modules have stopped.
6. **When the Set Email Alerts System Log Check Properties dialog appears, add the regular expressions for any patterns that you want the notification process to parse for when examining logs. To add an expression, press Add (H below) to bring up a dialog box, then enter the pattern in the space provided. Press Next (J) when ready.**



7. When the Set Email Alerts Event Notification Properties panel appears, use the radio buttons to select the event-severity level that should trigger notification (K below), use the spinner control to set the Maximum event wait time (L), and press Next (M).



8. When the Verify the Email Alerts Properties panel appears, press Finish.

Stop here.

## ▼ Modifying email alerts properties

Once email alerts are enabled, you can modify the information as follows:

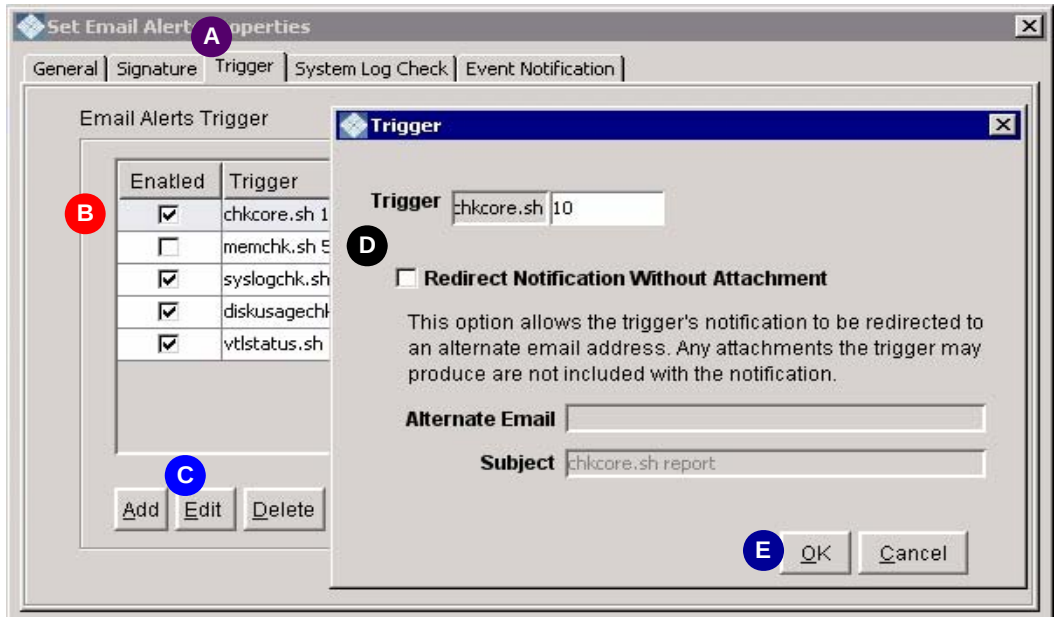
1. In the object tree of the VTL console, right-click on the VTL server node.
2. Select Email Alerts from the context menu.
3. When the property sheet appears, click on the appropriate tab to make your changes.

Stop here.

## ▼ Customizing email fields

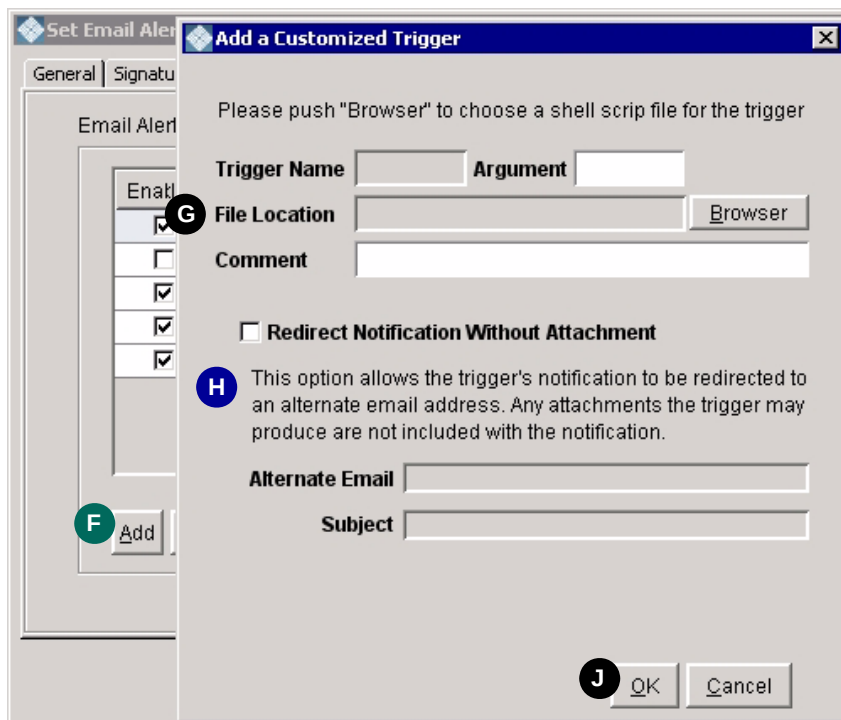
You can override the default Target Email or Subject by specifying an email address subject line. Proceed as follows:

1. In the object tree of the VTL console, right-click on the VTL server, and select Email Alerts from the context menu.
2. When the Set Email Alerts Properties dialog appears, select the Trigger tab (A below).



3. If you want to modify an existing trigger, highlight the trigger (B above), and press Edit (C). In the Trigger dialog, make your changes (D), and press OK (E).

4. To create a new trigger, press **Add (F below)**. When the **Add a Customized Trigger** dialog appears, supply a **Trigger Name**, a **command line Argument string**, and a **File Location (path and filename)** for the script (G), and **redirect notifications, if desired (H)**. Press **OK (J)**.



5. Press **OK** to exit the **Set Email Alerts Properties** dialog.
- Stop here.**

## Updating VTL software

---

When software patches become available, they are posted on the online Sun StorageTek Customer Resource Center with accompanying, explanatory text (“readme”) files. Download the patch files to a temporary directory on the VTL console host, and install them using the process below.

In general, you should consult your Sun support representative before downloading and applying patches. Never apply patches from sources other than Sun.

### ▼ Applying patches

Each patch file has a name of the form `update-vtxxxxxxsolarisnn`, where `xxxxxx` represents the patch build number and `nn` represents the applicable version of the Solaris operating system. The corresponding text (“readme”) files have the same name, plus the suffix `.txt`.

All patches are applied using the VTL console software, as follows.

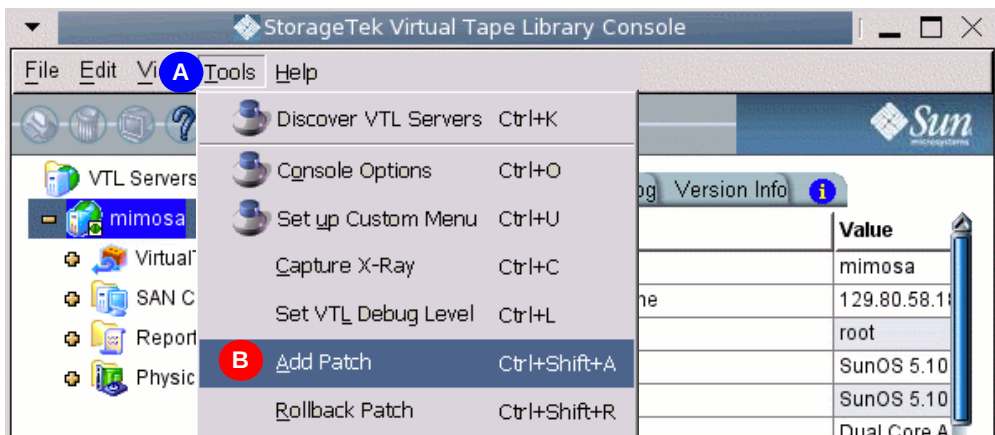
- 1. Understand the behavior of each patch before proceeding; read the accompanying text file (the “readme”).**

Some VTL patches require a platform reboot, while others merely stop and restart the server software.

- 2. Make sure that no critical processes are running before you proceed.**

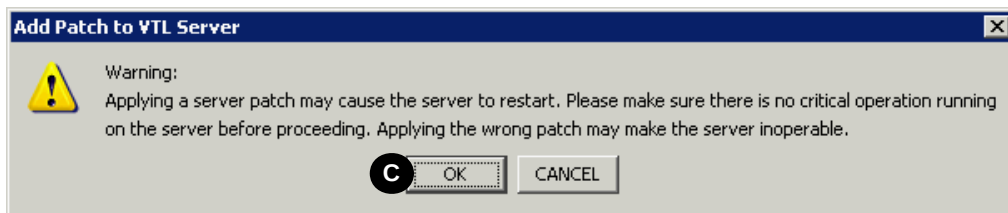
Processes will stop when the server software restarts.

3. Then, from the VTL console main menu, select **Tools** (A below).

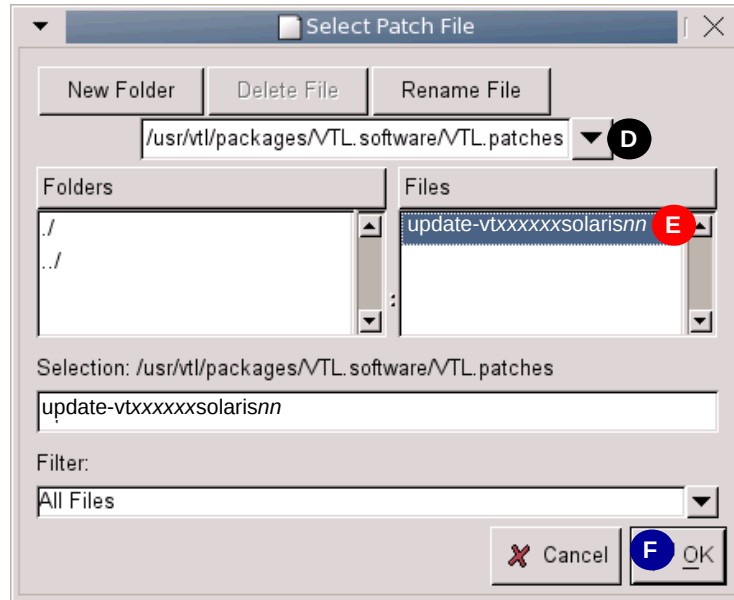


4. From the submenu, select **Add Patch** (B above).

5. When the warning notice appears, click **OK** (C below) to continue.

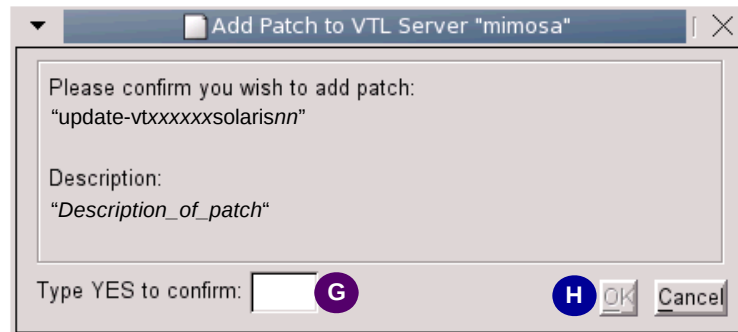


6. Locate the subdirectory where the patch files reside (D below), select the patch file (E), and press Open (F).



In the example, the patch files are shown in the standard location where patches are kept on the VTL appliance. If you are running the console from a remote host, the patch files will be in the temporary download directory that you selected.

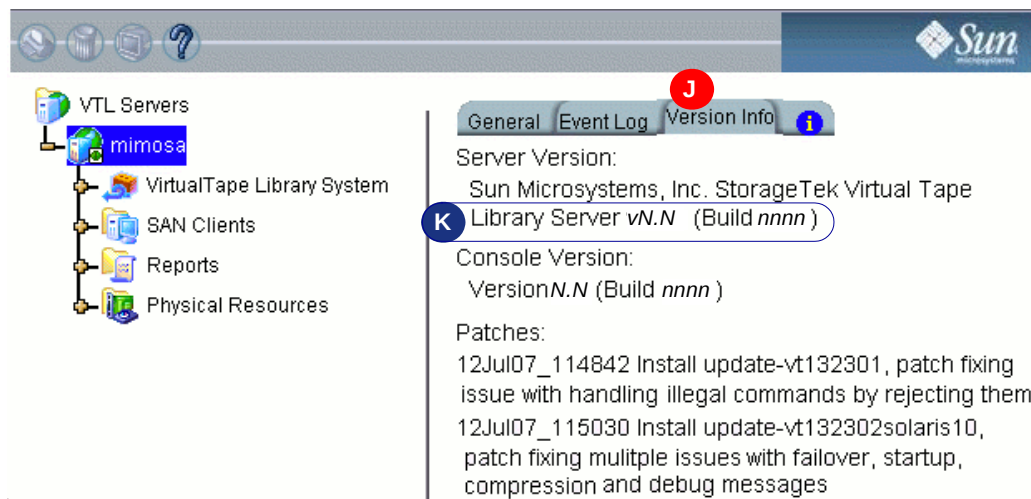
7. When the confirmation dialog appears, type YES in the text box (G below), and press OK (H).



8. If the patch requires it, reboot the server, log back in to Solaris, and restart the VTL console.

Otherwise, the patches install and restart the VTL service, logging you out. After a minute or two, you can reconnect.

9. Reconnect to the VTL server by double-clicking on the server node in the object tree at the left of the VTL console.
10. Verify that the patch was successfully applied: after you have connected, select the Version Info tab for the server (J below), and make sure that the Version and Build (K) have been updated.



## VTL command line reference

---

VirtualTape Library (VTL) provides a simple utility that allows you to perform some of the more common VTL functions at a command line instead of through the VTL Console. You can use this command line utility to automate many tasks, as well as integrate VTL with your existing management tools.

### Using the command line utility

Type `iscon` at the command line to display a list of commands. Each command must be combined with the appropriate long or short arguments (ex. Long: `--server-name` Short: `-s servername`) that are described in this chapter.

If you type the command name (for example, `c:\iscon importtape`), a list of arguments will be displayed for that command.

### Commands

On the following pages is a list of commands you can use to perform VTL functions from the command line. You should be aware of the following as you enter commands:

- Type each command on a single line, separating arguments with a space.
- You can use either the short or long arguments.
- Variables are listed in `<>` after each argument.
- Arguments listed in brackets `[ ]` are optional.
- The order of the arguments is irrelevant.
- Arguments separated by `|` are choices. Only one can be selected.

- For a value entered as a literal, it is necessary to enclose the value in quotes (double or single) if it contains special characters such as \*, <, >, ?, |, %, \$, or space. Otherwise, the system will interpret the characters with a special meaning before it is passed to the command.
- Literals cannot contain leading or trailing spaces. Leading or trailing spaces enclosed in quotes will be removed before the command is processed.

## Common arguments

The following arguments are used by many commands. For each, a long and short variation is included. You can use either one. The short arguments **ARE** case sensitive. For arguments that are specific to each command, refer to the section for that command.

| Short Argument | Long Argument     | Value/Description                        |
|----------------|-------------------|------------------------------------------|
| -s             | --server-name     | VTL Server Name (hostname or IP address) |
| -u             | --server-username | VTL Server Username                      |
| -p             | --server-password | VTL Server User Password                 |
| -c             | --client-name     | VTL Client Name                          |
| -v             | --vdevid          | VTL Virtual Device ID                    |

---

**Note** – You only need to use the --server-username (-u) and --server-password (-p) arguments when you log into a server. You do not need them for subsequent commands on the same server during your current session.

---

---

# Login/logout to the VTL Server

## Log in to the VTL Server

```
iscon login [-s <server-name> -u <username> -p <password>|-e] [-X <rpc-  
timeout>]
```

```
iscon login [--server-name=<server-name> --server-username=<username>  
--server-password=<password>|--environment] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to log into the specified VTL Server with a given username and password. Once successfully logged into the server, `-u` (`--server-username`) and `-p` (`--server-password`) are not necessary for the other CLI commands with optional `-u` and `-p` arguments.

In order to use the `-e` (`--environment`) parameter, you must set the following three environment variables:

- `ISSERVERNAME`
- `ISUSERNAME`
- `ISPASSWORD`

After setting these variables, the environment parameter can be used in the login command in place of `-s <server-name> -u <user-name> -p <password>`. Therefore, you could type the following to log in: `iscon login -e`

To set these environment variables in the bash shell, you must set three variables as follows:

- `export ISSERVERNAME=10.1.1.1`
- `export ISUSERNAME=root`
- `export ISPASSWORD=password`

`-X` (`--rpc-timeout`) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Log out from the VTL Server

```
iscon logout -s <server-name> [-X <rpc-timeout>]
```

```
iscon logout --server-name=<server-name> [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to log out from the specified VTL Server. If the server was not logged in or you have already logged out from the server when this command is issued, error 0x0902000f will be returned. After logging out from the server, the -u and -p arguments will not be optional for the server commands.

---

## Virtual devices / Clients

### Get virtual device list

```
iscon getvdevlist -s <server-name> [-u <username> -p <password>]
[-l [-v <vdevid> | -n <vdevname>] [-A] [-C] [-M <output-delimiter>] ]
[-X <rpc-timeout>]
```

```
iscon getvdevlist --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
[--longlist [--vdevid=<vdevid> | --vdevname=<vdevname>]
[--long-physical-layout] [--long-client-list]
[--output-delimiter=<output-delimiter>] ] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command retrieves and displays information about all virtual devices or a specific virtual device from the specified server. The default output format is a list with a heading.

The -l (--longlist) optional argument displays detailed information for each virtual device. Additional options can be specified along with the -l (--longlist) option to display the physical device layout and/or the assigned client information.

-v (--vdevid) or -n (--vdevname) are options to display only the specified virtual device information when -l (--longlist) is specified.

-A(--long-physical-layout) displays the physical layout when -l (--longlist) is specified.

-C (--long-client-list) displays the assigned client list when -l (--longlist) option is specified.

-M (--output-delimiter) can be specified when -l is specified to replace the linefeed with the specified delimiter. The maximum length of the delimiter is 8.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Get Client virtual device list

```
iscon getclientvdevlist -s <server-name> [-u <username> -p <password>]
-c <client-name> [-t <client-type>] [-l [-M <output-delimiter>] ]
[-X <rpc-timeout>]
```

```
iscon getclientvdevlist --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--client-name=<client-name> [--client-type=<client-type>]
[--longlist [--output-delimiter=<output-delimiter>] ] [--rpc-timeout=<rpc-
timeout>]
```

### Description:

This command retrieves and displays information about all virtual devices assigned to the client from the specified server. The default output format is a list with heading. Use -c (--client-name) to specify a client name or \* for all clients. -t (client-type) is the type of the client protocol to be retrieved in one of the following values: *SCSI*, *FC*, or *ISCSI*. The client type will only take effect when the client name is \*. Be aware that in some platforms you are required to enclose the "\*" in double quote to take it as a literal.

-l(--longlist) is an option to display the long format.

-M (--output-delimiter) can be specified when -l is specified to replace the linefeed with the specified delimiter. The maximum length of the delimiter is 8.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Add client

```
iscon addclient -s <server-name> [-u <username> -p <password>]
-c <client-name>
[-I <initiator-wwpns>] [-a <on|off>] [-A <on|off>]] | [-C <on|off>] [-X <rpc-
timeout>]
```

```
iscon addclient --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--client-name=<client-name> [--initiator-wwpns=<initiator-wwpns>]
[--enable-VSA=<on|off>] [--enable-iSeries=<on|off>]] | [--enable-
Celerra=<on|off>]
[--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to add a client to the specified server. `-c` (`--client-name`) is a unique client name for the client to be created. The maximum length of the client name is 64. The following characters are invalid for a client name: `<>"&$/\'`

`-I` (`--initiator-wwpns`) is the option to set the initiator WWPNS. An initiator WWPNS is a 16-byte Hex value. Separate initiator WWPNS with commas if more than one initiator WWPNS is specified. For example: 13af35d2f4ea6fbc,13af35d2f4ea6fad

`-a` (`--enable-VSA`) is an option for Volume Set Addressing with the following values: *on* or *off* (default).

`-A` (`--enable-iSeries`) is an option to support IBM iSeries Server with the following values: *on* or *off* (default).

`-C` (`--enable-Celerra`) is an option to support Celerra with the following values: *on* or *off* (default).

Enabling Celerra will automatically disable VSA and iSeries, and vice versa.

`-X` (`--rpc-timeout`) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Delete client

```
iscon deleteclient -s <server-name> [-u <username> -p <password>]
-c <client-name> [-X <rpc-timeout>]
```

```
iscon deleteclient --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--client-name=<client-name> [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to delete a client from the specified server. `-c` (`--client-name`) is the name of the client to be deleted.

`-X` (`--rpc-timeout`) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Get client properties

```
iscon getclientprop -s <server-name> [-u <username> -p <password>]
-c <client-name> [-X <rpc-timeout>]
```

```
iscon getclientprop --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--client-name=<client-name> [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command gets client properties. `-c` (`--client-name`) is required to specify the client name.

`-X` (`--rpc-timeout`) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Assign virtual device

```
iscon assignvdev -s <server-name> [-u <username> -p <password>]
-v <vdevid> -c <client-name> -a <access-mode> [-y]
[-I <initiatorWWPN|*>] [-T <targetWWPN|*>] [-l <lun>] [-X <rpc-timeout>]
```

```
iscon assignvdev --server-name=<server-name>
[--server-username=<username> --server-password=<password>] --vdevid=<vdevid>
--client-name=<client-name> --access-mode=<access-mode> [--vlib-only]
[--initiatorWWPN=<initiatorWWPN|*>] [--targetWWPN=<targetWWPN|*>] [--
lun=<lun>]
[--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to assign a virtual device on a specified server to a client.

`-v` (`--vdevid`) is required to specify the virtual device ID of the virtual tape library or virtual tape drive to be assigned.

`-c` (`--client-name`) is required to specify the client to which the virtual tape library or drive will be assigned.

The values for <access-mode> are: *ReadOnly*, *ReadWrite*, *ReadWriteNonExclusive*. The values for the short format are: *R* / *W* / *N*.

-y (--vlib-only) is an option that allows you to assign the virtual tape library to the client without assigning all of the virtual tape drives in the library. The default is to assign all of the virtual tape drives in the library.

-I (--initiatorWWPN) and -T (--targetWWPN) are options for Fibre Channel clients. The initiator WWPN or target WWPN is a 16-byte hex value or "\*" for all. For example, 13af35d2f4ea6fbc. The default is "\*" if it is -I or the -T option is not specified.

-l (--lun) is another option for Fibre Channel clients. The range is between 0 and 15. The next available LUN will be assigned if it is not specified.

-M (--output-delimiter) can be specified when -l is specified to replace the linefeed with the specified delimiter. The maximum length of the delimiter is 8.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Unassign virtual device

```
iscon unassignvdev -s <server-name> [-u <username> -p <password>]
-v <vdevid> -c <client-name> [-y] [-f] [-X <rpc-timeout>]
```

```
iscon unassignvdev --server-name=<server-name> [--server-username=<username>]
[--server-password=<password>] --vdevid=<vdevid> --client-name=<client-name>
[--vlib-only] [--force] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to unassign a virtual device on the specified server from a client.

-v (--vdevid) is required to specify the virtual device ID of the virtual tape library or drive to be unassigned.

-c (--client-name) is required to specify the client name from which to unassign the library or drive.

-y (--vlib-only) is an option that allows you to unassign the virtual tape library to the client without unassigning all of the virtual tape drives in the library. The default is to unassign all of the virtual tape drives in the library.

The -f (--force) option is required to unassign the virtual device when the client is connected and the virtual device is attached. An error will be returned if the force option is not specified.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Create virtual device

```
iscon createvdev -s <server-name> [-u <username> -p <password>]
-I <ACSL> [-n <vdevname>] [-X <rpc-timeout>]

iscon createvdev --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--scsiaddress=<ACSL> [--vdevname=<vdevname>] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to create a direct virtual device, such as virtual tape library or virtual tape drive.

-I (--scsiaddress) is required to specify the SCSI address of the virtual tape library or virtual tape drive in the following format: ACSL=#:#: (adapter:channel:id:lun)

-n (--vdevname) is an option to specify the direct virtual device name. A default name will be generated if the name is not specified. The maximum length is 64. Leading and trailing spaces will be removed. Enclose the name in double quotes. The following characters are invalid for the direct virtual device name: <>"&\$/\'

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 300 seconds.

## Delete virtual device

```
iscon deletevdev -s <server-name> [-u <username> -p <password>]
-v <vdevid> [-d] [-f] [-X <rpc-timeout>]]

iscon deletevdev --server-name=<server-name>
[--server-username=<username> --server-password=<password>] --vdevid=<vdevid>
[--delete-virtual-tapes] [--force] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to delete a virtual tape library, virtual tape drive, standalone virtual tape drive, or virtual tape.

In order to delete a virtual tape drive from a virtual tape library, the virtual tape drive must have the highest element number in the library.

`-v (--vdevid)` is required to specify the virtual device ID.

A virtual device cannot be deleted if any of the following conditions apply:

- The specified virtual device is a virtual tape library or a virtual tape drive and there are clients currently connected to the library or drive.
- The specified virtual device is a virtual tape configured for replication, unless the `-f (--force)` option is used.
- The specified virtual device is the only existing virtual tape drive in the parent virtual tape library.

`-d (--delete-virtual-tapes)` is an option to delete all of the existing virtual tapes from a virtual tape library, a standalone virtual tape drive, or a loaded virtual tape drive selected for deletion. By default, the virtual tapes are moved to the vault, or, if a loaded virtual tape drive is selected, back to the library.

`-f (--force)` is an option to force the deletion of a virtual tape configured for replication. The corresponding virtual tape replica will not be deleted or promoted.

`-X (--rpc-timeout)` is an option to specify a number between 1 and 30000 seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Get supported virtual libraries

```
iscon getsupportedvlibs -s <server-name> [-u <username> -p <password>]
[-l [-t <vlib-type>] [-c][-M <output-delimiter>] ] [-X <rpc-timeout>]
```

```
iscon getsupportedvlibs --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
[--longlist [--vlib-type=<vlib-type>] [--compatible-drive-list]
[--output-delimiter=<output-delimiter>] ] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command retrieves information about all supported virtual tape libraries.

`-l (--longlist)` can be specified to get the supported library information in a long format. The default is to display the information in a list format.

`-t (--vlib-type)` is an option with the `-l (--longlist)` option to get the detail library information for a specific library. The format for the `<vlib-type>` is: `<vendorID>:<productID>`. For example, ADIC:Scalar 100

`-c (--compatible-drive-list)` is an option to display the compatible drives in a tabular format instead of the default long format.

`-M (--output-delimiter)` can also be specified with the `-l (--longlist)` option to replace the linefeed with the specified delimiter. The maximum length of the delimiter is 8.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Get supported virtual drives

```
iscon getsupportedvdrives -s <server-name> [-u <username> -p <password>]
[-l [-M <output-delimiter>] ] [-X <rpc-timeout>]
```

```
iscon getsupportedvdrives --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
[--longlist [--output-delimiter=<output-delimiter>] ] [--rpc-timeout=<rpc-
timeout>]
```

### Description:

This command retrieves information about all supported virtual tape drives.

-l (--longlist) can be specified to get the supported drive information in a long format. The default is to display the information in a list format.

-M (--output-delimiter) can be specified when -l is specified to replace the linefeed with the specified delimiter. The maximum length of the delimiter is 8.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Create virtual tape library

```
iscon createvirtuallibrary -s <server-name> [-u <username> -p <password>]
-t <vlib-type> [-n <vlib-name>] -d <vdrive-type> [-r <vdrive-name-prefix>]
[-R <num-of-drives>] [-A <auto-archive-mode> [-Y <days>] [-J] | -N <auto-
repl-mode>]
-S <target-name> [-M <#[D|H|M]>] ] [-B <barcode-range>] [-T <num-of-slots>]
[-E <import-export-slots>] [-D -I <initial-size> -C <increment-size>]
[-m <max-capacity>] [-L <on|off>] [-k <key-name> -W <key-password>] [-X <rpc-
timeout>]
```

```
iscon createvirtuallibrary --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--vlib-type=<vlib-type> [--vlib-name=<vlib-name>] --vdrive-type=<vdrive-type>
[--vdrive-name-prefix=<vdrive-name-prefix>] [--num-of-drives=<num-of-drives>]
[--auto-archive-mode=<auto-archive-mode> [--delay-delete-days=<days>]
[--auto-eject-to-ie] | --auto-replication=<auto-repl-mode> --target-
name=<target-name>]
[--delay-delete-time=<#[D|H|M]>] ] [--barcode=<barcode-range>]
[--num-of-slots=<num-of-slots>] [--import-export-slots=<import-export-slots>]
```

```
[--capacity-on-demand --initial-size=<initial-size> --increment-
size=<increment-size>]
[--max-capacity=<max-capacity>] [--auto-loader=<on|off>]
[--key-name=<key-name> --key-password=<key-password>] [--rpc-timeout=<rpc-
timeout>]
```

## Description:

This command creates a virtual tape library.

-t (--vlib-type) is required in the following format: <vdendorID>:<productID>

-n (--vlib-name) is optional. A default name will be provided in the format of <vendorID>-<productID>-<vid> if it is not specified.

-d (--vdrive-type) is required to specify the type of tape drive to be created in the library. The format of <vdrive-type> is as follows: <vdendorID>:<productID>

-r (--vdrive-name-prefix) is an option to specify the prefix of the virtual drive. The default prefix is in the format of <drive-vdendorID>-<drive-productID>-<vid>.

-R (--num-of-drives) can also be specified up to the maximum number of drives supported by the library. The default is 1 if it is not specified.

-A (--auto-archive-mode) is an option with one of the following values: *copy* or *move*.

-Y (--delay-delete-days) is an option for move mode to specify the number of days to wait before deletion. The maximum is 365 days.

-J (--auto-eject-to-ie) is an option to be specified with -A (--auto-archive-mode) to eject the tape to the import/export (IE) slot after the export job.

-N (--auto-replication) is an option with one of the following values: *replication* or *remotemove*.

-S (--target-name) is the remote server name for auto-replication. It is required for auto-replication.

-M (--delay-delete-time) is an option for *remotemove* mode to specify a time to wait before deletion. It can be specified in days(D), hours(H) or minutes(M). For example, 2D, 10H, 150M. The default value is one day.

-B (--barcode) can be specified in the following format: <barcodeB>-<barcodeE>

Barcode is an alpha-numeric value with a length of 4 to 12. <barcodeB> and <barcodeE> have to be the same length.

<barcodeE> has to be greater than <barcodeB>. A default <barcode-range> will be generated if it is not specified.

-T (--num-of-slots) and -E (--import-export-slots) are optional. The <num-of-slots> can exceed the maximum number of slots supported by the specified library type, but it is limited to 65536. The <--import-export-slots> cannot exceed the maximum number of IE slots supported by the specified library type. The default is to use the maximum number of slots supported by the specified library type.

-D (--capacity-on-demand) is an option to expand the virtual tape when needed. The default is to create the virtual tape with the maximum capacity if it is not specified.

-I (--initial-size) and -C (--increment-size) are options to be specified with <capacity-on-demand> option. The default value for both options is 5 GB. The <--increment-size> cannot be less than 5 GB.

-m (--max-capacity) is an option to specify the maximum capacity of the virtual tape. The maximum capacity configured for the specified type of virtual library will be used if it is not specified.

The unit of <max-capacity>, <initial-size> and <increment-size> are all in GB.

-L (--auto-loader) is an option to set the auto-loader for those libraries that support the feature. The default value is *off*.

-k (--key-name) and -W (--key-password) are options for tape encryption support to be set in conjunction with Auto-Archive Mode. Specify the key name and key password of the encryption key if you wish to encrypt the data when exporting the virtual tape to the physical tape.

A virtual device ID will be assigned to the virtual library when it is created successfully.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Add virtual tape drive

```
iscon addvirtualdrive -s <server-name> [-u <username> -p <password>]
-L <tape-library-vid> [-r <vdrive-name-prefix>] [-R <num-of-drives>] [-X
<rpc-timeout>]
```

```
iscon addvirtualdrive --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--tape-library-vid=<tape-library-vid> [--vdrive-name-prefix=<vdrive-name-
prefix>]
[--num-of-drives=<num-of-drives>] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command adds a virtual tape drive to a specify virtual tape library.

-L (--tape-library-vid) is required to specify the virtual tape library to add the virtual tape drive(s).

-r (--vdrive-name-prefix) is an option to specify the prefix of the virtual tape drive. The default prefix is in the format of <drive-vdendorID>-<drive-productID>-<vid>.

-R (--num-of-drives) is optional, the default is 1 if it is not specified.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 300 seconds.

## Create standalone tape drive

```
iscon createstandalone drive -s <server-name> [-u <username> -p <password>]
-d <vdrive-type> [-r <vdrive-name-prefix>] [-R <num-of-drives>]
[-D -I <initial-size> -C <increment-size>] [-m <max-capacity>] [-X <rpc-
timeout>]
```

```
iscon createstandalone drive --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--vdrive-type=<vdrive-type> [--vdrive-name-prefix=<vdrive-name-prefix>]
[--num-of-drives=<num-of-drives>] [--capacity-on-demand --initial-
size=<initial-size>
--increment-size=<increment-size>] [--max-capacity=<max-capacity>]
[--rpc-timeout=<rpc-timeout>]
```

### Description:

This command creates a standalone virtual tape drive.

-d (--vdrive-type) is required to specify the type of tape drive to be created in the following format: <vdendorID>:<productID>

-r (--vdrive-name-prefix) is an option to specify the prefix of the virtual drive. The default prefix is in the format of <drive-vdendorID>-<drive-productID>-<vid>.

-R (--num-of-drives) can be specified to create multiple drives of the same type. The default is 1 if it is not specified. The maximum number of drives is 10.

-D (--capacity-on-demand) is an option to expand the virtual tape when needed. The default is to create the virtual tape with the maximum capacity if it is not specified.

-I (--initial-size) and -C (--increment-size) are options to be specified with <capacity-on-demand> option. The default value for both options is 5 GB. The <--increment-size> cannot be less than 5 GB.

-m (--max-capacity) is an option to specify the maximum capacity of the virtual tape. The maximum capacity configured for the specified type of virtual tape drive will be used if it is not specified.

The unit of <max-capacity>, <initial-size> and <increment-size> are all in GB.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Create virtual tape

```
iscon createvirtualtape -s <server-name> [-u <username> -p <password>] -v
<parent-vid>
[ [-g <#(GB)>] [-I <ACSL>] ] [-n <vdevname>] [-B <barcode | barcode-range>] -t
<count>]
[-A -l <plib-vid> -b <physical-tape-barcode> [-J] | -N [-S <target-name>]
[-U <target-username> -P <target-password>] [-X <rpc-timeout>]
```

```
iscon createvirtualtape --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--parent-vid=<parent-vid> [ [--size-gb=<#(GB)>] [--scsiaddress=<ACSL>] ]
[--vdevname=<vdevname>] [--barcode=<barcode | barcode-range>] [--
count=<count>]
[--enable-auto-archive --plib-vid=<plib-vid>
--physical-tape-barcode=<physical-tape-barcode>
[--auto-eject-to-ie] | --enable-auto-remotecopy
--target-name=<target-name> [--target-username=<target-username>
--target-password=<target-password>] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command creates a virtual tape.

-v (--parent-vid) is the virtual device id of the virtual tape library or standalone tape drive.

-g (--size-gb) is an option to specify the size in GB. The size of the virtual tape will be the size configured in the properties of the virtual tape library or virtual tape drive if it is not specified. This option cannot be specified if the capacity on demand option is not enabled at parent level.

-I (--scsiaddress) is an option to specify specific physical devices to be used to create a virtual device. It can be a list of ACSLs separated by a comma or a file enclosed in <> containing an ACSL on each line.

ACSL=#:#:# (adapter:channel:id:lun)

-n (--vdevname) is an option to specify the virtual tape name or prefix when creating more than one tape. The maximum length of the virtual device name is 64. Leading and trailing spaces will be removed. Enclose the name in double quotes to ensure the proper name. The following characters are invalid for the name: <>"&\$/\'

-B (--barcode) is an option to either set the virtual tape with the provided barcode or create virtual tapes in batch mode configured with barcodes from the specified barcode range. The argument must be within the barcode range configured for the library and must not contain used barcodes. When provided as a barcode range, the option creates a virtual tape for each barcode in the range.

-t (--count) is an option to create multiple virtual tapes having the barcode automatically chosen from within the barcode range configured at library level. The library must have the required number of free slots available. If combined, "count" and "barcode" options must agree in number.

If the parent library has the auto-archive/remotecopy property enabled, use the following options to provide additional information for virtual tape creation:

-A (--enable-auto-archive) is an option when the parent library is enabled with auto-archive option.

-l (--plib-vid) is required when <auto-archive-mode> is specified. It is the physical tape library where the tape will be exported to automatically.

-b (--physical-tape-barcode) is required to specify the list of physical tape barcode(s) when the auto-archive option is specified. Separate multiple barcodes with commas. For example,  
-b 00010001,00010009,0001000A

-J (--auto-eject-to-ie) is optional when <auto-archive-mode> is specified.

-N (--enable-auto-replication) is an option when the parent library is enabled with the auto-replication option.

-S (--target-name) can be specified when auto-replication option is specified. The default remote server from the parent library will be used if it is not specified.

The *count* and *barcode* options cannot be specified when the -A (--enable-auto-archive) option is specified because the number of tapes will be obtained from the list of barcodes specified with -b (--physical-tape-barcode) option.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Move virtual tape

```
iscon movevirtualtape -s <server-name> [-u <username> -p <password>] -v
<vdevvid>
[-L <tape-library-vid> | -D <tape-drive-vid> | -l <slot-no>] [-X <rpc-
timeout>]
```

```
iscon movevirtualtape --server-name=<server-name>
[--server-username=<username> --server-password=<password>] --vdev=<vdev>
[--tape-library-vid=<tape-library-vid> | --tape-drive-vid=<tape-drive-vid> |
--slot-no=<slot-no>] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command moves a virtual tape to a different location.

-v (--vdev) is required to specify the ID of the virtual tape to be moved.

-L (--tape-library-vid) is the virtual library to move to. It is not required if the virtual tape is moved within the library.

-D (--tape-drive-vid) is the virtual drive in a library or the standalone drive to move to.

-l (--slot-no) is the slot in a library to move to.

If none of the above locations are specified, the vault will be assumed to be the new location.

If the tape is in a slot in a library, it can be moved to a different slot or a drive in the library, or it can be moved to the vault.

- Vlib Slot -> Tape drive (in the library only)
- Vlib Slot -> Slots in same library
- Vlib Slot -> Vault

If it is in a drive in the library, it can be moved to an available slot in the library or to the vault.

- Vlib Drive -> Slots in same library
- Vlib Drive -> Vault

If the tape is in a standalone drive, it can only be moved to the vault.

- Standalone Tape Drive -> Vault

If the tape is in the vault, it can be moved to an available slot in a library, or an available standalone drive.

- Vault -> Vlib (First available slot)
- Vault -> Standalone Tape Drive

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Tape copy

```
iscon tapecopy -s <server-name> [-u <username> -p <password>]
-v <source-vdevid> -S <target-name> [-U <target-username> -P <target-
password>]
[-L <tape-library-vid> | -D <tape-drive-vid>] [-n <vdevname>] [-f]
[-X <rpc-timeout>]

iscon tapecopy --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--source-vdevid=<source-vdevid> --target-name=<target-name>
[--target-username=<target-username> --target-password=<target-password>]
[--tape-library-vid=<tape-library-vid> | --tape-drive-vid=<tape-drive-vid>]
[--vdevname=<vdevname>] [--force] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command copies a tape.

-v (--source-vdevid) is required to specify the ID of the virtual tape to be copied from.

-S (--target-name) is required to specify the target server name where the remote tape copy will be created and copied to.

-U (--target-username) and -P (--target-password) are optional for connection and login to the target server if the target server was not logged in with login command.

-L <tape-library-vid> and -D <tape-drive-vid> are options to move the tape copy to the virtual tape library or virtual tape drive when the copy is completed.

-n (--vdevname) is an option to specify the virtual tape name of the tape copy. The maximum length of the virtual device name is 64. Leading and trailing spaces will be removed. Enclose the name in double quotes. The following characters are invalid for the name: <>"&\$/\'

A default name with the primary server and source virtual tape name will be generated if it is not specified.

-f (--force) option is required when the tape is scheduled to be deleted. The deletion schedule for the virtual tape will be removed and the replication will be configured.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Set tape duplication

```
iscon setvirtuallibrarytapeduplication -s <server-name> [-u <username> -p
<password>]
```

```
-v <vdev> -Z <on|off> -Q <num-of-copies> [-X <rpc-timeout>]
iscon setvirtuallibrarytapeduplication --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--vdev=<vdev> --tape-duplication=<on|off> --num-of-copies=<num-of-copies>
[--rpc-timeout=<rpc-timeout>]
```

### Description:

This command sets the Tape Duplication property for a virtual tape library.

-v (--vdev) is required in order to identify the virtual library.

-Z (--tape-duplication) is required in order to enable or disable the Tape Duplication property: *on* (enable) or *off* (disable).

-Q (--num-of-copies) is an option to specify the number of copies to be made using the same barcode if tape duplication option is enabled. The maximum value is 5. The default value is 1.

The virtual library must have the Auto Archive or Tape Caching property enabled in order to enable tape duplication.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Set tape properties

```
iscon settapeproperty -s <server-name> [-u <username> -p <password>]
-v <vdev> [-B <barcode>] [-f] [-F] [-w <on|off>] [-A <auto-archive-mode> [-Y <days>]
[-J <on|off>] | -N <auto-repl-mode> -S <target-name>
[-U <target-username> -P <target-password>]
[-M <#[D|H|M]>] ] [-k <key-name> -W <key-password> | -d]
[-Z <on|off> -Q <num-of-copies>] [-X <rpc-timeout>]

iscon settapeproperty --server-name=<server-name>
[--server-username=<username> --server-password=<password>] --vdev=<vdev>
[--barcode=<barcode>] [--force] [--full-capacity] [--tape-write-protect=<on|off>]
[--auto-archive-mode=<auto-archive-mode> [--delay-delete-days=<days>]
[--auto-eject-to-ie] | --auto-replication=<auto-repl-mode> --target-name=<target-name>
[--server-username=<username> --server-password=<password>]
[--delay-delete-time=<#[D|H|M]>] ] [--key-name=<key-name> --key-password=<key-password> |
--disable-key] [--tape-duplication=<on|off> --num-of-copies=<num-of-copies>]
[--rpc-timeout=<rpc-timeout>]
```

**Description:**

This command sets tape properties.

-v (--vdevid) is required to specify the ID of the virtual tape to set the properties.

-B (--barcode) is the option to specify the new barcode for the tape. -f (--force) option is required if the new barcode is not in the barcode range specified for the parent library. Barcode is an alpha-numerical value with a length of 4 to 12.

-F (--full-capacity) is an option to expand the tape to the maximum capacity and turn off the <capacity-on-demand> option if it is enabled for the virtual tape.

-w (--tape-write-protect) is an option to turn on and off the tape write protection with the following values: *on* or *off*.

-A (--auto-archive-mode) is an option with one of the following values: *copy* or *move* or *inherited* or *none*.

"none" is the value to turn off the auto-archive mode if the virtual tape is enabled with auto-archive option.

"inherited" can only be specified when the parent library is enabled with auto-archive option.

-Y (--delay-delete-days) is an option for *move* mode to specify the number of days to wait before the deletion. The maximum is 365 days.

-J (--auto-eject-to-ie) is an option for auto-archive mode in order to enable or disable the ejection of the physical tape to the IE slot after a successful archive job: *on* (enable) or *off* (disable).

-N (--auto-replication) is an option with one of the following values: *localcopy*, *localmove*, *replication*, *remotemove*, or *none*.

-S (--target-name) is the remote server name for auto-replication. It is required for auto-replication.

-U (--target-username) and -P (--target-password) are options to specify a different user ID and password to log in to the remote server.

-M (--delay-delete-time) is an option for auto-replication move mode to specify up to 30 days of retention period before deletion. The default value is 1 day. The value can be specified in days(D), hours(H) or minutes(M). For example: 2D, 10H, 150M.

-A (--auto-archive-mode) and -N (--auto-replication) cannot be specified if replication is enabled for the tape.

-k (--key-name), -W (--key-password) and -d (--disable-key) are options for tape encryption support to be set in conjunction with Auto-Archive Mode. Specify the key name and key password of the encryption key if you wish to encrypt the data when exporting the virtual tape to the physical tape. Specify -d (--disable-key) if you wish to disable tape encryption for this tape.

-Z (--tape-duplication) is an option to set the Tape Duplication property with one of the following values: *on* (enable), *off* (disable), or *inherit*.

-Q (--num-of-copies) is an option to specify the number of copies to be made using the same barcode if the tape duplication option is enabled. The maximum value is 5. The default value is 1.

Tape Duplication can be enabled only if the virtual library hosting the virtual tape has the Tape Caching property enabled or the virtual tape has the Auto Archive property enabled.

At least one of the properties has to be specified.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

---

## Automated tape caching

### Set tape caching

```
iscon settapecaching -s <server-name> [-u <username> -p <password>]
-L <library-vid> -t <tape-caching-enable> [-S <start-time>][-W <day-of-the-
week>]
[-b <and-or>] [[-e][-f]][-c <disk-capacity>][-d <days-old>]
[-R <retention-days> | -I | -M | -N] [-X <rpc-timeout>]

iscon settapecaching --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--tape-library-vid=<library-vid> [--start-time=<start-time>]
[--day-of-the-week=<day-of-the-week>] --tape-caching-enable=<tape-caching-
enable>
[--trigger-combine=<and-or>] [--end-of-backup] [--tape-full]]
[--disk-capacity=<disk-capacity>] [--days-old=<days-old>]
[--retention-days=<retention-days> | --immediately | --no-more-space | --
never]
[--rpc-timeout=<rpc-timeout>]
```

**Description:**

This command can be used in order to enable, disable, or change the Automated Tape Caching policy for a virtual tape library.

-L (--tape-library-vid) is the virtual device ID of the virtual tape library to be set.

Set -t (--tape-caching-enable) to 1 for enable or 0 to disable.

If the *disable* option is used all other arguments will be ignored.

The *enable* option must be used in order to set or change the tape caching policy.

Time based data migration triggers:

-S (--start-time) alone can be used to start daily migrations at the time specified. The default value is 00:00(am)(hh:mm). When combined with other data migration triggers, the -S option will delay the migration execution to the specified time.

-W (--day-of-the-week) can be used to start weekly migrations on the specified day at 00:00(am): Sunday: 0, Monday: 1, ..., Saturday: 6. The default value is -1. This option is ignored if Policy Based triggers are used.

Policy based data migration triggers:

-b (--trigger-combine) tells how trigger policies are combined (specified by -e, -c, -d). 1 -- and; 0 -- or. The default value is 1 (and).

-e (--end-of-backup) triggers data migration when unloading a tape from a drive after some data is written to it.

-f (--tape-full) applies to -e options. Data is migrated only if the tape becomes full.

-c (--disk-capacity) triggers data migration when disk usage percentage is above the global disk space threshold.

-d (--days-old) triggers data migration after data was retained on disk for (days-old) days (up to 3650 days).

Reclamation triggers:

-R (retention-days) determines the number of days virtual tapes will be kept in the system before they are deleted.

Select -I (--immediately) and virtual tapes will be deleted immediately after data migration completes.

Select -M (--no-more-space) and virtual tapes will be deleted when disk space is needed to create (or expand) a virtual tape. The last used will be deleted.

Select -N (--never) and virtual tapes will never be deleted.

The reclamation triggers are exclusive.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Sync physical tapes

```
iscon syncphysicaltape -s <server-name> [-u <username> -p <password>]
-l <plib-vid> -b <physical-tape-barcode> -L <virtual-tape-library-id>
-t <virtual-tape-slot-no> [-M <sync-mode>] [-k <key-name> -W <key-password>]
[-I <ACSL list>] [-n <vdevname>] [-g <#(GB)>] [-X <rpc-timeout>]
```

```
iscon syncphysicaltape --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--plib-vid=<physical-tape-library-vid> --physical-tape-barcode=<physical-
tape-barcode>
--tape-library-vid=<virtual-tape-library-id>
--virtual-tape-slot-no=<virtual-tape-slot-no> [--sync-mode=<sync-mode>]
[--key-name=<key-name> --key-password=<key-password>] [--scsiaddress=<ACSL
list>]
[--vdevname=<vdevname>] [--size-gb=<#(GB)>] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command creates a synchronized virtual tape for the specified physical tape. The physical tape must be from the specified physical tape library and the virtual tape will be created in the specified virtual tape library. The virtual tape library must have the tape caching feature enabled.

-l <--plib-vid> is the virtual ID of the physical tape library where the physical tapes are located.

-b <--physical-tape-barcode> is the barcode of the physical tape. The virtual tape will be created with the same barcode. The barcode must not be in use by any other virtual tape in the system. If the barcode contains leading or trailing space characters, it must be enclosed in double quotes.

-L <--tape-library-vid> is the ID of the virtual tape library where the virtual tapes will be created.

-t <--virtual-tape-slot-no> is an option to provide an empty destination slot for the virtual tape. Not for "-M cache" mode.

[-M <--sync-mode>] is an option to select the synchronization mode from one of the following values (default is "cache"):

- cache (create cache)
- metadata (create cache and copy meta data)
- directlink (create direct link )

-k (--key-name) and -W (--key-password) are options for tape encryption support. If the tape to be synchronized was encrypted through the system, you need to specify the key name and the key password of the encryption key to decrypt the data on the imported tape.

[-I <--scsiaddress>] is the option to specify which physical devices to be used to create the virtual device. It can be a list of ACSLs separated with commas.  
ACSL=#: #: #: # (adapter:channel:id:lun)

-n (--vdevname) is an option to specify the virtual tape name or prefix when creating more than one tape. The maximum length of the virtual device name is 64. Leading and trailing spaces will be removed. Please enclose the name in double quotes to ensure the proper name. The following characters are invalid for the name: <>"&\$/\'

-g (--size-gb) is an option to specify the initial size, in GB, of the virtual tapes, if the capacity-on-demand property for the virtual tape library is enabled. The default is 1 GB

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Migrate virtual tapes

```
iscon migratevirtualtapes -s <server-name> [-u <username> -p <password>]
-T <tape-vid-list> [-f] [-X <rpc-timeout>]

iscon migratevirtualtapes --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--tape-vid-list=<tape-vid-list> [--tape-full] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command migrates the specified virtual tapes to the physical libraries they are synchronized with.

-T (--tape-vid-list) is a list of virtual tape ID(s) separated with commas.

-F (--tape-full) is an option to force full tape migration. By default, the migration operation is incremental.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Reclaim disk space

```
iscon reclaimtapes -s <server-name> [-u <username> -p <password>]
-T <tape-vid-list> [-X <rpc-timeout>]
```

```
iscon reclaimtapes --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--tape-vid-list=<tape-vid-list> [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command reclaims the disk space occupied by the specified migrated virtual tapes.

-T (--tape-vid-list) is required to specify the ID of the virtual tapes to be reclaimed, separated with commas.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 300 seconds.

## Renew cache

```
iscon renewcache -s <server-name> [-u <username> -p <password>]
-v <vdevid> [-M <metadata>] [-k <key-name> -W <key-password>] [-I <ACSL>] [-n
<vdevname>] [-g <#(GB)>] [-X <rpc-timeout>]
```

```
iscon renewcache --server-name=<server-name>
[--server-username=<username> --server-password=<password>] [--import-
mode=<metadata>] [--key-name=<key-name> --key-password=<key-password>] [--
scsiaddress=<ACSL>]
[--vdevname=<vdevname>] [--size-gb=<#(GB)>] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command converts a virtual stub tape into a virtual cache tape.

-v (--vdevid) is required to specify the ID of the virtual stub tape.

-M (--import-mode) is an option to specify that the header area should be copied from the physical tape to the new virtual tape cache. The value of this option must be: *metadata*.

-k (--key-name) and -W (--key-password) are options for tape encryption support. If the tape to be renewed was encrypted through the system, you need to specify the key name and the key password of the encryption key to decrypt the data.

The following properties of the virtual cache tape can be set if the "-M" option is not specified:

-I (--scsiaddress) is the option to specify which physical devices should be used to create the virtual device. It can be a list of ACSLs separated with commas or a file enclosed in <> containing an ACSL on each line.

ACSL=#:#:# (adapter:channel:id:lun)

-n (--vdevname) is an option to specify the virtual tape name or prefix when creating more than one tape. The maximum length of the virtual device name is 64. Leading and trailing spaces will be removed. Enclose the name in double quotes to ensure it is properly parsed and interpreted. The following characters are invalid for the name: <>"&\$/'

-g (--size-gb) is an option to specify the size in GB. The size of the virtual tape will be the size configured in the properties of the virtual tape library or virtual tape drive if it is not specified. This option cannot be specified if the capacity-on-demand option is not enabled at library level.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

---

## System configuration

### Add a license keycode

```
iscon addlicense -s <server-name> [-u <username> -p <password>] -k <license-  
keycode>  
[-X <rpc-timeout>]
```

```
iscon addlicense --server-name=<server-name>  
[--server-username=<username> --server-password=<password>] --  
license=<license-keycode>  
[--rpc-timeout=<rpc-timeout>]
```

#### Description:

This command adds a license keycode.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Remove a license keycode

```
iscon removelicence -s <server-name> [-u <username> -p <password>] -k
<license-keycode>
[-X <rpc-timeout>]

iscon removelicence --server-name=<server-name>
[--server-username=<username> --server-password=<password>] --
license=<license-keycode>
[--rpc-timeout=<rpc-timeout>]
```

### Description:

This command removes a license keycode.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Get VTL info

```
iscon getvtlinfo -s <server-name> [-u <username> -p <password>]
[-T <vtl-info_type> [-L <tape-library-vid>]] [-F <vtl-info-filter>] [-l [-M]]
[-X <rpc-timeout>]

iscon getvtlinfo --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
[--vtl-info-type=<vtl-info-type> [--tape-library-vid=<tape-library-vid>] ]
[--vtl-info-filter=<vtl-info-filter>]
[--longlist [--ouput-delimiter=<output-delimiter>] ] [--rpc-timeout=<rpc-
timeout>]
```

### Description:

This command retrieves VTL information.

-T (--vtl-info-type) is the VTL information type with one of the following values: *VLIBS* or *VDRIVES* or *VAULT* or *PLIBS* or *PDRIVES*.

- *VLIBS* = display virtual tape libraries only.
- *VDRIVES* = display standalone virtual tape drives only
- *VAULT* = display virtual tape vault only.
- *PLIBS* = display physical tape libraries only.
- *PDRIVES* = display standalone physical tape drives only.

The default is to display all the information.

-L (--tape-library-vid) is an option to specify the virtual tape library when *VLIBS* is specified, or to specify the physical tape library when *PLIBS* is specified.

-F (--vtl-info-filter) is an additional filter that can be combined using the following values separated with commas: *library* or *drive* or *tape*.

- library = include physical and/or virtual library information.
- drive = include physical and/or virtual drive information.
- tape = include physical and/or virtual tape information.

For example: -F "library,drive,tape" or --vtl-info-filter="library,drive,tape"

The default is to display all of the information that applies. There will be an error if <vtl-info-type> is specified and the <vtl-info-filter> specified does not apply. For example, "library" does not apply to "VDRIVES".

-l (--longlist) is an option to display the information in a detail format.

-M (--output-delimiter) can be specified when -l is specified to replace the linefeed with the specified delimiter. The maximum length of the delimiter is 8.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

---

## Import/Export

### Import tape

```
iscon importtape -s <server-name> [-u <username> -p <password>]
[-M <import-mode>] -v <plib-or-pdrive-vid> [-B <barcode> | -l <slot-no>]
-L <tape-library-vid> [-b <virtual-tape-barcode>] -t <virtual-tape-slot-no>
[-j <job-description>] [-k <key-name> -W <key-password>] [-X <rpc-timeout>]
```

```
iscon importtape --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
[--import-mode=<import-mode>] --plib-or-pdrive-vid=<plib-or-pdrive-vid>
[--barcode=<barcode> | --slot-no=<slot-no>] --tape-library-vid=<tape-library-vid>
--virtual-tape-slot-no=<virtual-tape-slot-no>
[--virtual-tape-barcode=<virtual-tape-barcode>] [--job-description=<job-description>]
[--key-name=<key-name> --key-pasword=<key-password>] [--rpc-timeout=<rpc-timeout>]
```

#### Description:

This command imports the data from a tape into the VTL.

**-M** (**--import-mode**) is an option in one of the following values: *copy* (default) or *direct-access* or *recycle*.

**-v** (**--pdrive-or-pdrive-vid**) is required to specify the virtual device ID of the physical tape library or physical tape drive from which the physical tape is to be imported.

If the physical tape is from a physical tape library, either **<barcode>** or **<slot-no>** of the physical tape should be specified with **-B** (**--barcode**) or **-l** (**--slot-no**) to identify the physical tape. If the barcode contains leading or trailing space characters, it must be enclosed in double quotes. No physical tape information is required if the physical tape is imported from a standalone physical tape drive.

**-L** (**--tape-library-vid**) is the virtual device ID of the virtual tape library to which the physical tape is to be imported.

**-t** (**--virtual-tape-slot-no**) is required for the virtual tape location.

**-b** (**--virtual-tape-barcode**) is optional when the physical tape from a physical tape library contains barcode. It is required if the physical tape does not have a barcode or when it is from a physical tape drive.

**-j** (**--job-description**) is an option to specify a description for the tape import job.

**-k** (**--key-name**) and **-W** (**--key-password**) are options for tape encryption support. If the tape to be imported was encrypted through the system, you need to specify the key name and the key password of the encryption key to decrypt the data on the imported tape.

**-X** (**--rpc-timeout**) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 300 seconds.

## Export virtual tape

```
iscon exportvirtualtape -s <server-name> [-u <username> -p <password>] -v
<vdevvid>
-L <tape-library-vid> -b | -B <barcode> | -l <slot-no>
[-M <export-mode> [-Y <days>] ] [-j <job-description>] [-f] [-J]
[-k <key-name> -W <key-password>] [-Z <on> -Q <num-of-copies>] [-X <rpc-
timeout>]
```

```
iscon exportvirtualtape --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--vdevvid=<vdevvid> --tape-library-vid=<tape-library-vid>
--same-barcode | --barcode=<barcode> | --slot-no=<slot-no>
[--export-mode=<export-mode>] [--delay-delete-days=<days>] ]
[--job-description=<job-description>] [--force] [--auto-eject-to-ie]
[--key-name=<key-name> --key-pasword=<key-password>]
[--tape-duplication=<on> --num-of-copies=<num-of-copies>] [--rpc-
timeout=<rpc-timeout>]
```

**Description:**

This command exports the information from a virtual tape to a physical tape.

`-v (--vdev-id)` is required to specify the ID of the virtual tape to be exported to the physical tape.

`-L (--tape-library-vid)` is also required to specify the ID of the target physical tape library.

One of the three export methods below is required to select the physical tapes:

- `-b (--same-barcode)` is the option to select a physical tape with the same barcode of the virtual tape if a physical tape with the same barcode exists.
- `-B (--barcode)` is the option to specify the barcode of an available physical tape in the physical tape library.
- `-l (--slot-no)` is the option to specify the slot number of an available physical tape in the physical tape library.

`-M (--export-mode)` is an option with one of the following values: *copy* (default) or *move*.

`-Y (--delay-delete-days)` is an option for *move mode* to specify the number of days to wait before deletion. The maximum is 365 days. The default value is 365 days.

`-j (--job-description)` is an option to specify a description for the tape export job.

`-f (--force)` is required when the tape is scheduled to be deleted.

`-J (--auto-eject-to-ie)` is an option to eject the tape to the IE slot after the export job.

`-k (--key-name)` and `-W (--key-password)` are options for tape encryption support. Specify the key name and key password of the encryption key if you wish to encrypt the data when exporting the virtual tape to the physical tape.

`-Z (--tape-duplication)` is an option to enable tape duplication with the following value: *on*.

`-Q (--num-of-copies)` is an option to specify the number of copies to be made using the same barcode if the tape duplication option is enabled. The maximum value is 5. The default value is 1.

`-X (--rpc-timeout)` is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Get import/export job status

```
iscon getimportexportjobstatus -s <server-name> [-u <username> -p <password>]
```

```
[ -j <job-id-list> ] [ -T <job-type> -S <job_status> ] [ -X <rpc-timeout> ]
iscon getimportexportjobstatus --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
[--job-id-list=<job-id-list>] | [--job-type=<job_type> --
job_status=<job_status>]
[--rpc-timeout=<rpc-timeout>]
```

**Description:**

This command displays the status of the import/export jobs present in the queue. If no filters are specified, the command displays all the jobs that are in the queue.

-j <--job-id-list> is an optional list of job IDs separated with commas. The command displays the status of specified jobs only. All other filters are ignored.

-T <--job-type> is an optional job type based filter. The command displays those jobs matching the provided type. The accepted job type values are: IMPORT, EXPORT, or OTHER.

-S <--job\_status> is an optional job status based filter. The command displays those jobs matching the provided status. The accepted job status values are: FAILED, HOLD, READY, or OTHER.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Resume import/export jobs

```
iscon resumeimportexportjobs -s <server-name> [-u <username> -p <password>]
-j <job-id-list> [-X <rpc-timeout>]

iscon resumeimportexportjobs --server-name=<server-name>
[--server-username=<username> --server-password=<password>] --job-id-
list=<job-id-list>
[--rpc-timeout=<rpc-timeout>]
```

**Description:**

This command resumes specified import/export jobs. The jobs must be held in the import/export queue in a suspended state.

-j <--job-id-list> is a list of job IDs separated with commas.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Delete import/export jobs

```
iscon deleteimportexportjobs -s <server-name> [-u <username> -p <password>]
-j <job-id-list> [-X <rpc-timeout>]
```

```
iscon deleteimportexportjobs --server-name=<server-name>
[--server-username=<username> --server-password=<password>] --job-id-
list=<job-id-list>
[--rpc-timeout=<rpc-timeout>]
```

### Description:

This command deletes specified import/export jobs. The jobs must be held in the import/export queue.

-j <--job-id-list> is a list of job IDs separated with commas.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Suspend import/export jobs

```
iscon suspendimportexportjobs -s <server-name> [-u <username> -p <password>]
-j <job-id-list> [-X <rpc-timeout>]
```

```
iscon suspendimportexportjobs --server-name=<server-name>
[--server-username=<username> --server-password=<password>] --job-id-
list=<job-id-list>
[--rpc-timeout=<rpc-timeout>]
```

### Description:

This command suspends specified import/export jobs. The jobs must be held in the import/export queue and must be idle.

-j <--job-id-list> is a list of job IDs separated with commas.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Cancel import/export jobs

```
iscon cancelimportexportjobs -s <server-name> [-u <username> -p <password>]
-j <job-id-list> [-X <rpc-timeout>]
```

```
iscon cancelimportexportjobs --server-name=<server-name>
```

```
[--server-username=<username> --server-password=<password>] --job-id-  
list=<job-id-list>  
[--rpc-timeout=<rpc-timeout>]
```

**Description:**

This command cancels specified import/export jobs. The jobs must be held in the import/export queue and must be running.

-j <--job-id-list> is a list of job IDs separated with commas.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

---

## Replication

### Create a replica

```
iscon createreplication -s <server-name> [-u <username> -p <password>]  
-v <source-vdev-id> -S <target-name> [-U <target-username> -P <target-  
password>]  
[-w <watermark(MB)> | [-d <YYYYMMDDHHMM> -i <#[H|M]>]] [-r <on>]  
[[-t <timeout>] [-I <retry-in>]] [-C <retry-for>]] [-c <on|off>] [-e  
<on|off>]  
[-n <replica-vdev-name>] [-X <rpc-timeout>]
```

```
iscon createreplication --server-name=<server-name>  
[--server-username=<username> --server-password=<password>]  
--source-vdev-id=<source-vdev-id> --target-name=<target-name>  
[--target-username=<target-username> --target-password=<target-password>]  
[--watermark=<watermark(MB)> | [--date=<YYYYMMDDHHMM> --interval=<#[H|M]>]] |  
[--repl-first <on>] [--replication-timeout=<timeout>]  
[--replication-retry-interval=<retry-in>] [--replication-retry-count=<retry-  
for>]  
[--compression=<on|off>] [--encryption=<on|off>] [--force] [--rpc-  
timeout=<rpc-timeout>]
```

**Description:**

This command allows you to set up a replication configuration.

`-v (--source-vdev)` is required to specify the ID of the virtual tape to be configured for replication.

`-S (--target-name)` is required to specify the target server name.

`-U (--target-username)` and `-P (--target-password)` are optional for connection and login to the target server if the target server are not logged in with a login command.

The replication configuration requires a trigger policy to be set. If no trigger policy is specified, the command will automatically apply the appropriate default policy based on the tape caching property of the specified virtual tape.

Any combination of the following two options can be used to set up a replication trigger policy for a virtual tape with the tape caching property disabled. The default policy is 1024 MB watermark.

`-w (--watermark)` is a data size based trigger in MB. The watermark is checked when the tape is unloaded from the tape drive and the replication is triggered if the amount of new data on the tape has reached the specified watermark.

`-d (--date)` combined with `-i (--interval)` is a time based trigger. The replication is triggered at the time specified by date and then repeated every interval. `-d (--date)` format is `YYYYMMDDHHMM` and `-i (--interval)` format is a number followed by `H` for hours or `M` for minutes (e.g. `-i 2H` or `--interval=120M`). The default value for interval is 1H (one hour).

`-r (--repl-first)` is an option to replicate the virtual tape before it is migrated. Use "on" in order to enable this policy or "off" to have tape migration executed first. The default policy is to replicate the virtual tape after it is migrated.

- Replication is retried based on the timeout policy:
- `-t (--replication-timeout)` in seconds (default 60).
- `-I (--replication-retry-interval)` in seconds (default 60).
- `-C (--replication-retry-count)` retry count (default 1).

`-c (--compression)` is an option to enable or disable compression with one of the values: *on* or *off*.

`-e (--encryption)` is an option for remote replication only to set encryption with one of the values: *on* or *off*.

`-f (--force)` option is required when the tape is scheduled to be deleted. The deletion schedule for the virtual tape will be removed and the replication will be configured.

`-X (--rpc-timeout)` is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Promote a replica

```
iscon promotereplica -s <server-name> -v <vdev> | -S <target-name> -V
<replicaid>
[-u <username> -p <password>] [-U <target-username> -P <target-password>] [-
f]
[-X <rpc-timeout>]

iscon promotereplica --server-name=<server-name> --vdev=<vdev> |
--target-name=<target-name> --replicaid=<replicaid> [--server-
username=<username>
--server-password=<password>] [--target-username=<target-username>
--target-password=<target-password>] [--force] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to promote a replica to a regular virtual device if the primary disk is available and the replica disk is in a valid state.

Specify either the primary server and the source virtual tape ID or the target server and the tape replica ID. The user name and password must be provided for both servers, if the servers were not registered using the login command.

-v (--vdev) is the ID of the source virtual tape and -V (--replicaid) is the ID of the tape replica.

If the source virtual tape is still valid and available, and the tape replica is in an invalid state, the tape replica can be promoted with the force option. But, it is recommended to synchronize the tape replica with the source virtual tape first unless the source virtual tape is physically defective or unavailable.

-f (--force) is an option to enforce the promotion if the source virtual tape is no longer available or the tape replica is in invalid state, if you are sure the data on the tape replica is useful.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Remove replication

```
iscon removereplication -s <server-name> -v <vdev> | -S <target-name> -V
<replicaid>
[-u <username> -p <password>] [-U <target-username> -P <target-password>] [-
f]
[-X <rpc-timeout>]

iscon removereplication --server-name=<server-name> --vdev=<vdev> |
--target-name=<target-name> --replicaid=<replicaid> [--server-
username=<username>]
```

```
--server-password=<password>] [--target-username=<target-username>
--target-password=<target-password>] [--force] [--rpc-timeout=<rpc-timeout>]
```

This command allows you to remove the replication configuration from the primary disk on the primary server and delete the replica disk on the target server.

Specify either the primary server and the source virtual tape ID or the target server and the tape replica ID. The user name and password must be provided for both servers, if the servers were not registered using the login command.

-v (--vdevid) is the ID of the source virtual tape and -V (--replicaid) is the ID of the tape replica.

If the target server no longer exists or cannot be connected to, only the replication configuration on the primary server will be removed.

If the primary server no longer exists or cannot be connected to, only the tape replica will be deleted.

-f (--force) option has to be specified when either the primary server or target server no longer exists or cannot be connected.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Suspend replication

```
iscon suspendreplication -s <server-name> [-u <username> -p <password>]
-v <vdevid> [-X <rpc-timeout>]
```

```
iscon suspendreplication --server-name=<server-name>
[--server-username=<username> --server-password=<password>] --vdevid=<vdevid>
[--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to suspend scheduled replications for a virtual device that will be triggered by your replication policy. It will not stop a replication that is currently in progress.

-v (--source-vdevid) is the ID of the source virtual tape on the primary server to be suspended.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Resume replication

```
iscon resumereplication -s <server-name> [-u <username> -p <password>]
-v <vdev> [-X <rpc-timeout>]
```

```
iscon resumereplication --server-name=<server-name>
[--server-username=<username> --server-password=<password>] --vdev=<vdev>
[--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to resume replication for a virtual device that was suspended by the *suspendreplication* command. The replication will then be triggered by the replication policy once it is resumed.

-v (--source-vdev) is the ID of the source virtual tape on the primary server to be resumed.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Set replication properties

```
iscon setreplicationproperties -s <server-name> [-u <username> -p <password>]
-v <source-vdev> [-w <watermark(MB)> | [-d <YYYYMMDDHHMM> -i <#[H|M]>]] |
[-r <on|off>] [[-t <timeout>] [-I <retry-in>]] [-C <retry-for>]] [-c
<on|off>]
[-e <on|off>] [-X <rpc-timeout>]
```

```
iscon setreplicationproperties --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--source-vdev=<source-vdev>
[--watermark=<watermark(MB)> | [--date=<YYYYMMDDHHMM> --interval=<#[H|M]>]] |
[--repl-first <on|off>] [[--replication-timeout=<timeout>] [--replication-
retry-interval=<retry-in>] [--replication-retry-count=<retry-for>]][--
compression=<on|off>]
[--encryption=<on|off>] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to change the replication policy for the specified virtual tape.

-v (--source-vdev) is required to specify the ID of the source virtual tape.

Any combination of the following two options can be used to set up a replication trigger policy for a virtual with the tape caching property disabled.

`-w (--watermark)` is a data size based trigger in MB. The watermark is checked when the tape is unloaded from the tape drive and the replication is triggered if the amount of new data on the tape has reached the specified watermark.

`-d (--date)` combined with `-i (--interval)` is a time based trigger. The replication is triggered at the time specified by date and then repeated every interval. `-d (--date)` format is `YYYYMMDDHHMM` and `-i (--interval)` format is a number followed by `H` for hours or `M` for minutes (e.g. `-i 2H` or `--interval=120M`).

To delete a watermark trigger specify 0 for the watermark. To delete a time based trigger specify NA for date. At least one trigger must remain active.

The date argument is not required if you are only changing the interval.

For virtual tapes having the tape caching property enabled, replication is triggered based on the tape caching policy:

`-r (--repl-first)` is required to replicate the virtual tape before it is migrated. Use "on" in order to enable this policy or "off" to have tape migration executed first.

The replication retry policy can be changed using the following options:

- `-t (--replication-timeout)` in seconds (default 60).
- `-I (--replication-retry-interval)` in seconds (default 60).
- `-C (--replication-retry-count)` retry count (default 1).

`-c (--compression)` is an option to enable or disable compression with one of the values: *on* or *off*.

`-e (--encryption)` is an option for remote replication only to set the encryption with one of the values: *on* or *off*.

`-X (--rpc-timeout)` is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Get replication properties

```
iscon getreplicationproperties -s <server-name> [-u <username> -p <password>]
-v <source-vdev> [-X <rpc-timeout>]
```

```
iscon getreplicationproperties --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--source-vdev=<source-vdev> [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to get the replication properties for a virtual device configured for replication.

-v (--source-vdev) is required to specify the ID of the source virtual tape.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Get replication status

```
iscon getreplicationstatus -S <target-name> [-U <username> -P <password>]
-V <replicaid> [-X <rpc-timeout>]
```

```
iscon getreplicationstatus --target-name=<target-name>
[--target-username=<username> --target-password=<password>]
--replicaid=<replicaid> [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command shows the replication status.

-S (--target-name) is the target server and -V (--replicaid) is ID of the tape replica, both of which are required.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Start replication

```
iscon startreplication -s <server-name> [-u <username> -p <password>]
-v <vdev> [-X <rpc-timeout>]
```

```
iscon startreplication --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--vdev=<vdev> [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to start replication on demand for a virtual device.

-v (--source-vdev) is the ID of the source virtual tape on the primary server to start.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Stop replication

```
iscon stopreplication -s <server-name> [-u <username> -p <password>]
-v <vdev> [-X <rpc-timeout>]
```

```
iscon stopreplication --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
-vdev=<vdev> [--rpc-timeout=<rpc-timeout>]
```

This command allows you to stop the replication that is in progress for a virtual device.

-v (--source-vdev) is the ID of the source virtual tape on the primary server to stop.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

---

## Physical devices

### Inventory physical tape library

```
iscon plibinventory -s <server-name> [-u <username> -p <password>]
[-l <physical-tape-library-vid>] [-X <rpc-timeout>]
```

```
iscon plibinventory --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
[--plib-vid=<tape-library-vid>] [--rpc-timeout=<rpc-timeout>]
```

#### Description:

This command performs an inventory of the physical tapes in a physical tape library.

-l (--plib-vid) is an option to specify the physical tape library to perform the inventory.

Inventory operation will be performed for all the physical tape libraries if -l (--plib-vid) is not specified.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Get physical tape list

```
iscon getphysicaltapelist -s <server-name> [-u <username> -p <password>]
-l <physical-tape-library-vid> [-X <rpc-timeout>]
```

```
iscon getphysicaltapelist --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--plib-vid=<physical-tape-library-vid> [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command displays a list of physical tapes located in the specified physical tape library.

-l (--plib-vid) is the ID of the physical tape library.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 300 seconds.

## Move physical tape

```
iscon movephysicaltape -s <server-name> [-u <username> -p <password>]
-m <move-operation> -L <physical-tape-library-vid>
-B <physical-tape-barcode> | -l <from-location-id> -t <to-location-id>
[-X <rpc-timeout>]
```

```
iscon movephysicaltape --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--move-operation=<move-operation> --tape-library-vid=<physical-tape-library-vid>
--physical-tape-barcode=<barcode> | --from-location-id=<from-location-id>
--to-location-id=<to-location-id> [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command moves a physical tape to a new location.

-m(--move-operation) is one of the following operations:

- DriveToSlot
- SlotToSlot
- SlotToDrive
- IESlotToSlot
- SlotToIESlot

-L(--tape-library-vid) is the physical library virtual ID where the tape is located.

-B(--physical-tape-barcode) identifies the physical tape to be moved. If barcode is not provided, the current tape location must be provided accordingly to the requested operation.

-l(--from-location-d) is the current slot or import/export (IE) slot number, or the physical drive virtual ID.

-t(--to-location-id) is the destination slot or IE slot number or the physical drive virtual ID. This does not apply to the IEslot. If the destination is the IEslot, the physical tape will be moved to the first available IEslot.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 60 seconds.

## Eject physical tape

```
iscon ejectphysicaltape -s <server-name> [-u <username> -p <password>]
-L <physical-tape-library-vid> -B <physical-tape-barcode-list>
[-A <acs-lsm-cap>] [-X <rpc-timeout>]
```

```
iscon ejectphysicaltape --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--tape-library-vid=<physical-tape-library-vid>
--tape-barcode-list=<physical-tape-barcode-list> | [--acs-lsm-cap=<acs-lsm-
cap>]
[--rpc-timeout=<rpc-timeout>]
```

### Description:

This command ejects physical tapes from the specified library.

-L(--tape-library-vid) is the physical library virtual ID where the tapes are located.

-B(--tape-barcode-list) identifies the physical tapes to be ejected. This argument can be a list of barcodes separated with commas. The list should be enclosed in double quotes.

-A <--acs-lsm-cap> is an optional argument representing the Cartridge Access Port for the Automated Cartridge System Library Software libraries. The format of the argument is acs:lsm:cap

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 10,800 seconds.

## Assign physical resource to VTL

```
iscon assignresourcetovtl -s <server-name> [-u <username> -p <password>]
-I <ACSL> [-L <tape-library-vid>] [-X <rpc-timeout>]
```

```
iscon assignresourcetovtl --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--scsiaddress=<ACSL> [--tape-library-vid=<tape-library-vid>]
[--rpc-timeout=<rpc-timeout>]
```

### Description:

This command assigns a physical tape library or drive to VTL.

-I (--scsiaddress) is required in order to identify the physical tape library or the physical tape drive to be assigned to VTL.

-L (--tape-library-vid) is an option to specify the physical tape library as a parent when assigning physical tape drive to physical tape library that is already assigned to VTL.

The physical tape library information can be retrieved by issuing the *getvtlinfo* command.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Unassign physical resource from VTL

```
iscon unassignresourcefromvtl -s <server-name> [-u <username> -p <password>]
-v <vdev> [-q] [-X <rpc-timeout>]
```

```
iscon unassignresourcefromvtl --server-name=<server-name>
[--server-username=<username> --server-password=<password>] --vdev=<vdev>
[--preserve-directlink] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command unassigns a physical tape library or drive from VTL.

-v (--vdev) is required to specify the ID of the physical tape library or the physical tape drive to be unassigned from VTL.

-q (--preserve-directlink) is an option to preserve the direct linked tapes for physical tape libraries.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Get physical device information

```
iscon getpdevinfo -s <server-name> [-u <username> -p <password>]
[-F [-M | -C <category>] | [-a] [-A] [-I <ACSL>] ] [-o <output-format>]
[-X <rpc-timeout>]
```

```
iscon getpdevinfo --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
[--config [--include-system-info | --category=<category>] |
[--allocated-list] [--available-list] [--scsiaddress=<ACSL>] ]
[--output-format=<output-format>] [--rpc-timeout=<rpc-timeout>]
```

### Description:

-F (--config) is an option to get the physical device configuration information. The default is to exclude the system device information.

-M (--include-system-info) is an option to include the system device information.

-C (--category) is an option to be used as a filter to get the configuration information for the specified category with one of the values: *virtual* (default) or *service-enabled* or *direct*.

The -M (--include-system-info) and -C (--category) options are mutually exclusive.

-o (--output-format) is the option to specify the output format. The <output-format> for the -F (--config) option is one of the following values: *list* or *detail* or *guid* or *scsi*.

-a (--allocated-list) is an option to get the allocated physical device information.

-A (--available-list) is an option to get the available physical device information.

-I (--scsiaddress) is an option to specify the SCSI address as a device filter in the following format: <ACSL>=#: #: #: # (adapter:channel:id:lun)

The <output-format> for the -a (--allocated-list) and the -A (--available-list) options is one of the following values: *list* or *detail* or *size-only*.

-F (--config), and -a (--allocated-list) and/or -A (--available-list) are mutually exclusive. You can either get the configuration information or get the allocation information. When getting the allocation information, you can specify either -a (--allocated-list), or -A (--available-list) or both. The default is to display both the device allocation and availability information if none of the options is specified.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

## Rescan physical devices

```
iscon rescandevices -s <server-name> [-u <username> -p <password>]
[-a <adapter-range>] [-i <scsi-range>] [-l <lun-range>] [-L] [-X <rpc-
timeout>]
```

```
iscon rescandevices --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
[--adapter-range=<adapter-range>] [--scsi-range=<scsi-range>] [--lun-
range=<lun-range>]
[--sequential] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to rescan the physical resource(s) on the specified server to get the proper physical resource configuration.

-a (--adapter-range) is the adapter or adapter range to be rescanned. The default is to rescan all adapters, if it is not specified. For example: -a 5 or -a 5-10

-i (--scsi-range) is the starting SCSI ID and ending SCSI ID to be rescanned. The default is to rescan all the SCSI IDs if the range is not specified. For example: -i 0-5

-l (--lun-range) is the starting LUN and ending LUN to be rescanned. The default is not to rescan any LUN if it is not specified. For example: -l 0-10

-L (--sequential) is an option to rescan sequentially.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 300 seconds.

## Import disk

```
iscon importdisk -s <server-name> [-u <username> -p <password>]
-i <guid> | -I <ACSL> [-X <rpc-timeout>]
```

```
iscon importdisk --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
--scsiaddress=<ACSL> | --guid=<guid> [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to import a foreign disk to the specified server. A foreign disk is a virtualized physical device containing VTL logical resources previously set up on a different VTL server. If the previous server is no longer available, the disk can be set up on a new VTL server and the resources on the disk can be imported to the new server to make them available to clients.

The <guid> is the unique identifier of the physical device. <ACSL> is the SCSI address of the physical device in the following format: #:#:# (adapter:channel:scsi id:lun)

Either -i (--guid) or -I (--scsiaddress) has to be specified.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 300 seconds.

## Prepare physical device for VTL server

```
iscon preparedisk -s <server-name> [-u <username> -p <password>]
[-U <target-username> -P <target-password>] -i <guid> | -I <ACSL>
-C <category> [-N <new-guid>] [-X <rpc-timeout>]
```

```
iscon preparedisk --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
[--target-username=<username> --target-password=<password>]
--scsiaddress=<ACSL> | --guid=<guid> --category=<category> [--new-guid=<new-
guid>]
[--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to prepare a physical device to be used by an VTL server or reserve a physical device for other usage.

The <guid> is the unique identifier of the physical device. <ACSL> is the SCSI address of the physical device in the following format: #:#:# (adapter:channel:scsi id:lun)

Either -i (--guid) or -I (--scsiaddress) has to be specified.

-C (--category) is the required to specify the new category for the physical device in one of the following values: *unassigned* or *virtual* or *direct* or *service-enabled*.

-N (--new-guid) is an option to specify the new guid for the physical device if the new category is "virtual".

If the server is set up for failover, the failover partner has to be rescanned after the disk preparation.

<target-username> and <target-password> are options to specify the user name and password for the failover partner.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 300 seconds.

# Reports

## Server throughput report

```
iscon createserverthroughputreport -s <server-name> [-u <username> -p
<password>]
[-z <report period>] | [-D <date-range>] [-o <filename>] [-f] [-X <rpc-
timeout>]
```

```
iscon createserverthroughputreport --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
[--report-period=<report-period>] | [--date-range=<date-range>]
[--output-file=<filename>] [--force] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command creates a report that displays throughput data and configuration information for a specific server.

`-z (--report-period)` is the period of time that the report should cover. The accepted values are:

- `t` - today
- `y` - yesterday
- `7` - last seven days
- `30` - last thirty days

`-D (--date-range)` is the starting date and ending date in the following format (maximum 30 days):  
YYYYMMDD-YYYYMMDD or YYYYMMDD

Either `-z (--report-period)` or `-D (--date-range)` can be specified, but not both. The date option is applied to the server local time. The default value is: "`-z t`" (today).

`-o (--output-file)` is the file name used to save the report data. If an output filename is not specified, the default filename is: `ServerThroughput-server-MM-DD-YYYY-hh-mm-ss[.#]`

`[.#]` is the additional suffix when there is a duplicate.

Specify the `-f (--force)` option if you want to overwrite the existing file if the output file already exists.

`-X (--rpc-timeout)` is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The default RPC timeout is 300 seconds.

## SCSI channel throughput report

```
iscon createscsichannelthroughputreport -s <server-name> [-u <username> -p
<password>]
[-z <report period>] | [-D <date-range>] -t <adapter-no> [-o <filename>] [-f]
[-X <rpc-timeout>]
```

```
iscon createscsichannelthroughputreport --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
[--report-period=<report-period>] | [--date-range=<date-range>]
--adapter-no=<adapter-no> [--output-file=<filename>] [--force] [--rpc-
timeout=<rpc-timeout>]
```

### Description:

This command creates a report that displays the throughput values for a specific SCSI/Fibre channel.

-t (--adapter-no) is required in order to identify the requested SCSI/Fibre Channel adapter.

-z (--report-period) is the period of time that the report should cover. The accepted values are:

- t - today
- y - yesterday
- 7 - last seven days
- 30 - last thirty days

-D (--date-range) is the starting date and ending date in the following format (maximum 30 days):

YYYYMMDD-YYYYMMDD or YYYYMMDD

Either -z (--report-period) or -D (--date-range) can be specified, but not both. The date option is applied to the server local time. The default value is: "-z t" (today).

-o (--output-file) is the file name used to save the report data. If the output filename is not specified, the default filename is: SCSIChannelThroughput-server-MM-DD-YYYY-hh-mm-ss[.#]

[.#] is the additional suffix when there is a duplicate.

Specify the -f (--force) option if you want to overwrite the existing file if the output file already exists.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The default RPC timeout is 300 seconds.

## Device throughput report

```
iscon createdevicethroughputreport -s <server-name> [-u <username> -p
<password>]
-I <ACSL> [-z <report period>] | [-D <date-range>] [-o <filename>] [-f]
[-X <rpc-timeout>]
```

```
iscon createdevicethroughputreport --server-name=<server-name>
[--server-username=<username> --server-password=<password>] --
scsiaddress=<ACSL>
[--report-period=<report-period>] | [--date-range=<date-range>]
[--output-file=<filename>] [--force] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command creates a report that displays throughput values for a specific device.

-I <ACSL> (--scsiaddress) is the LUN address of the device.

-z (--report-period) is the period of time that the report should cover. The accepted values are:

- t - today
- y - yesterday
- 7 - last seven days
- 30 - last thirty days

-D (--date-range) is the starting date and ending date in the following format (maximum 30 days):  
YYYYMMDD-YYYYMMDD or YYYYMMDD

Either -z (--report-period) or -D (--date-range) can be specified, but not both. The date option is applied to the server local time. The default value is: "-z t" (today).

-o (--output-file) is the file name used to save the report data. If the output filename is not specified, the default filename is: SCSIDeviceThroughput-server-MM-DD-YYYY-hh-mm-ss[.#]

[.#] is the additional suffix when there is a duplicate.

Specify the -f (--force) option if you want to overwrite the existing file if the output file already exists.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The default RPC timeout is 300 seconds.

## Physical resources configuration report

```
iscon createphyresourcesconfreport -s <server-name> [-u <username> -p
<password>]
[-o <filename>] [-f] [-X <rpc-timeout>]

iscon createphyresourcesconfreport --server-name=<server-name>
[--server-username=<username> --server-password=<password>] [--output-
file=<filename>]
[--force] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command creates a report that displays the physical resources configuration for a specific server. This report lists all of the physical resources on this server, including each physical adapter and physical device.

-o (--output-file) is the file name used to save the report data. If the output filename is not specified, the default filename is: PhysicalResourcesConfiguration-server-MM-DD-YYYY-hh-mm-ss[.#]

[.#] is the additional suffix when there is a duplicate.

Specify the -f (--force) option if you want to overwrite the existing file if the output file already exists.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The default RPC timeout is 300 seconds.

## Disk usage report

```
iscon creatediskusagereport -s <server-name> [-u <username> -p <password>] [-o
<filename>] [-f] [-X <rpc-timeout>]

iscon creatediskusagereport --server-name=<server-name>
[--server-username=<username> --server-password=<password>] [--output-
file=<filename>]
[--force] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command creates a report that displays the amount of disk space used by disk libraries on a specific server.

-o (--output-file) is the file name used to save the report data. If the output filename is not specified, the default filename is: DiskSpaceUsage-server-MM-DD-YYYY-hh-mm-ss[.#]

[.#] is the additional suffix when there is a duplicate.

Specify the `-f (--force)` option if you want to overwrite the existing file if the output file already exists.

`-X (--rpc-timeout)` is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The default RPC timeout is 300 seconds.

## Physical resources allocation report

```
iscon createphyresourcesallocreport -s <server-name> [-u <username> -p
<password>]
[-o <filename>] [-f] [-X <rpc-timeout>]
```

```
iscon createphyresourcesallocreport --server-name=<server-name>
[--server-username=<username> --server-password=<password>] [--output-
file=<filename>]
[--force] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command creates a report that displays the physical resource allocation for a specific server.

`-o (--output-file)` is file name used to save the report data. If the output filename is not specified, the default filename is: `PhysicalResourcesAllocation-server-MM-DD-YYYY-hh-mm-ss[.#]`

`[.#]` is the additional suffix when there is a duplicate.

Specify the `-f (--force)` option if you want to overwrite the existing file if the output file already exists.

`-X (--rpc-timeout)` is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The default RPC timeout is 300 seconds.

## Specific physical resource allocation report

```
iscon createphyresourceallocreport -s <server-name> [-u <username> -p
<password>]
-I <ACSL> [-o <filename>] [-f] [-X <rpc-timeout>]
```

```
iscon createphyresourceallocreport --server-name=<server-name>
[--server-username=<username> --server-password=<password>] [--
scsiaddress=<ACSL>]
[--output-file=<filename>] [--force] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command creates a report that displays the physical resource allocation of a specific device on a specific server.

-I <ACSL> (--scsiaddress) is the LUN address of the device.

-o (--output-file) is the file name used to save the report data. If the output filename is not specified, the default filename is: PhysicalResourceAllocation-server-MM-DD-YYYY-hh-mm-ss[.#]

[.#] is the additional suffix when there is a duplicate.

Specify the -f (--force) option if you want to overwrite the existing file when the output file already exists.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The default RPC timeout is 300 seconds.

## Fibre Channel adapter configuration report

```
iscon createfcaconfreport -s <server-name> [-u <username> -p <password>] [-o <filename>] [-f] [-X <rpc-timeout>]
```

```
iscon createfcaconfreport --server-name=<server-name>
[--server-username=<username> --server-password=<password>] [--output-
file=<filename>]
[--force] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command creates a report that displays the Fibre Channel adapter configuration for a specific server.

-o (--output-file) is the file name used to save the report data. If the output filename is not specified, the default filename is: FCAdaptersConfig-server-MM-DD-YYYY-hh-mm-ss[.#]

[.#] is the additional suffix when there is a duplicate.

Specify the -f (--force) option if you want to overwrite the existing file if the output file already exists.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The default RPC timeout is 300 seconds.

## Replication status report

```
iscon createreplicationstatusreport -s <server-name> [-u <username> -p <password>]
```

```
[ -D <date-range> ] [ -r <repl-resource-type> | -R <resourceList> ] [ -o
<outputFilename> ]
[ -f ] [ -X <rpc-timeout> ]

iscon createreplicationstatusreport --server-name=<server-name>
[--server-username=<username> --server-password=<password>] [--date-
range=<date-range>]
[--repl-resource-type=<repl-resource-type> | --resource-list=<resourceList>]
[--output-file=<outputFilename>] [--force] [--rpc-timeout=<rpc-timeout>]
```

## Description:

This command creates a report that displays the status of a specified resource on a specific server.

-D (--date-range) is an option to specify the date range to be queried. The date format is YYYYMMDD or YYYYMMDD-YYYYMMDD. If date range is not specified, the default is today's date.

-r (--repl-resource-type) is an option to specify a generic resource type to be queried. It can be one of the following:

- TAPE
- TAPEReplica

The default value is TAPE.

-R <--resource-list> is an option to report the status of the specified resources only. The argument can be a list of virtual identifiers separated with commas or the name of a file enclosed in <> containing the resource ID on each line. All the resources must be of the type specified by "-r".

- Example 1: -R 10000005,10000006
- Example 2: -R "<res\_id\_file.txt>"

-o (--output-file) is the file name used to save the report data. If the output filename is not specified, the default filename is: ReplicationStatus-server-MM-DD-YYYY-hh-mm-ss[.#]

[.#] is the additional suffix when there is a duplicate.

Specify the -f (--force) option if you want to overwrite the existing file if the output file already exists.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The default RPC timeout is 300 seconds.

## Virtual library information report

```
iscon createvirlibinfo report -s <server-name> [-u <username> -p <password>]
```

```
[-o <filename>] [-f] [-X <rpc-timeout>]
```

```
iscon createvirlibinfoforeport --server-name=<server-name>
[--server-username=<username> --server-password=<password>] [--output-
file=<filename>]
[--force] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command creates a report that displays all of the virtual libraries for a specific server.

-o (--output-file) is the file name used to save the report data. If the output filename is not specified, the default filename is: VirtualLibraryInfo-server-MM-DD-YYYY-hh-mm-ss[.#]

[.#] is the additional suffix when there is a duplicate.

Specify the -f (--force) option if you want to overwrite the existing file if the output file already exists.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The default RPC timeout is 300 seconds.

## Virtual tape information report

```
iscon createvirtapeinfoforeport -s <server-name> [-u <username> -p <password>]
[-o <filename>] [-f] [-X <rpc-timeout>]
```

```
iscon createvirtapeinfoforeport --server-name=<server-name>
[--server-username=<username> --server-password=<password>] [--output-
file=<filename>]
[--force] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command creates a report that displays all of the virtual tapes for a specific server.

-o (--output-file) is the file name used to save the report data. If the output filename is not specified, the default filename is: VirtualTapeInfo-server-MM-DD-YYYY-hh-mm-ss[.#]

[.#] is the additional suffix when there is a duplicate.

Specify the -f (--force) option if you want to overwrite the existing file if the output file already exists.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The default RPC timeout is 300 seconds.

## Create job report

```
iscon createjobreport -s <server-name> [-u <username> -p <password>]
[-z <report period>] | [-D <date-range>] [-o <filename>] [-f] [-X <rpc-
timeout>]
```

```
iscon createjobreport --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
[--report-period=<report-period>] | [--date-range=<date-range>]
[--output-file=<filename>] [--force] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command creates a report that displays all of the jobs executed during a selected period of time for a specific server.

-z (--report-period) is the period of time that the report should cover. The accepted values are:

- t - today
- y - yesterday
- 7 - last seven days
- 30 - last thirty days

-D (--date-range) is the starting date and ending date in the following format (maximum 30 days):  
YYYYMMDD-YYYYMMDD or YYYYMMDD

Either -z (--report-period) or -D (--date-range) can be specified, but not both. The date option is applied to the server local time. The default value is: "-z t" (today).

-o (--output-file) is the file name used to save the report data. If the output filename is not specified, the default filename is: JobReport-MM-DD-YYYY-hh-mm-ss[.#]

[.#] is the additional suffix when there is a duplicate.

Specify the -f (--force) option if you want to overwrite the existing file if the output file already exists.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The default RPC timeout is 300 seconds.

---

# Event Log

## Get Event Log

```
iscon geteventlog -s <server-name> [-u <username> -p <password>]  
[-D <date-range>] [-F <fileFormat>] [-o <filename>] [-H] [-f] [-X <rpc-  
timeout>]
```

```
iscon geteventlog --server-name=<server-name>  
[--server-username=<username> --server-password=<password>] [--date-  
range=<date-range>] [--file-format=<fileFormat>] [--include-heading] [--  
output-file=<filename>] [--force]  
[--rpc-timeout=<rpc-timeout>]
```

### Description:

This command gets the event log.

-D (--date-range) is the starting date/time and ending date/time in the following format:

YYYYMMDDhhmmss-YYYYMMDDhhmmss or YYYYMMDDhhmmss

-F (--fileFormat) is one of the following formats: *csv* (default) or *txt*.

-H (--include-heading) is the option to include the event log data heading.

-o (--output-file) is the full path of the file name to save the event log data. If an output filename is not specified, the default filename is: eventlogYYYY-MM-DD-hh-mm-<servername>[.#]

[.#] is the additional suffix when there is a duplicate.

Specify the -f (--force) option if you want to overwrite the existing file if the output file already exists.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 30 seconds.

# Technical support

## Get X-Ray

```
iscon getxray -s <server-name> [-u <username> -p <password>]
[-l <#|all|YYMMDDhhmm-YYMMDDhhmm>] [-r] [-o <filename>] [-f] [-X <rpc-
timeout>]
```

```
iscon getxray --server-name=<server-name>
[--server-username=<username> --server-password=<password>]
[--get-log=<#|all|YYMMDDhhmm-YYMMDDhhmm>] [--rescan-for-xray] [--output-
file=<filename>] [--force] [--rpc-timeout=<rpc-timeout>]
```

### Description:

This command allows you to get X-ray information from the VTL Server for diagnostic purposes. Each X-ray contains technical information about your server, such as server messages and a snapshot of your server's current configuration and environment. You should not create an X-ray unless you are requested to do so by your Technical Support representative.

-l (--get-log) is a filter to get the specified log messages.

- # = number of lines
- all = all the log messages
- YYMMDDhhmm-YYMMDDhhmm = log messages in date/time range

The default is to get all the log messages.

-r (--rescan-for-xray) is an option to rescan the physical devices before the xray is taken. The default is not to rescan the devices.

-o (--output-file) is the full path of the file name to save the xray to. The default output filename format is:  
xray-YYYY-MM-DD-hh-mm-<servername>.tar.gz

Specify the -f (--force) option if you want to overwrite the existing file if the output file already exists. Otherwise, an error will be returned.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 300 seconds.

## Get attention required information

```
iscon getattentionrequired -s <server-name> [-u <username> -p <password>]  
[-X <rpc-timeout>]
```

```
iscon getattentionrequired --server-name=<server-name>  
[--server-username=<username> --server-password=<password>]  
[--rpc-timeout=<rpc-timeout>]
```

### Description:

This commands displays the attention required messages.

-X (--rpc-timeout) is an option to specify a number between 1 and 30000 in seconds for the RPC timeout. The system will retry the command for the amount of time specified if the server does not respond. The default RPC timeout is 300 seconds.

## Required ports

---

In order to maintain a high level of security, you should disable all unnecessary ports. The only ports required by VTL are:

- TCP port 11576 - Used for VTL Console to VTL Server management communication.
- UDP port 11577 - Used for IP replication.
- UDP port 11578 - Used for encryption.
- UDP port 11579 - Used for encryption.
- TCP port 11580 - Used for communication between a failover pair.
- UDP port 161 - Used for SNMP traps.
- TCP port 161 - Used for SNMP traps.
- TCP/UDP port 3205 - Used for iSCSI.
- TCP port 3260 - Used for iSCSI.

Although you may temporarily open some ports during initial setup of the VTL server, such as the telnet port (23) and FTP ports (20 and 21), you should shut them down after you have done your work.



# Troubleshooting

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This appendix addresses the following issues:

- “Problems during console operations” on page 231
- “Problems affecting physical resources” on page 234
- “Problems with virtual resources” on page 235
- “Problems during import/export operations” on page 239
- “Taking an X-ray for technical support” on page 241

## Problems during console operations

**Issue:** VTL console is unable to connect to a VTL server

**Indications:** The VTL console does not connect to the server node. The word `Failed` appears at during the connection process.

**Diagnostics:** Determine the cause of the failure using the following procedure.

**Case: Connection fails before login**

1. Wait for a while. Then attempt to connect again.
2. If you can now connect, stop here.  
The server was busy and unable to respond immediately.
3. If the IP address of the server changed recently, delete the server from the VTL console. Then re-add it, and try to connect.
4. If you can now connect, stop here.  
The VTL console was still using the old IP address.

5. If you still cannot connect, try to connect using the server's IP address instead of its server name (or vice versa).
6. If you can now connect, stop here.  
The host name or IP address that failed may be incorrect.
7. If you still cannot connect, check network connectivity. Ping the target server and other machines in the same subnet.
8. If you cannot ping the server or the hosts on the same subnet, there is a network outage. Stop here, and correct the problem. Then reconnect to the VTL server.

#### **Case: Connection fails during log in**

1. Verify the user name and password.  
The password is case-sensitive. Make sure the Caps Lock key is not pressed on the keyboard
2. If the user name or password was incorrect, stop here, and log in using the correct credentials.
3. If the user name and password seem to be correct, make sure they exist on the server. From the machine where VTL console is installed, open a secure shell (ssh) session on the VTL server, and log on using the same user name and password as above.  
Note that ssh may be disabled if local security policies so require.
4. If ssh is enabled but you still cannot log in, the user name or password is probably incorrect. Stop here, and obtain proper credentials.
5. If you can log in using ssh, check the status of the VTL server software modules. From the ssh commandline, run the following command:

```
# ipstor status
```

6. If a module has stopped, restart it with the following command, and stop here.

```
# vtl restart <module name>
```

#### **Case: Connection fails while retrieving the server configuration**

1. If the connection fails while retrieving the server configuration, note any error messages that appear.
2. Then contact Sun technical support.

#### **Case: Connection fails while checking the VTL license**

1. Contact Sun technical support.

**Case: Connection fails while expanding the VTL server node**

1. Check the memory consumption on the console host.
2. If memory consumption is excessive, stop unnecessary processes, and retry.
3. If you can connect, stop here.  
Avoid running memory-intensive applications on this host when the console is in use.
4. If you cannot connect or if memory consumption appears to be within normal limits, contact Sun technical support.

**Issue: Requested operations cannot be performed from the VTL console**

Indications: The server exhibits symptoms of high CPU utilization, such as `Server Busy` or `RPC Timeout` messages.

Diagnostics: Determine whether high CPU utilization is normal.

1. Check the Event Log or syslog (`/var/adm/messages`) for CPU-intensive activity on the server.  
Backup jobs that backup to multiple virtual or physical devices in parallel, data compression, and encryption all place heavy demands on the CPU.
2. If CPU-intensive processes are running on the server, stop here, and retry the console later.  
The VTL server is behaving normally.
3. If CPU-intensive processes are not running on the server, if the CPU is not actually busy, or if the problem persists, contact Sun technical support.

**Issue: VTL console operations are very slow**

Indications: The VTL console is abnormally slow or unresponsive.

Diagnostics: Determine the reason.

**Case: Low host system memory**

1. Check memory utilization for all running processes on the host.
2. Stop unnecessary processes.
3. If no unnecessary processes are running, provide the host with more memory.

### **Case: High server activity**

1. Check the Event Log or syslog (/var/adm/messages) for CPU-intensive activity on the server.

Backup jobs that backup to multiple virtual or physical devices in parallel, data compression, and encryption all place heavy demands on the CPU.

1. Also, try starting a second instance of the VTL console. If the second VTL console cannot establish connections, that means the server is busy with previous RPC operations.
2. If CPU-intensive processes are running on the server, stop here, and retry the console later.

The VTL server is behaving normally.

3. If CPU-intensive processes are not running on the server, if the CPU is not actually busy, or if the problem persists, contact Sun technical support.

## **Problems affecting physical resources**

**Issue:**            **The VTL console does not display some physical storage devices**

**Indications:**    The console does not display all expected physical devices.

**Diagnostics:**    Check to see if the devices are present and accessible.

1. Rescan physical devices from the VTL console by right-clicking on Physical Resources and selecting Rescan from the context menu. Make sure that Discover New Devices is specified. Specify a LUN Range that you reasonably expect will include the device.
2. If the console now displays the missing devices, stop here.
3. If rescanning does not detect the missing devices, check the system Event Log or syslog (/var/adm/messages) for error messages that may correspond to the rescan operation. Look for failed devices or errors that kept an otherwise discoverable device from being accessed.
4. If the logs reveal a device failure or error, stop here. Correct the device problem.
5. If the logs do not reveal the source of the problem, make sure that the VTL server is powered up and that all cable connectors are securely connected.
6. If the VTL server is not powered up or if cables are not connected, stop here. Correct the problem.

7. If you have still not solved the problem, contact Sun technical support.

## Problems with virtual resources

**Issue:** **Virtual tapes are shown offline in the console**

**Indications:** Virtual tapes are offline.

**Diagnostics:** Locate the physical resources that back the virtual tapes and assess their state.

1. Identify the physical resources that back the virtual tapes. In the Virtual Tape Library System branch of the VTL object tree, highlight the branch representing the offline virtual tape, select the `Layout` tab from the property sheet at right, and note the identifying information for the disk that corresponds to the offline tape.
2. In the Physical Resource branch, under the `Storage Devices > Fibre Channel Devices`, locate the physical resources that you identified in the preceding step. Make sure that each physical device is present, operating normally and accessible.
3. If physical devices appear to be missing, inaccessible, or failing, contact Sun technical support.

**Issue:** **Tape expansion does not work**

**Indications:** The size of virtual tape cannot be expanded.

**Diagnostics:** Determine the cause.

1. In the Virtual Tape Library System branch of the VTL object tree, highlight the tape in the console, and make sure that the `Total Size` field is accurate.
2. If the `Total Size` field is accurate, make sure that client machine has been refreshed to see the updated virtual resource. Rescan devices.  
The expansion has succeeded, but the client machine does not yet see the new size of the expanded device.
3. If rescanning resolves the problem, stop here.
4. If the `Total Size` field is accurate or if the problem persists after a rescan, check the Event Log for error messages.  
The expansion probably failed.

5. If you find disk space errors, there may not be enough physical disk space for the expansion. Add more physical storage or change the size of expansion. Then retry.
6. If no disk space problems were found, or if correcting them does not solve the problem, make sure that the physical storage partition is valid. Correct any problems, and retry.
7. If the partition is valid or if correcting it does not solve the problem, look for I/O errors.
8. If I/O errors are found, consult technical support.
9. Otherwise, look for an RPC timeout during execution of the expand command. See if the server is busy by running the `top` or `ps -x` command on the VTL server.
10. If the server seems excessively busy, stop any unnecessary processes, and retry the expansion operation.
11. If the problem persists or if the event logs show no obviously relevant errors, contact technical support.

**Issue: Client cannot see tape library/drives provisioned by VTL**

**Indications:** A client operating system or application does not correctly detect virtual devices.

**Diagnostics:** Further characterize the problem, and determine the cause.

**Case: Neither the operating system nor applications appear to see the device**

1. See if the operating system includes the device in its configuration.
  - On Sun Solaris platforms, tape libraries are usually shown in the form `/dev/sg<index>`, if the `sg` module is loaded. Tape drives are displayed in the form `/dev/rmt/<index>`, if the `st` module loaded.
  - On Linux platforms, tape libraries are usually shown in the form `/dev/sg<index>`, assuming that the `sg` module is loaded. Tape drives are displayed in the form `/dev/st/<index>`, `/dev/nst/<index>`, and `/dev/sg/<index>`, if the `st` module loaded.
  - On Microsoft Windows platforms, tape libraries appear under Media Changers and tape drives under Tape drives. Usually the tape drive is represented as `\tape<index>`.
  - HP-UX represents tape libraries with a string of the form `/dev/rac/cXtXdX`, if the `schgr` driver is loaded. Tape drives are represented by `/dev/rmt/<index>`, if the `stape` driver is loaded.
  - AIX displays tape devices as `/dev/rmt<index>` (for LTO1/LTO2) or `/dev/mt<index>` (for DLT/SDLT).

2. If the operating system does not show the device, go to “The operating system cannot detect the device” on page 237.
3. If the operating system does show the device, go to “Applications cannot see the device” on page 237.

**Case: The operating system cannot detect the device**

1. If the operating system does not see the device, use the VTL console to check the status of the virtual device.
2. If the virtual device is `offline`, stop here, and go to “Virtual tapes are shown offline in the console” on page 235.
3. If the virtual device is `online`, check the client configuration. In the VTL console, right-click on the client, and examine the `Resources` tab of the properties sheet in the right-hand pane.
4. If you do not see virtual devices on the `Resources` tab, assign devices to the client. Make sure that devices that are shared by clients attach in `Read/Write non-exclusive` mode. On the client, rescan devices.
5. If the client can see the devices after rescanning, stop here.
6. If the client cannot see its assigned devices, check World Wide Port Names (WWPNs). In the VTL console, right-click on the client, and select `Properties` from the context menu. Record the initiator and target WWPNs.
7. Select the `Physical Resources` object and locate the HBA that corresponds to the recorded target WWPN. In the property sheet at right, select the `SNS table` tab and look up initiator WWPN that you recorded in the previous step. If multiple HBAs exist, either from the client host or from the VTL target, look up all entries from all target SNS tables.
8. If the VTL console does not record the correct initiator WWPN, unassign the client and the reassign it using the correct mapping. On the client, rescan devices.
9. If the client can see the devices after rescanning, stop here.

**Case: Applications cannot see the device**

1. If an application fails to find the device, see “The backup application cannot see the device at all” on page 238.
2. If an application finds the device in an unexpected location, see “The backup software does not see the device in the expected place” on page 238.

**Case: The backup application cannot see the device at all**

1. If the operating system sees the device but a backup application does not, check the drivers for the backup software. Make sure the driver is appropriate for the library and tape drive type.
2. If a driver appears to be inappropriate, refer to the backup software manual. Some backup products recommend specific versions of drivers or special settings. Apply the correct driver.
3. If changing the driver solves the problem, stop here.
4. If the recommended driver is installed or if installing it did not help, check the driver version and upgrade as necessary.
5. If upgrading the driver solves the problem, stop here.
6. If the driver is correctly versioned or if upgrading the driver does not help, look for application software conflicts. Multiple backup products on a single server can cause this sort of problem.

**Case: The backup software does not see the device in the expected place**

1. If the operating system correctly recognizes the device, but the backup software does not see the device in the expected place, suspect a serialization error in the application. Consult the application vendor and documentation, and install applicable software patches or upgrades.

Serialization converts objects into streams of sequential object properties. If the application misinterprets the sequence, it may confuse properties such as ownership.

**Issue: Client sees the tape library/drive but cannot access it**

Indications: A client operating system or application cannot access virtual devices.

Diagnostics: Further characterize the problem, and determine the cause.

**Case: Neither the operating system nor applications appear to have access**

1. Obtain an operating system-specific raw device utility that can access tape drives.
  - Microsoft Windows clients can use `ntutil` to check emulated IBM Ultrium devices.
  - UNIX systems can use the `mt` or `tar` command to access the tape device (using a syntax like `mt -f /dev/rmt/0 status`).
2. Stop the backup application.

3. Using the VTL console, load a tape into a virtual drive.

While most raw device utilities work with tape drives, they cannot, in most cases, load tapes. Even if some can move tapes, you need to know the exact address of the tape and the drive.

4. Attempt to access the device using the raw utility.
5. If you cannot access the device, go to “The operating system cannot access the device” on page 239.
6. If you can access the device, go to “The operating system can access the device.” on page 239.

**Case: The operating system cannot access the device**

1. If the operating system cannot access the device, make sure that physical storage resources are accessible and in read/write mode.
2. Check the Event Log or syslog (/var/adm/messages) for I/O errors.  
I/O error messages usually begin with `log_scsi_error`.
3. Make sure that the adapter driver on the client is certified for use with VTL.

**Case: The operating system can access the device.**

1. If the operating system can access the device, the backup software is causing the problem. Consult the application documentation and/or application vendor customer support.
2. Make sure that you have the correct drivers.

## Problems during import/export operations

**Issue:** Import/Export does not work as expected

**Indications:** Import/export operations fail or result in unexpected behavior.

**Diagnostics:** Determine the cause.

**Case: Tape devices and/or media types are mismatched**

1. Make sure that you are importing from or exporting to the same type of media and device.

You can only import and export data between a physical tape device and a virtual tape device of the same type, using physical and virtual media of the same capacity.

2. If dissimilar physical and virtual devices or media are being used, stop here. Correct the condition, and retry the import/export job.
3. If physical and virtual devices are identical or if making them so does not solve the problem, see if compressed data is being imported/exported.
4. If compressed data is being imported/exported, make sure that virtual and physical media have the same uncompressed capacity.  
Import/export operations fail if the target media does not have enough capacity to accommodate decompressed data.
5. If compression is not an issue, see “The export/import job is not complete” on page 240.

**Case: The export/import job is not complete**

1. If dissimilar media capacity is not the problem, make sure that the job is not still running. In the VTL console, select the Import/Export Queue, and search for related export/import jobs.
2. If a related job is found, the job is not yet complete. Stop here, and recheck it later. Jobs are only listed in the queue while active, so listed jobs are still running.
3. If related jobs are not listed in the queue or if the problem persists after the job completes, use the VTL console to examine the Event Log for failure messages.
4. If failure messages are found, stop here, correct the error condition(s), and retry the import/export job.
5. If the problem persists, see “Virtual tape barcodes duplicate physical tape barcodes” on page 240.

**Case: Virtual tape barcodes duplicate physical tape barcodes**

1. If export/import problems persist, make sure that virtual and physical tapes each have their own, unique barcodes. Use the VTL console to Inventory the physical library, and check the results against the virtual tapes.
2. If duplicates are found, stop here. Correct the situation, and retry the import/export operation.
3. Otherwise, see “A physical tape library or device is not ready” on page 240.

**Case: A physical tape library or device is not ready**

1. Check the status of physical tape drives.

2. If physical tape drives require cleaning, clean them, and stop here. Retry the import/export operation.
3. If cleaning is unnecessary or does not help, see if physical tapes need to be moved and mounted before the import/export operation can continue.
4. If tapes have to be moved, move them, and stop here. Retry the import/export operation.
5. If tapes do not need to be moved, check for other anomalous conditions.
6. If other anomalous conditions are found, correct them, and stop here. Retry the import/export operation.
7. If problems persist, see “VTL drive assignments do not reflect library element addresses” on page 241.

**Case: VTL drive assignments do not reflect library element addresses**

1. When you import data, make sure the assignment of drive in VTL follows the element address of the drives in the physical library. Assign the tape drive in the order of their element address.
2. If VTL assigns drives out of element order, unassign and reassign tape drives in the correct order. Stop here, and retry the import/export operation.
3. If drive order is not an issue or if correcting it fails to resolve the problem, see “Some other system error is causing the problem” on page 241.

**Case: Some other system error is causing the problem**

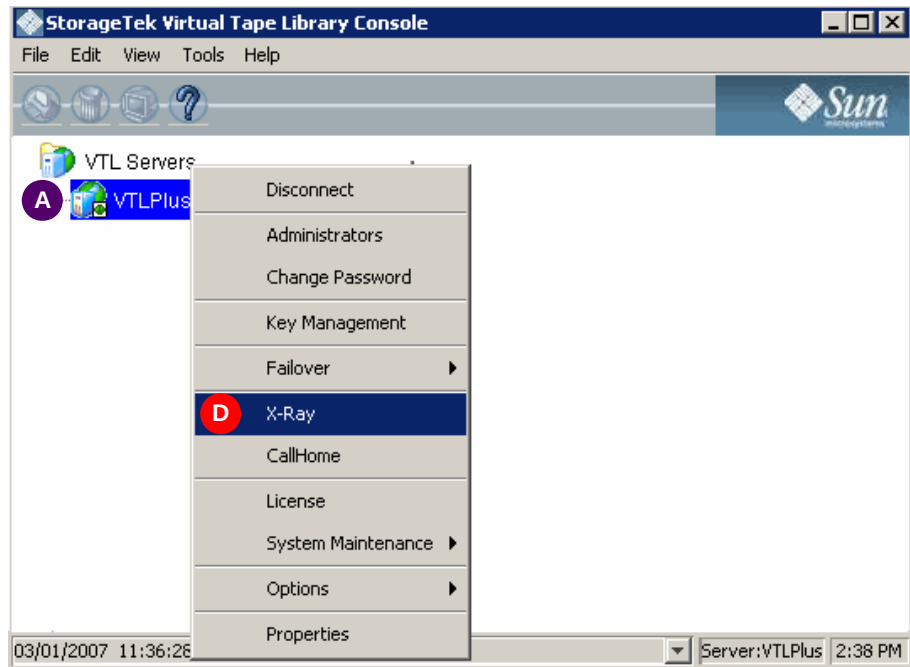
1. If problems persist after other possibilities have been exhausted, examine the VTL Event Log or the server syslog (/var/adm/messages) for error messages that relate to the physical tape library or drive.
2. If you find error messages, correct the issues if possible. Stop here, and retry the import/export operation.
3. If you cannot find relevant errors or cannot determine a cause or resolution for an error condition, contact Sun technical support.

## Taking an X-ray for technical support

If, during a technical support call, a Sun technical support representative asks you to take an X-Ray of your system, note the items that you need to include. Then proceed as follows.

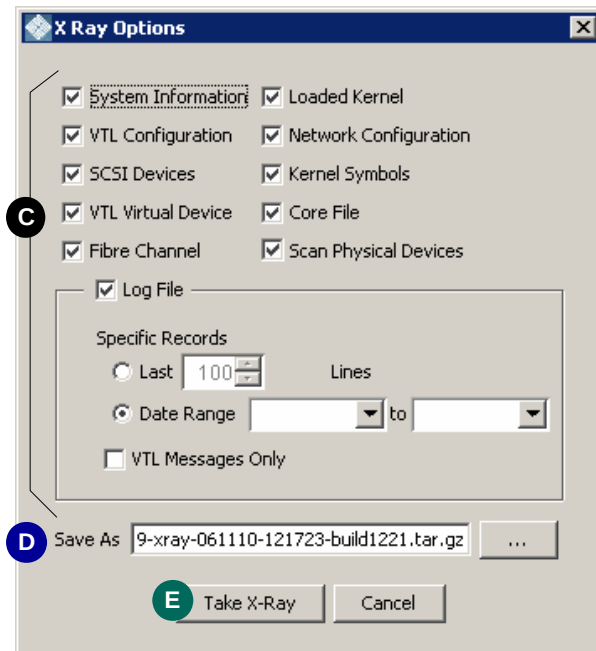
## ▼ Taking an X-Ray

1. In the object tree of the VTL console, right-click on the branch representing the VTL server (A below), and select X-Ray from the context menu (B).



2. When the X-Ray Options dialog appears, check the checkboxes corresponding to the items that you need to include (C below).

The defaults are shown below:



If you select the Log File option, you can filter the output by specifying a number of records or a date range. You can limit the results to VTL system-related messages by checking the VTL Messages Only check box.

3. In the Save As text box (D above), specify an output path and filename for the X-Ray archive.
4. X-Rays are saved as gzipped tar archives.
5. Press Take X-Ray (E above) to generate the output.



# SNMP traps

The VTL product family defines the following Simple Network Management Protocol (SNMP) traps.

| Trap | Severity      | Message                                                                                          |
|------|---------------|--------------------------------------------------------------------------------------------------|
| 9    | Error         | SCSI Port Error -- %1.                                                                           |
| 1000 | Error         | Socket connection could not be terminated properly -- %1.                                        |
| 1001 | Error         | Socket connection could not be terminated properly due to error during shutdown -- %1.           |
| 1002 | Error         | Unexpected interrupt occurred.                                                                   |
| 1003 | Informational | "VTL Server has detected virtual device[%1] at SCSI %2, channel %3, ID %4, LUN %5."              |
| 1004 | Informational | VTL Server has not detected any virtual device.                                                  |
| 1005 | Error         | Out of kernel resources. Failed to get major number for VTL SCSI device.                         |
| 1006 | Error         | Failed to allocate memory.                                                                       |
| 1007 | Error         | Failed to set up the network connection due to an error in SANRPC_Init -- %1.                    |
| 1008 | Error         | Failed to set up the network connection due to an error in SANRPCListen -- %1.                   |
| 1009 | Informational | There are %1 real device(s) associated with virtual device [%2].                                 |
| 1010 | Informational | Real Device[%1 %2 %3 %4].                                                                        |
| 1011 | Error         | Error while writing -- write(%1) result = 0x%2 cmd = 0x%3.                                       |
| 1012 | Error         | Error while reading -- read(%1) result = 0x%2 cmd = 0x%3.                                        |
| 1013 | Informational | VTL Server [Build %1] is running on Linux %2.                                                    |
| 1014 | Informational | VTL Server has been shut down.                                                                   |
| 1015 | Informational | "Maximum SCSI devices reached. On your VTL Server, verify with the command: cat /proc/scsi/scsi" |
| 1016 | Informational | Primary virtual device %1 has failed. VTL is switching to the secondary virtual device.          |
| 1017 | Informational | Secondary virtual device %1 has failed.                                                          |

| Trap | Severity      | Message                                                                                                                                                                                                        |
|------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1020 | Informational | Replication for virtual tape %1 started.                                                                                                                                                                       |
| 1021 | Informational | Replication for virtual tape %1 finished.                                                                                                                                                                      |
| 1022 | Warning       | Replication has failed for virtual tape %1 -- %2.                                                                                                                                                              |
| 1023 | Error         | Failed to connect to physical device %1. Switching alias to %2.                                                                                                                                                |
| 1024 | Informational | Device %1 has attached to the VTL Server.                                                                                                                                                                      |
| 1025 | Informational | Device %1 has detached from the VTL Server.                                                                                                                                                                    |
| 1026 | Informational | Replication has been started for virtual tape %1; it was triggered by the watermark.                                                                                                                           |
| 1027 | Informational | Replication has been started for virtual tape %1; it was triggered by the interval schedule.                                                                                                                   |
| 1028 | Informational | Replication has been started for virtual tape %1; it was triggered by the time of day schedule.                                                                                                                |
| 1029 | Informational | Replication has been started for virtual tape %1; it was manually triggered by the administrator.                                                                                                              |
| 1030 | Error         | Failed to start replication -- replication is already in progress for virtual tape %1.                                                                                                                         |
| 1031 | Error         | Failed to start replication -- replication control area not present on virtual tape %1.                                                                                                                        |
| 1032 | Error         | Failed to start replication -- replication control area has failed for virtual tape %1.                                                                                                                        |
| 1034 | Error         | Replication failed for virtual device %1 -- the network transport returned error %2.                                                                                                                           |
| 1035 | Error         | Replication failed for virtual device %1 -- the local disk failed with error %2.                                                                                                                               |
| 1038 | Error         | Replication failed for virtual device %1 -- the local server could not allocate memory.                                                                                                                        |
| 1039 | Error         | Replication failed for virtual device %1 -- the replica failed with error %2.                                                                                                                                  |
| 1040 | Error         | Replication failed for virtual device %1 -- failed to set the replication time.                                                                                                                                |
| 1041 | Informational | Mirror synchronization started for virtual device %1.                                                                                                                                                          |
| 1042 | Informational | Mirror synchronization finished for virtual device %1.                                                                                                                                                         |
| 1043 | Error         | A SCSI command terminated with a non-recoverable error condition that was most likely caused by a flaw in the medium or an error in the recorded data. Please check the system log for additional information. |
| 1044 | Error         | "A SCSI command terminated with a non-recoverable hardware failure (for example, controller failure, device failure, parity error, etc.). Please check the system log for additional information."             |
| 1045 | Informational | Rescan replica has completed for virtual device %1                                                                                                                                                             |
| 1046 | Error         | Rescan replica has failed for virtual device %1 -- the local device failed with error %2.                                                                                                                      |

| Trap | Severity      | Message                                                                                                           |
|------|---------------|-------------------------------------------------------------------------------------------------------------------|
| 1047 | Error         | Rescan replica has failed for virtual device %1 -- the replica device failed with error %2.                       |
| 1048 | Error         | Rescan replica has failed for virtual device %1 -- the network transport returned error %2.                       |
| 1049 | Error         | Rescan replica cannot proceed -- replication control area not present on virtual device %1                        |
| 1050 | Error         | Rescan replica cannot proceed -- replication control area has failed for virtual device %1                        |
| 1051 | Error         | Rescan replica cannot proceed -- a merge is in progress for virtual device %1                                     |
| 1052 | Error         | Rescan replica failed for virtual device %1 -- replica status returned %2                                         |
| 1053 | Error         | Rescan replica cannot proceed -- replication is already in progress for virtual device %1                         |
| 1054 | Error         | Replication cannot proceed -- a merge is in progress for virtual device %1                                        |
| 1055 | Error         | Replication failed for virtual tape %1 -- replica status returned %2                                              |
| 1056 | Error         | Replication control area exchange failed for virtual tape %1 -- the error code is %2                              |
| 1057 | Informational | Replication control area exchange has completed for virtual tape %1                                               |
| 1058 | Informational | Replication has finished for virtual tape %1. %2 KB in %3 seconds (%4KB/sec)                                      |
| 1059 | Error         | Replication failed for virtual tape %1 -- start replication returned %2                                           |
| 1060 | Error         | Rescan replica failed for virtual device %1 -- start scan returned %2                                             |
| 1061 | Warning       | I/O path failure detected. Alternate path will be used. Failed path (A.C.S.L): %1; New path (A.C.S.L): %2         |
| 1062 | Informational | Replication has been started for group %1; it was triggered by the watermark.                                     |
| 1063 | Informational | Replication has been started for group %1; it was triggered by the interval schedule.                             |
| 1064 | Informational | Replication has been started for group %1; it was triggered by the time of day schedule.                          |
| 1065 | Informational | Replication has been started for group %1; it was manually triggered by the administrator.                        |
| 1067 | Error         | Replication cannot proceed -- unable to connect to replica server %1.                                             |
| 1068 | Error         | Replication cannot proceed -- group %1 is corrupt.                                                                |
| 1069 | Error         | Replication cannot proceed -- virtual tape %1 no longer has a replica or the virtual tape replica does not exist. |
| 1070 | Error         | Replication cannot proceed -- replication is already in progress for group %1.                                    |
| 1071 | Error         | Replication cannot proceed -- virtual tape %1 no longer has a replica or the virtual tape replica does not exist. |
| 1072 | Error         | Replication cannot proceed -- missing a remote replica device in group %1.                                        |
| 1073 | Error         | Replication cannot proceed -- unable to open configuration file.                                                  |

| Trap | Severity      | Message                                                                                                                                                                          |
|------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1074 | Error         | Replication cannot proceed -- unable to allocate memory.                                                                                                                         |
| 1075 | Error         | Replication cannot proceed -- unexpected error %1.                                                                                                                               |
| 1076 | Informational | Starting replication for virtual device %1 of group %2 to replica device %3.                                                                                                     |
| 1077 | Informational | Replication for group %1 has completed successfully.                                                                                                                             |
| 1079 | Error         | Replication for group %1 has failed due to error on virtual device %2                                                                                                            |
| 1082 | Error         | Replication for virtual tape %1 has been manually aborted by user                                                                                                                |
| 1083 | Error         | Replication for group %1 has been manually aborted by user                                                                                                                       |
| 1084 | Error         | A SCSI command terminated with a recovered error condition. This may indicate that the device is becoming less reliable. Please check the system log for additional information. |
| 1085 | Error         | for virtual device %1 has been auto-disabled due to an error.                                                                                                                    |
| 1086 | Error         | Replication cannot proceed -- failed to load the virtual tape %1.                                                                                                                |
| 1087 | Error         | Replication cannot proceed -- virtual tape %1 is in the drive.                                                                                                                   |
| 1088 | Error         | Replication cannot proceed -- failed to set initialization status in VirtualLibrary System for virtual tape %1.                                                                  |
| 1089 | Informational | No data has been updated to the virtual tape %1 since last replication. Replication is completed without updating the replica.                                                   |
| 1201 | Warning       | Kernel memory is low. Add more memory to the system if all possible! Restart the host if possible.                                                                               |
| 1202 | Informational | Path trespassed to %1 successfully.                                                                                                                                              |
| 1203 | Error         | Path failed to trespass to %1.                                                                                                                                                   |
| 1204 | Error         | Failed to add path group. ACSL: %1.                                                                                                                                              |
| 1205 | Informational | Activated path successfully: %1.                                                                                                                                                 |
| 1206 | Error         | Failed to activate path: %1.                                                                                                                                                     |
| 1207 | Error         | Critical path failure detected. Path %1 will be removed.                                                                                                                         |
| 1208 | Warning       | Path %1 does not belong to active path group.                                                                                                                                    |
| 1209 | Informational | Rescan the FC adapters is recommended to correct the configuration.                                                                                                              |
| 1210 | Warning       | No valid path is available for device %1.                                                                                                                                        |
| 1211 | Warning       | No valid group is available.                                                                                                                                                     |
| 1212 | Warning       | "No active path group found. Storage connectivity failure. Check cables, switches and storage system to determine cause. GUID: %1."                                              |
| 1213 | Informational | Storage device added new path: %1.                                                                                                                                               |
| 1214 | Error         | Failed to add path: %1.                                                                                                                                                          |
| 2000 | Informational | Path status has changed : %1                                                                                                                                                     |
| 7000 | Informational | Patch %1 installation completed successfully.                                                                                                                                    |
| 7001 | Error         | Patch %1 failed -- environment profile is missing in /etc.                                                                                                                       |

| Trap  | Severity      | Message                                                                                             |
|-------|---------------|-----------------------------------------------------------------------------------------------------|
| 7002  | Error         | Patch %1 failed -- it applies only to build %2.                                                     |
| 7003  | Error         | Patch %1 failed -- you must be the root user to apply the patch.                                    |
| 7004  | Warning       | Patch %1 installation failed -- it has already been applied.                                        |
| 7005  | Error         | Patch %1 installation failed -- prerequisite patch %2 has not been applied.                         |
| 7006  | Error         | Patch %1 installation failed -- cannot copy new binaries.                                           |
| 7007  | Informational | Patch %1 rollback completed successfully.                                                           |
| 7008  | Warning       | Patch %1 rollback failed -- there is no original file to restore.                                   |
| 7009  | Error         | Patch %1 rollback failed -- cannot copy back previous binaries.                                     |
| 10000 | Informational | VTL Server setup has begun.                                                                         |
| 10001 | Error         | Insufficient privilege (uid: %1).                                                                   |
| 10002 | Error         | VTL Server environment is corrupt.                                                                  |
| 10003 | Error         | Failed to initialize configuration %1.                                                              |
| 10004 | Error         | Failed to get SCSI device information.                                                              |
| 10005 | Error         | A physical device will not be available because we cannot create a Global Unique Identifier for it. |
| 10006 | Error         | Failed to write configuration %1.                                                                   |
| 10007 | Informational | VTL Server setup is complete.                                                                       |
| 10050 | Informational | VTL Server FSID update has begun.                                                                   |
| 10051 | Informational | "VTL Server FSID update vdev %1, local sect %2, pdev sect %3, from %4 to %5."                       |
| 10052 | Informational | "VTL Server FSID update pdev a:%1, c:%2, s:%3, l:%4 from %5 to %6."                                 |
| 10053 | Informational | VTL Server FSID update dynamic xml pdev from %1 to %2.                                              |
| 10054 | Error         | VTL Server FSID update error.                                                                       |
| 10055 | Informational | VTL Server FSID update is complete.                                                                 |
| 10056 | Informational | Server Persistent Binding update has begun.                                                         |
| 10057 | Informational | "Server Persistent Binding update, swap binding %1."                                                |
| 10058 | Informational | "Server Persistent Binding update, set default binding for %1."                                     |
| 10059 | Error         | Server Persistent Binding update error.                                                             |
| 10060 | Informational | "Server Persistent Binding update is complete, %1 changes."                                         |
| 10100 | Error         | Failed to scan new SCSI devices.                                                                    |
| 10101 | Error         | Failed to update configuration %1.                                                                  |
| 10102 | Error         | Failed to add new SCSI devices.                                                                     |
| 10200 | Warning       | Configuration %1 exists.                                                                            |
| 10201 | Warning       | Overwriting existing configuration %1.                                                              |
| 10202 | Informational | Cancelled overwriting configuration %1.                                                             |

| Trap  | Severity      | Message                                                                                            |
|-------|---------------|----------------------------------------------------------------------------------------------------|
| 10206 | Informational | Add scsi alias=%1.                                                                                 |
| 10207 | Error         | "Add Adapter %1 failed, not enough memory."                                                        |
| 10208 | Informational | "Set Adapter %1 offline, adapter count %2."                                                        |
| 10209 | Error         | "Add Physical Device %1 failed, not enough memory."                                                |
| 10210 | Warning       | Marked Physical Device [%1] OFFLINE because its GUID: %2 does not match scsi GUID: %3.             |
| 10211 | Warning       | "Marked Physical Device [%1] OFFLINE because its wwid %2 does not match scsi wwid %3, [GUID: %4]." |
| 10212 | Warning       | "Marked Physical Device [%1] OFFLINE because scsi status indicate OFFLINE, [GUID: %2]."            |
| 10213 | Warning       | "Marked Physical Device [%1] OFFLINE because it did not respond correctly to inquiry, [GUID: %2]." |
| 10214 | Warning       | "Marked Physical Device [%1] OFFLINE because its GUID is an invalid FSID, [GUID: %2]."             |
| 10215 | Warning       | "Marked Physical Device [%1] OFFLINE because its storage capacity has changed, [GUID: %2]."        |
| 10240 | Error         | Missing SCSI Alias %1.                                                                             |
| 10241 | Error         | Physical Adapter %1 could not be located in /proc/scsi/.                                           |
| 10242 | Error         | Duplicate Physical Adapter number %1 in /proc/scsi/.                                               |
| 10243 | Error         | Physical Device data structure is null.                                                            |
| 10244 | Error         | "Invalid FSID, device %1 - the LUN byte (4th byte) in FSID %2 does not match actual LUN."          |
| 10245 | Error         | "Invalid FSID, Generate FSID %1 does not match device acsl:%2 GUID %3."                            |
| 10246 | Error         | "Fail to generate FSID for device acsl:%1, can't validate FSID."                                   |
| 10247 | Error         | "Device (acsl:%1) GUID is blank, can't validate FSID."                                             |
| 10248 | Warning       | Remove all scsi alias from %1.                                                                     |
| 10249 | Warning       | Remove missing scsi alias %1 from %2.                                                              |
| 10250 | Warning       | Remove scsi alias %1 from %2 because their categories are different.                               |
| 10251 | Warning       | Remove scsi alias %1 from %2 because their GUIDs are different.                                    |
| 10496 | Error         | Failed to attach tle repository.                                                                   |
| 11000 | Error         | Failed to create socket.                                                                           |
| 11001 | Error         | Failed to set socket to re-use address.                                                            |
| 11002 | Error         | Failed to bind socket to port %1.                                                                  |
| 11003 | Error         | Failed to create TCP service.                                                                      |
| 11004 | Error         | "Failed to register TCP service (program: %1, version: %2)."                                       |
| 11005 | Informational | VTL communication module started.                                                                  |

| Trap  | Severity      | Message                                                                                                                                                                                                                                |
|-------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11006 | Error         | VTL communication module failed to start.                                                                                                                                                                                              |
| 11007 | Warning       | There is not enough disk space available to successfully complete this operation and maintain the integrity of the configuration file. There is currently %1 MB of disk space available. VTL requires %2 MB of disk space to continue. |
| 11010 | Informational | Changed server time to %1.                                                                                                                                                                                                             |
| 11020 | Informational | Auto save configuration enabled: ftp_server=%1 directory=%2 interval=%3 copies=%4.                                                                                                                                                     |
| 11021 | Informational | Auto save configuration enabled: ftp_server=%1 port=%2 directory=%3 interval=%4 copies=%5.                                                                                                                                             |
| 11022 | Informational | Auto save configuration disabled.                                                                                                                                                                                                      |
| 11030 | Error         | Auto save configuration: cannot setup crontab.                                                                                                                                                                                         |
| 11031 | Error         | Auto save configuration: cannot create the running script %1.                                                                                                                                                                          |
| 11032 | Error         | Auto save configuration: cannot connect to ftp server %1 port %2.                                                                                                                                                                      |
| 11033 | Error         | Auto save configuration: cannot login user %1.                                                                                                                                                                                         |
| 11034 | Error         | Auto save configuration: directory %1 doesn't exist.                                                                                                                                                                                   |
| 11035 | Error         | Auto save configuration: failed to copy %1 to ftp server.                                                                                                                                                                              |
| 11036 | Error         | Auto save configuration: failed to delete old file %1 from ftp server.                                                                                                                                                                 |
| 11037 | Informational | Automated Tape Caching is %1 for virtual library %2.                                                                                                                                                                                   |
| 11100 | Informational | SAN Client (%1): SAN Client added.                                                                                                                                                                                                     |
| 11101 | Error         | SAN Client (%1): Failed to add SAN Client.                                                                                                                                                                                             |
| 11102 | Informational | SAN Client (%1): Authentication succeeded.                                                                                                                                                                                             |
| 11103 | Error         | SAN Client (%1): Authentication failed.                                                                                                                                                                                                |
| 11104 | Error         | Too many SAN Client connections.                                                                                                                                                                                                       |
| 11105 | Informational | SAN Client (%1): Logged in.                                                                                                                                                                                                            |
| 11106 | Error         | SAN Client (%1): Failed to log in.                                                                                                                                                                                                     |
| 11107 | Error         | SAN Client (%1): Illegal access.                                                                                                                                                                                                       |
| 11108 | Informational | SAN Client (%1): Logged out.                                                                                                                                                                                                           |
| 11109 | Error         | SAN Client (%1): Failed to open file %2.                                                                                                                                                                                               |
| 11110 | Error         | SAN Client (%1): Failed to get hostname.                                                                                                                                                                                               |
| 11111 | Error         | SAN Client (%1): Failed to resolve hostname %2.                                                                                                                                                                                        |
| 11112 | Error         | SAN Client (%1): Failed to parse configuration file %2.                                                                                                                                                                                |
| 11113 | Error         | SAN Client (%1): Failed to restart authentication module.                                                                                                                                                                              |
| 11114 | Error         | SAN Client (%1): Failed to allocate memory.                                                                                                                                                                                            |
| 11115 | Error         | "SAN Client (%1): License conflict -- Number of CPU's approved: %2, number of CPU's used: %3."                                                                                                                                         |

| Trap  | Severity      | Message                                                                                                                         |
|-------|---------------|---------------------------------------------------------------------------------------------------------------------------------|
| 11170 | Error         | Failed to virtualize LUN %1 because of mismatching size between configuration file and disk. Please do rescan and try it again. |
| 11200 | Error         | Buffer overflow.                                                                                                                |
| 11201 | Error         | Too many Console connections.                                                                                                   |
| 11202 | Error         | Console (%1): Illegal access.                                                                                                   |
| 11203 | Error         | Console (%1): SCSI device re-scanning has failed.                                                                               |
| 11204 | Error         | Console (%1): SCSI device checking has failed.                                                                                  |
| 11205 | Error         | Console (%1): Failed to get information for file %2.                                                                            |
| 11206 | Error         | Console (%1): Failed to allocate memory.                                                                                        |
| 11207 | Error         | Console (%1): Failed to open file %2.                                                                                           |
| 11208 | Error         | Console (%1): Failed to read file %2.                                                                                           |
| 11209 | Error         | Console (%1): Insufficient privilege access.                                                                                    |
| 11210 | Informational | Console (%1): Physical SCSI devices have changed.                                                                               |
| 11211 | Error         | Console (%1): Failed to save file %2.                                                                                           |
| 11212 | Error         | Console (%1): Failed to create index file %2 for Event Log.                                                                     |
| 11213 | Error         | Console (%1): Illegal time range (%2 - %3) for Event Log.                                                                       |
| 11214 | Error         | Console (%1): Failed to get Event Log (%2 - %3).                                                                                |
| 11215 | Error         | Console (%1): Failed to open directory %2.                                                                                      |
| 11216 | Error         | Console (%1): Out of system resources. Failed to fork process.                                                                  |
| 11217 | Error         | Console (%1): Failed to execute program %2.                                                                                     |
| 11218 | Error         | Console (%1): Failed to remove file %2.                                                                                         |
| 11219 | Error         | Console (%1): Failed to add device %2.                                                                                          |
| 11220 | Error         | Console (%1): Failed to remove device %2.                                                                                       |
| 11221 | Error         | Console (%1): Failed to add SAN Client (%2) to virtual device %3.                                                               |
| 11222 | Error         | Console (%1): Failed to remove SAN Client (%2) from virtual device %3.                                                          |
| 11223 | Informational | Console (%1): Logged in with read/write privileges.                                                                             |
| 11224 | Informational | Console (%1): Logged in with read only privileges.                                                                              |
| 11225 | Informational | Console (%1): Logged out.                                                                                                       |
| 11226 | Informational | Console (%1): Configuration file %2 saved.                                                                                      |
| 11227 | Informational | Console (%1): Virtual device %2 added.                                                                                          |
| 11228 | Informational | Console (%1): Virtual device %2 removed.                                                                                        |
| 11229 | Informational | Console (%1): SAN Client (%2) added to virtual device %3.                                                                       |
| 11230 | Informational | Console (%1): SAN Client (%2) removed from virtual device %3.                                                                   |
| 11231 | Error         | Console (%1): Failed to get CPU status.                                                                                         |

| Trap  | Severity      | Message                                                                         |
|-------|---------------|---------------------------------------------------------------------------------|
| 11232 | Error         | Console (%1): Failed to get memory status.                                      |
| 11233 | Error         | Console (%1): Failed to map the SCSI device name for [%2 %3 %4 %5].             |
| 11234 | Error         | Console (%1): Failed to execute "hdparm" for %2."                               |
| 11235 | Error         | Console (%1): Failed to get the VTL Server module status.                       |
| 11236 | Error         | Console (%1): Failed to get the version information for the message file.       |
| 11237 | Error         | Console (%1): Failed to get file %2.                                            |
| 11238 | Error         | Console (%1): Failed to restart the authentication module.                      |
| 11239 | Informational | Console (%1): Authentication module restarted.                                  |
| 11240 | Error         | Console (%1): Failed to start the VTL Server module.                            |
| 11241 | Informational | Console (%1): VTL Server module started.                                        |
| 11242 | Error         | Console (%1): Failed to stop the VTL Server module.                             |
| 11243 | Informational | Console (%1): VTL Server module stopped.                                        |
| 11244 | Error         | Console (%1): Failed to access the VTL administrator list.                      |
| 11245 | Error         | Console (%1): Failed to add user %2.                                            |
| 11246 | Informational | Console (%1): User %2 added.                                                    |
| 11247 | Error         | Console (%1): Failed to delete user %2.                                         |
| 11248 | Informational | Console (%1): User %2 deleted.                                                  |
| 11249 | Error         | Console (%1): Failed to reset password for user %2.                             |
| 11250 | Informational | Console (%1): Password for user %2 reset.                                       |
| 11251 | Error         | Console (%1): Failed to update password for user %2.                            |
| 11252 | Informational | Console (%1): Password for user %2 updated.                                     |
| 11253 | Error         | Console (%1): Failed to modify virtual device %2.                               |
| 11254 | Informational | Console (%1): Virtual device %2 modified.                                       |
| 11255 | Error         | Console (%1): Failed to modify virtual device %3 for SAN Client (%2).           |
| 11256 | Informational | Console (%1): Virtual device %3 for SAN Client (%2) modified.                   |
| 11257 | Error         | Console (%1): Failed to add SAN Client (%2).                                    |
| 11258 | Informational | Console (%1): SAN Client (%2) added.                                            |
| 11259 | Error         | Console (%1): Failed to delete SAN Client (%2).                                 |
| 11260 | Informational | Console (%1): SAN Client (%2) deleted.                                          |
| 11261 | Error         | Console (%1): Failed to get SAN Client connection status for virtual device %2. |
| 11262 | Error         | Console (%1): Failed to parse configuration file %2.                            |
| 11263 | Error         | Console (%1): Failed to restore configuration file %2.                          |
| 11264 | Informational | Console (%1): Configuration file %2 restored.                                   |

| Trap  | Severity      | Message                                                                      |
|-------|---------------|------------------------------------------------------------------------------|
| 11265 | Error         | Console (%1): Failed to restart IOCore module.                               |
| 11266 | Error         | Console (%1): Failed to erase partition of virtual device %2.                |
| 11267 | Informational | Console (%1): Virtual device %2 partition erased.                            |
| 11268 | Error         | Console (%1): Failed to update meta information of virtual device %2.        |
| 11269 | Error         | Console (%1): Failed to get ID for SAN Client (%2).                          |
| 11270 | Error         | Console (%1): Failed to add mirror for virtual device %2.                    |
| 11271 | Informational | Console (%1): Mirror added for virtual device %2.                            |
| 11272 | Error         | Console (%1): Failed to remove mirror for virtual device %2.                 |
| 11273 | Informational | Console (%1): Mirror removed for virtual device %2.                          |
| 11274 | Error         | Console (%1): Failed to stop mirroring for virtual device %2.                |
| 11275 | Informational | Console (%1): Mirroring stopped for virtual device %2.                       |
| 11276 | Error         | Console (%1): Failed to start mirror synchronization for virtual device %2.  |
| 11277 | Informational | Console (%1): Mirror synchronization for virtual device %2 started.          |
| 11278 | Error         | Console (%1): Failed to swap mirror for virtual device %2.                   |
| 11279 | Informational | Console (%1): Mirror swapped for virtual device %2.                          |
| 11280 | Error         | Console (%1): Failed to create shared secret for VTL Server %2.              |
| 11281 | Informational | Console (%1): Shared secret created for VTL Server %2.                       |
| 11282 | Error         | Console (%1): Failed to change device category for physical device %2 to %3. |
| 11283 | Informational | Console (%1): Device category changed for physical device %2 to %3.          |
| 11284 | Error         | Console (%1): Failed to get raw device name for physical device %2.          |
| 11285 | Error         | Console (%1): Failed to execute failover command (%2).                       |
| 11286 | Informational | Console (%1): Failover command executed (%2).                                |
| 11287 | Error         | Console (%1): Failed to set failover mode (%2).                              |
| 11288 | Informational | Console (%1): Failover mode set (%2).                                        |
| 11289 | Error         | Console (%1): Failed to restart VTL Server module.                           |
| 11290 | Informational | Console (%1): VTL Server module restarted.                                   |
| 11291 | Error         | Console (%1): Failed to update meta information of physical device %2.       |
| 11292 | Error         | Console (%1): Failed to swap IP address from %2 to %3.                       |
| 11293 | Informational | Console (%1): IP address swapped from %2 to %3.                              |
| 11294 | Error         | Console (%1): Failed to get host name.                                       |
| 11295 | Error         | Console (%1): Invalid configuration format.                                  |
| 11296 | Error         | Console (%1): Failed to resolve host name -- %2.                             |
| 11297 | Informational | Console (%1): Report file %2 removed.                                        |

| Trap  | Severity      | Message                                                                       |
|-------|---------------|-------------------------------------------------------------------------------|
| 11298 | Error         | Console (%1): Failed to reset cache on target device %2 (ID: %3) for %4 copy. |
| 11300 | Error         | Invalid user name (%1) used by client at IP address %2.                       |
| 11301 | Error         | Invalid password for user (%1) used by client at IP address %2.               |
| 11302 | Error         | Invalid passcode for machine (%1) used by client at IP address %2.            |
| 11303 | Error         | Authentication failed in stage %1 for client at IP address %2.                |
| 11304 | Informational | User %1 at IP address %2 authenticated.                                       |
| 11305 | Informational | Machine %1 at IP address %2 authenticated.                                    |
| 11306 | Error         | The VTL Administrator group does not exist.                                   |
| 11307 | Error         | User %1 at IP address %2 is not a member of the VTL Administrator's group.    |
| 11308 | Error         | The VTL Client group does not exist.                                          |
| 11309 | Error         | User ID %1 at IP address %2 is invalid.                                       |
| 11310 | Error         | VTL Client User name %1 does not match with the client name %2.               |
| 11311 | Error         | Client agent %1 failed to request license.                                    |
| 11312 | Informational | Client agent %1 requested license successfully.                               |
| 11313 | Error         | Client agent %1 failed to release license.                                    |
| 11314 | Informational | Client agent %1 released license successfully.                                |
| 11400 | Error         | Failed to communicate with the Self-Monitor module.                           |
| 11401 | Error         | Failed to release IP address %1.                                              |
| 11402 | Error         | Failed to read %1.                                                            |
| 11403 | Error         | Failed to retrieve authentication information.                                |
| 11404 | Error         | Failed to merge authentication information.                                   |
| 11405 | Error         | Failed to obtain IP address %1.                                               |
| 11406 | Error         | Failed to prepare the failover configuration package -- %1.                   |
| 11407 | Error         | Failed to extract the failover configuration package -- %1.                   |
| 11408 | Warning       | Synchronizing the system time with %1. A system reboot is recommended.        |
| 11500 | Error         | Out of disk space to expand virtual tape %1.                                  |
| 11501 | Error         | Failed to expand virtual tape %1: maximum segment exceeded (error code %2).   |
| 11502 | Error         | Failed to expand virtual tape %1 (segment allocation error code %2).          |
| 11503 | Informational | Expand %1 by %2 MBytes.                                                       |
| 11504 | Error         | Failed to expand virtual tape id %1 by %2 MBytes.                             |
| 11505 | Error         | Failed to change virtual tape %1 to direct link mode.                         |
| 11507 | Error         | Console (%1): Failed to create X-Ray file.                                    |
| 11508 | Error         | Console (%1): Failed to set the properties for the VTL Server.                |

| Trap  | Severity      | Message                                                                                                                                                                          |
|-------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11509 | Informational | Console (%1): Properties set for the VTL Server.                                                                                                                                 |
| 11510 | Error         | Console (%1): Failed to save report -- %2.                                                                                                                                       |
| 11511 | Error         | Console (%1): Failed to get the information for the NIC.                                                                                                                         |
| 11512 | Error         | "Console (%1): Failed to add a replica for virtual tape %2 to VTL Server %3 (watermark: %4 MB, time: %5, interval: %6, watermark retry: %7, suspended: %8)."                     |
| 11513 | Informational | "Console (%1): Replica for virtual tape %2 was added to VTL Server %3 (watermark: %4 MB, time: %5, interval: %6, watermark retry: %7, suspended: %8)."                           |
| 11514 | Error         | "Console (%1): Failed to remove the replica for virtual tape %2 from VTL Server %3 (watermark: %4 MB, time: %5, interval: %6, watermark retry: %7, suspended: %8)."              |
| 11515 | Informational | "Console (%1): Replica for virtual tape %2 was removed from VTL Server %3 (watermark: %4 MB, time: %5, interval: %6, watermark retry: %7, suspended: %8)."                       |
| 11516 | Error         | Console (%1): Failed to create the virtual tape replica %2.                                                                                                                      |
| 11517 | Informational | Console (%1): Virtual tape replica %2 was created.                                                                                                                               |
| 11518 | Error         | Console (%1): Failed to start replication for virtual tape %2.                                                                                                                   |
| 11519 | Informational | Console (%1): Replication for virtual tape %2 started.                                                                                                                           |
| 11520 | Error         | Console (%1): Failed to stop replication for virtual tape %2.                                                                                                                    |
| 11521 | Informational | Console (%1): Replication for virtual tape %2 stopped.                                                                                                                           |
| 11522 | Error         | Console (%1): Failed to promote virtual tape replica %2 to a virtual tape.                                                                                                       |
| 11523 | Informational | Console (%1): Virtual tape replica %2 promoted to a virtual tape.                                                                                                                |
| 11524 | Error         | Console (%1): Failed to run VTL Server X-Ray.                                                                                                                                    |
| 11525 | Informational | Console (%1): VTL Server X-Ray has been run.                                                                                                                                     |
| 11530 | Error         | Console (%1): Failed to back up configuration files.                                                                                                                             |
| 11531 | Informational | Console (%1): Backed up Configuration files successfully.                                                                                                                        |
| 11532 | Error         | Console (%1): Failed to restore configuration files.                                                                                                                             |
| 11533 | Informational | Console (%1): Restored VTL configuration files successfully.                                                                                                                     |
| 11534 | Error         | Console (%1): Failed to reset the umap for virtual device %2.                                                                                                                    |
| 11535 | Error         | "Console (%1): Failed to update the replication parameters for virtual tape %2 to VTL Server %3 (watermark: %4 MB, time: %5, interval: %6, watermark retry: %7, suspended: %8)." |
| 11536 | Informational | "Console (%1): Replication parameters for virtual tape %2 to VTL Server %3 updated (watermark: %4 MB, time: %5, interval: %6, watermark retry: %7, suspended: %8)."              |
| 11537 | Error         | Console (%1): Failed to claim physical device %2.                                                                                                                                |
| 11538 | Informational | Console (%1): Physical device %2 has been claimed.                                                                                                                               |

| Trap  | Severity      | Message                                                                                            |
|-------|---------------|----------------------------------------------------------------------------------------------------|
| 11539 | Error         | Console (%1): Failed to import physical device %2.                                                 |
| 11540 | Error         | "Console (%1): Host name mismatch (old: %2, new: %3)."                                             |
| 11541 | Error         | Console (%1): Failed to save event message (ID: %2).                                               |
| 11542 | Error         | Console (%1): Failed to remove virtual tape replica %2.                                            |
| 11543 | Informational | Console (%1): Virtual tape replica %2 removed.                                                     |
| 11544 | Error         | Console (%1): Failed to modify virtual tape replica %2.                                            |
| 11545 | Informational | Console (%1): Virtual tape replica %2 modified.                                                    |
| 11546 | Error         | Console (%1): Failed to mark the replication for virtual tape %2.                                  |
| 11547 | Informational | Console (%1): Replication for virtual tape %2 is marked in sync.                                   |
| 11548 | Error         | Console (%1): Failed to determine if data was written to virtual device %2.                        |
| 11549 | Error         | "Console (%1): Failed to set option ""%2 %3.""                                                     |
| 11550 | Informational | "Console (%1): Option ""%2 %3"" set."                                                              |
| 11553 | Error         | Console (%1): Failed to get login user list.                                                       |
| 11554 | Error         | Console (%1): Failed to set failover option <selfCheckInterval: %d sec>.                           |
| 11555 | Informational | Console (%1): Failover option <self check interval: %2 sec> has been set.                          |
| 11560 | Error         | Console (%1): Failed to get licenses.                                                              |
| 11561 | Error         | Console (%1): Failed to add license %2.                                                            |
| 11562 | Informational | Console (%1): License %2 added.                                                                    |
| 11563 | Error         | Console (%1): Failed to remove license %2.                                                         |
| 11564 | Informational | Console (%1): License %2 removed.                                                                  |
| 11565 | Error         | Console (%1): Failed to check licenses -- option mask %2.                                          |
| 11566 | Error         | "Console (%1): License conflict -- Number of CPU's available: %2, number of CPU's used: %3."       |
| 11567 | Error         | Console (%1): Failed to clean up failover server directory %2.                                     |
| 11568 | Error         | Console (%1): Failed to set (%2) I/O Core for failover -- Failed to create failover configuration. |
| 11569 | Error         | Console (%1): Failed to set %2 to Fibre Channel mode %3.                                           |
| 11570 | Informational | Console (%1): Set %2 to Fibre Channel mode %3.                                                     |
| 11571 | Error         | Console (%1): Failed to assign Fibre Channel device %2 to %3 (rolled back).                        |
| 11572 | Error         | Console (%1): Failed to assign Fibre Channel device %2 to %3 (not rolled back).                    |
| 11573 | Informational | Console (%1): Fibre Channel device %2 assigned to %3.                                              |
| 11574 | Error         | Console (%1): Failed to unassign Fibre Channel device %2 from %3 (rolled back) and returns %4.     |

| Trap  | Severity      | Message                                                                                                                        |
|-------|---------------|--------------------------------------------------------------------------------------------------------------------------------|
| 11575 | Error         | Console (%1): Failed to unassign Fibre Channel device %2 from %3 (not rolled back) and returns %4.                             |
| 11576 | Informational | Console (%1): Fibre Channel device %2 unassigned from %3.                                                                      |
| 11577 | Error         | Console (%1): Failed to get Fibre Channel target information.                                                                  |
| 11578 | Error         | Console (%1): Failed to get Fibre Channel initiator information.                                                               |
| 11579 | Error         | Console (%1): Failed to set %2 to Fibre Channel authentication mode %3.                                                        |
| 11580 | Informational | Console (%1): Set %2 Fibre Channel Properties.                                                                                 |
| 11583 | Informational | Console (%1): Failed to update Fibre Channel client (%2) WWPNs.                                                                |
| 11584 | Informational | Console (%1): Fibre Channel client (%2) WWPNs updated.                                                                         |
| 11585 | Error         | Console (%1): Failed to set Fibre Channel option %2.                                                                           |
| 11586 | Informational | Console (%1): Set Fibre Channel option to %2.                                                                                  |
| 11587 | Error         | Console (%1): Failed to demote virtual device %2 to a replica.                                                                 |
| 11588 | Informational | Console (%1): Virtual device %2 demoted to a replica.                                                                          |
| 11589 | Error         | Authentication failed to connect to client %1 and returned %2.                                                                 |
| 11592 | Error         | Console (%1): Failed to sync replication status for virtual tape %2 to the new target server.                                  |
| 11594 | Error         | Console (%1): Failed to set CallHome option %2.                                                                                |
| 11595 | Informational | Console (%1): Set CallHome option to %2.                                                                                       |
| 11596 | Error         | Console (%1): Failed to set hostedbackup option %2.                                                                            |
| 11597 | Informational | Console (%1): Set hostedbackup option to %2.                                                                                   |
| 11598 | Informational | Console (%1): Failed to set hostedbackup option %2 because of conflicting adapter number %3.                                   |
| 11599 | Informational | Console (%1): Set ndmp option to %2.                                                                                           |
| 11616 | Informational | Console (%1): Replication schedule for virtual tape %2 id %3 suspended.                                                        |
| 11617 | Informational | Console (%1): Replication schedule for virtual tape %2 id %3 resumed.                                                          |
| 11632 | Error         | "Console (%1): Failed to set failover option on secondary server <heartbeatInterval: %2 sec, autoRecoveryInterval: %3 sec>."   |
| 11633 | Error         | "Console (%1): Failed to set failover option on secondary server <heartbeatInterval: %2 sec, autoRecoveryInterval: disabled>." |
| 11634 | Informational | "Console (%1): Failover option on secondary server <heartbeatInterval: %2 sec, autoRecoveryInterval: %3 sec> has been set."    |
| 11635 | Informational | "Console (%1): Failover option on secondary server <heartbeatInterval: %2 sec, autoRecoveryInterval: disabled> has been set."  |
| 11648 | Error         | Failed to get inquiry string on SCSI device %1.                                                                                |
| 11649 | Error         | Failed to convert inquiry string on SCSI device %1.                                                                            |
| 11650 | Error         | Failed to get capacity size for SCSI device %1.                                                                                |

| Trap  | Severity      | Message                                                                                         |
|-------|---------------|-------------------------------------------------------------------------------------------------|
| 11651 | Error         | Medium Test failed for SCSI device %1.                                                          |
| 11652 | Error         | "Could not get type for SCSI device %1, because of inquiry string failure."                     |
| 11653 | Error         | "Discarded scsi device %1, unsupported type "%2"."                                              |
| 11654 | Error         | "Discarded scsi device %1, missing MTI vendor in inquiry string."                               |
| 11655 | Error         | "Discarded scsi device %1, bad capacity size."                                                  |
| 11656 | Error         | "Discarded scsi device %1, unsupported Cabinet ID."                                             |
| 11657 | Error         | "Discarded scsi device %1, missing "%2" vendor in inquiry string."                              |
| 11664 | Informational | Console (%1): Enable backup for virtual device %2.                                              |
| 11666 | Informational | Console (%1): Disable backup for virtual device %2.                                             |
| 11669 | Informational | Console (%1): Stopped active backup sessions for virtual device %2.                             |
| 11674 | Informational | Console (%1): Virtual tape %2 is in replication session.                                        |
| 11675 | Informational | Console (%1): Virtual device %2 is in backup session.                                           |
| 11680 | Informational | Console (%1): Cache resource %2 (ID: %3) resumed successfully.                                  |
| 11682 | Informational | Console (%1): Cache resource %2 (ID: %3) suspended successfully.                                |
| 11685 | Informational | Console (%1): %2 Resource %3 (ID: %4) added successfully.                                       |
| 11687 | Informational | Console (%1): %2 Resource %3 (ID: %4) deleted successfully.                                     |
| 11689 | Informational | Console (%1): resource %2 (ID: %3) resumed successfully.                                        |
| 11691 | Informational | Console (%1): resource %2 (ID: %3) suspended successfully.                                      |
| 11693 | Error         | Console (%1): policy for resource %2 (ID: %3) updated successfully.                             |
| 11694 | Error         | Console (%1): Failed to update policy for resource %2 (ID: %3).                                 |
| 11695 | Error         | Console (%1): Failed to get statistic information.                                              |
| 11696 | Error         | Console (%1): Failed to get status.                                                             |
| 11699 | Error         | Console (%1): Failed to get port mapping for adapter no %2 persistent binding.                  |
| 11702 | Informational | VirtualTape Library Emulation option was enabled successfully.                                  |
| 11703 | Informational | VirtualTape Library Emulation option was disabled successfully.                                 |
| 11704 | Error         | Console (%1): The configuration file update for %2 %3(s) was rolled back.                       |
| 11705 | Error         | Console (%1): The disk partition update for %2 %3(s) was rolled back.                           |
| 11706 | Error         | Console (%1): The device creation for %2 %3(s) was rolled back.                                 |
| 11707 | Error         | Console (%1): Failed to create %2 %3(s). Error: %4.                                             |
| 11708 | Informational | Console (%1): %2 %3(s) created successfully.                                                    |
| 11709 | Error         | Console (%1): The configuration file update for replication setup for %2 %3(s) was rolled back. |
| 11710 | Error         | Console (%1): The disk partition update for replication setup for %2 %3(s) was rolled back.     |

| Trap  | Severity      | Message                                                                                           |
|-------|---------------|---------------------------------------------------------------------------------------------------|
| 11711 | Error         | Console (%1): The replication setup for %2 %3(s) was rolled back.                                 |
| 11712 | Error         | Console (%1): Failed to configure replication for %2 %3(s). Error: %4.                            |
| 11713 | Informational | Console (%1): Replication for %2 %3(s) configured successfully.                                   |
| 11714 | Error         | Console (%1): The configuration file update for replication removal for %2 %3(s) was rolled back. |
| 11715 | Error         | Console (%1): The disk partition update for replication removal for %2 %3(s) was rolled back.     |
| 11716 | Error         | Console (%1): The replication removal for %2 %3(s) was rolled back.                               |
| 11717 | Error         | Console (%1): Failed to remove replication for %2 %3(s). Error: %4.                               |
| 11718 | Informational | Console (%1): Replication for %2 %3(s) removed successfully.                                      |
| 11719 | Error         | Console (%1): The configuration file update for deleting %2 %3(s) was rolled back.                |
| 11720 | Error         | Console (%1): The disk partition update for deleting %2 %3(s) was rolled back.                    |
| 11721 | Error         | Console (%1): The deletion of %2 %3(s) was rolled back.                                           |
| 11722 | Error         | Console (%1): Failed to delete %2 %3(s). Error: %4.                                               |
| 11723 | Informational | Console (%1): %2 %3(s) are deleted successfully.                                                  |
| 11724 | Error         | Console (%1): The configuration file update for promoting %2 %3(s) was rolled back.               |
| 11725 | Error         | Console (%1): The disk partition update for promoting %2 %3(s) was rolled back.                   |
| 11726 | Error         | Console (%1): The promotion of %2 %3(s) was rolled back.                                          |
| 11727 | Error         | Console (%1): Failed to promote %2 %3(s). Error: %4.                                              |
| 11728 | Informational | Console (%1): %2 %3(s) are promoted successfully.                                                 |
| 11729 | Error         | Console (%1): Failed to update replication properties for %2 %3(s). Error: %4.                    |
| 11730 | Informational | Console (%1): Replication properties for %2 %3(s) are updated successfully.                       |
| 11731 | Error         | Console (%1): Failed to update replica properties for %2 %3(s). Error: %4.                        |
| 11732 | Informational | Console (%1): Replica properties for %2 %3(s) are updated successfully.                           |
| 11733 | Informational | Console (%1): Virtual library %2 created successfully.                                            |
| 11734 | Error         | Console (%1): The configuration file update for virtual library creation was rolled back.         |
| 11735 | Error         | Console (%1): Adding virtual library to the system was rolled back.                               |
| 11736 | Error         | Console (%1): Failed to create virtual library. Error: %2.                                        |
| 11737 | Informational | Console (%1): %2 virtual tape drives created successfully.                                        |
| 11738 | Error         | Console (%1): The configuration file update for virtual drive creation was rolled back.           |
| 11739 | Error         | Console (%1): Adding virtual tape drives to the system was rolled back.                           |

| Trap  | Severity      | Message                                                                                                         |
|-------|---------------|-----------------------------------------------------------------------------------------------------------------|
| 11740 | Error         | Console (%1): Failed to create virtual tape drives. Error: %2.                                                  |
| 11750 | Informational | Console (%1): Add VirtualTape Library Emulation option successfully.                                            |
| 11751 | Informational | Console (%1): Remove VirtualTape Library Emulation option successfully.                                         |
| 11780 | Informational | Tape id %1 [%2] is enabled with auto-replication move mode and will be deleted in %3 at about %4.               |
| 11781 | Informational | The scheduled deletion for virtual tape id %1 is cancelled.                                                     |
| 11782 | Error         | Barcode [%1] of the source tape id %2 already exist on target server %3. Auto-replication cannot be configured. |
| 11783 | Error         | Failed to setup auto-replication for tape id %1 on target server %2. Error: %3.                                 |
| 11788 | Error         | Appliance Hardware Problem: %1.                                                                                 |
| 11791 | Error         | Failed to re-size virtual tape %1 to %2 MB. Error: %3.                                                          |
| 11792 | Informational | Virtual tape %1 is resized to %2 MB successfully.                                                               |
| 11793 | Warning       | Appliance Hardware Problem: %1.                                                                                 |
| 11794 | Informational | FC client %1 VSA mode is changed from %2 to %3.                                                                 |
| 11795 | Informational | FC client %1 celerra mode is changed from %2 to %3.                                                             |
| 11900 | Error         | Failed to import report request.                                                                                |
| 11901 | Error         | Failed to parse report request %1 %2.                                                                           |
| 11902 | Error         | Undefined report type %1.                                                                                       |
| 11903 | Error         | Failed to allocate memory.                                                                                      |
| 11904 | Error         | Failed to create directory %1.                                                                                  |
| 11905 | Informational | Directory %1 created.                                                                                           |
| 11906 | Error         | Failed to open file %1.                                                                                         |
| 11907 | Error         | Failed to write file %1.                                                                                        |
| 11908 | Warning       | File %1 does not exist.                                                                                         |
| 11909 | Error         | Failed to parse log file %1 %2.                                                                                 |
| 11910 | Error         | Failed to create report file %2 (type %1).                                                                      |
| 11911 | Informational | Report file %2 (type %1) created.                                                                               |
| 11912 | Informational | %1 property set for the VTL server.                                                                             |
| 12000 | Informational | VTL logger started.                                                                                             |
| 12001 | Error         | VTL logger stopped.                                                                                             |
| 12002 | Error         | Failed to open directory %1.                                                                                    |
| 12003 | Error         | Failed to open file %1.                                                                                         |
| 12004 | Error         | Failed to create directory %1.                                                                                  |

| Trap  | Severity      | Message                                                                                                             |
|-------|---------------|---------------------------------------------------------------------------------------------------------------------|
| 12005 | Error         | Failed to allocate memory.                                                                                          |
| 12006 | Warning       | Log size warning.                                                                                                   |
| 12007 | Error         | Failed to delete file %1.                                                                                           |
| 12008 | Error         | Wrong file format %1.                                                                                               |
| 12009 | Error         | Missing parameter %1.                                                                                               |
| 12010 | Error         | Invalid parameter %1.                                                                                               |
| 12011 | Error         | Wrong status for file %1.                                                                                           |
| 13000 | Informational | "VTL Failover Module started -- [Primary %1, IP %3, Heartbeat %4] [Secondary %2] (HBInterval %5) (AutoRecovery %6)" |
| 13001 | Informational | The VTL Console has requested that this server take over for the primary server.                                    |
| 13002 | Informational | Transferring primary static configuration to secondary.                                                             |
| 13003 | Informational | Transferring primary dynamic configuration to secondary.                                                            |
| 13004 | Informational | Transferring primary credential information to secondary.                                                           |
| 13005 | Informational | Taking over tasks for the primary server.                                                                           |
| 13006 | Informational | The primary VTL Server is recovering.                                                                               |
| 13007 | Informational | Restoring this server to its original configuration.                                                                |
| 13008 | Informational | VTL Failover Module stopped.                                                                                        |
| 13009 | Informational | Synchronizing the VTL configuration with the primary server.                                                        |
| 13100 | Error         | fail to retrieve primary's heartbeat information.                                                                   |
| 13101 | Error         | Failed to communicate with primary. Error: %1                                                                       |
| 13102 | Error         | Failed to run %1.                                                                                                   |
| 13103 | Informational | The system times of the failover pair differ by more than %1 second(s).                                             |
| 13300 | Error         | Failed to authenticate to the primary server -- Failover Module stopped.                                            |
| 13301 | Error         | Failed to authenticate to the local server -- Failover Module stopped.                                              |
| 13302 | Error         | Failed to transfer primary static configuration to secondary.                                                       |
| 13303 | Error         | Failed to transfer primary dynamic configuration to secondary.                                                      |
| 13304 | Error         | Failed to rename file %1.                                                                                           |
| 13305 | Error         | Failed to write to file %1.                                                                                         |
| 13306 | Error         | Failed to open file %1.                                                                                             |
| 13307 | Error         | Failed to transfer primary credential information to secondary.                                                     |
| 13308 | Error         | Invalid failover configuration detected. Failover will not occur.                                                   |
| 13309 | Error         | Primary server failed to respond command from secondary. Error: %1.                                                 |
| 13310 | Error         | Failed to copy from %1 to %2.                                                                                       |

| Trap  | Severity      | Message                                                                                                                                   |
|-------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| 13311 | Error         | Failed to merge static configuration for the primary server.                                                                              |
| 13312 | Error         | Failed to merge dynamic configuration for the primary server.                                                                             |
| 13313 | Error         | Out of memory -- %1.                                                                                                                      |
| 13314 | Error         | Failed to read from file %1.                                                                                                              |
| 13315 | Error         | Failed to merge authentication information for the primary server.                                                                        |
| 13316 | Error         | Fail to add virtual IP address. Error: %1.                                                                                                |
| 13317 | Error         | Fail to release virtual IP address. Error: %1.                                                                                            |
| 13318 | Error         | Failed to restore authentication information for this server.                                                                             |
| 13319 | Error         | Fail to stop VTL failover module. Host may need to reboot.                                                                                |
| 13320 | Error         | Failed to update the configuration files to the primary server -- %1.                                                                     |
| 13500 | Informational | VTL Self-Monitor Module started -- (%1)(%2)                                                                                               |
| 13501 | Informational | all VTL related processes and resources function normally                                                                                 |
| 13502 | Informational | Take back the virtual IP address: %1.                                                                                                     |
| 13503 | Warning       | No heartbeat request detected for %1 seconds.                                                                                             |
| 13504 | Informational | Stopping Self-Monitor module.                                                                                                             |
| 13600 | Informational | Releasing virtual IP address: %1.                                                                                                         |
| 13700 | Error         | Failed to allocate memory -- Self-Monitor Module stopped.                                                                                 |
| 13701 | Error         | Failed to release virtual IP address. Error: %1. Retrying the operation.                                                                  |
| 13702 | Error         | Failed to add virtual IP address: %1. Retrying the operation.                                                                             |
| 13703 | Error         | Failed to stop VTL Self-Monitor Module.                                                                                                   |
| 13704 | Error         | VTL module failure detected. Condition: %1.                                                                                               |
| 13710 | Warning       | "The Live Trial period has expired for VTL Server %1. Please contact Sun Microsystems, Inc. or its representative to purchase a license." |
| 13711 | Warning       | "The following options are not licensed: %1. Please contact Sun Microsystems, Inc. or its representative to purchase a license."          |
| 13800 | Critical      | Primary server failure detected. Failure condition: %1                                                                                    |
| 13801 | Informational | Secondary server will take over primary server operation.                                                                                 |
| 13802 | Informational | Manual failover initiated.                                                                                                                |
| 13803 | Informational | Primary acknowledged takeover request. Resources are released.                                                                            |
| 13804 | Informational | Quorum disk failed to release to secondary.                                                                                               |
| 13805 | Informational | Virtual drives released successfully.                                                                                                     |
| 13808 | Informational | IP address released successfully.                                                                                                         |
| 13809 | Informational | Failover completed successfully.                                                                                                          |
| 13810 | Informational | Primary server restored. Waiting for failback.                                                                                            |

| Trap  | Severity      | Message                                                                                                   |
|-------|---------------|-----------------------------------------------------------------------------------------------------------|
| 13811 | Informational | Primary server failback initiated.                                                                        |
| 13812 | Informational | Server IP address add successfully.                                                                       |
| 13814 | Informational | Quorum disk returned to primary.                                                                          |
| 13815 | Informational | Virtual drives added successfully.                                                                        |
| 13816 | Informational | Primary server restored.                                                                                  |
| 13817 | Critical      | Primary server failback was unsuccessful. Failed to update the primary configuration.                     |
| 13818 | Error         | Quorum disk negotiation failed.                                                                           |
| 13820 | Warning       | Failed to detect primary server heartbeat.                                                                |
| 13821 | Error         | Failed to contact other entities in network. Assume failure in secondary side. Failover not initiated.    |
| 13822 | Warning       | Secondary will not take over because storage connectivity is not 100%.                                    |
| 13823 | Warning       | Primary failed to acknowledge takeover request in time. Secondary will take over forcefully.              |
| 13824 | Informational | Environment variable ISFCFORPCTO set to %1                                                                |
| 13825 | Informational | Environment variable ISFOQUORUMREQ set to %1                                                              |
| 13826 | Informational | Environment variable ISFOQUORUMCON set to %1                                                              |
| 13827 | Error         | Fail to stop quorum updating process. PID: %1. Maybe due to storage device or connection failure.         |
| 13828 | Informational | "Almost running out of file handlers (current %1, max %2)"                                                |
| 13829 | Informational | "Almost running out of memory (current %1 K, max %2 K)"                                                   |
| 13830 | Error         | Get configuration file from storage failed.                                                               |
| 13831 | Informational | Get configuration file from storage successful.                                                           |
| 13832 | Error         | "Primary server operation is resumed either by user initiated action, or secondary server is suspended.." |
| 13833 | Error         | Failed to backup file from %1 to %2.                                                                      |
| 13834 | Error         | Failed to copy file out from Quorum repository.                                                           |
| 13835 | Error         | Failed to take over primary.                                                                              |
| 13836 | Error         | Failed to get configuration files from repository. Check and correct the configuration disk.              |
| 13837 | Informational | Configuration files retrieved from repository successfully.                                               |
| 13838 | Informational | Successfully copy file out from Quorum repository.                                                        |
| 13839 | Informational | Secondary server initiated failback to primary (%1) .                                                     |
| 13840 | Informational | Secondary server will take over (%1).                                                                     |
| 13841 | Error         | Secondary server does not match primary server status (%1).                                               |
| 13842 | Warning       | Secondary server will takeover. Primary is still down.                                                    |

| Trap  | Severity      | Message                                                                                                                 |
|-------|---------------|-------------------------------------------------------------------------------------------------------------------------|
| 13843 | Error         | Secondary server fail to get original conf file from repository before failback .                                       |
| 13844 | Error         | Failed to write %1 to repository.                                                                                       |
| 13845 | Warning       | Quorum disk failure detected. Secondary is still in takeover mode.                                                      |
| 13846 | Informational | Force takeover is initiated. Secondary will perform SCSI reserve to lock the storage.                                   |
| 13847 | Informational | Secondary server is performing SCSI release to storage.                                                                 |
| 13848 | Warning       | Primary is already shut down. Secondary will take over immediately.                                                     |
| 13849 | Warning       | One of the heartbeat channels is down: IP address: %1.                                                                  |
| 13850 | Error         | "Secondary server can not locate quorum disk. Either the configuration is wrong, or the drive is offline."              |
| 13851 | Error         | Secondary server can't take over due to %1                                                                              |
| 13852 | Informational | Secondary server is being requested to release its own resources during takeover %1                                     |
| 13853 | Informational | Secondary notified primary to go up because secondary is unable to take over.                                           |
| 13854 | Informational | Secondary suspended failover for %1 min.                                                                                |
| 13855 | Informational | Secondary resumed failover.                                                                                             |
| 13860 | Error         | failed to merge configuration file %1 %2.                                                                               |
| 13861 | Error         | failed to rename file from %1 to %2.                                                                                    |
| 13862 | Error         | failed to write file %1 to repository                                                                                   |
| 13863 | Critical      | Primary server is commanded to resume. %1                                                                               |
| 13864 | Critical      | Primary server operation will terminate. %1                                                                             |
| 13865 | Informational | Primary server will resume due to user initiated action.                                                                |
| 13866 | Error         | Failed to remove schedule                                                                                               |
| 13867 | Informational | Primary server is resuming and forcing device reset to clear SCSI reservation                                           |
| 13868 | Informational | Secondary server takeover unilaterally. All resources will be released. Primary server reboot is required for recovery. |
| 13869 | Informational | Removing schedule %1 for failover process clean-up.                                                                     |
| 13870 | Informational | Schedule removal completed                                                                                              |
| 13871 | Informational | Primary server failure condition still exists: %1                                                                       |
| 13872 | Informational | Waiting for primary to acknowledge takeover request. May take approx. %1 sec.                                           |
| 13873 | Informational | Waiting for primary to release resources. May take approx. %1 sec.                                                      |
| 13875 | Informational | Primary server is starting to activate virtual drives.                                                                  |
| 13876 | Informational | Primary server has completed activating virtual drives.                                                                 |
| 13877 | Informational | Secondary server failed to take over.                                                                                   |

| Trap  | Severity      | Message                                                                                                                                            |
|-------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 13878 | Error         | Primary server has invalid failover configuration.                                                                                                 |
| 13879 | Critical      | Secondary server detect kernel module failure, reboot machine may need.                                                                            |
| 15050 | Error         | Server ioctl call %1 failed on vdev id %2: Invalid Argument (EINVAL).                                                                              |
| 15051 | Error         | Server ioctl call %1 failed on vdev id %2: I/O error (EIO).                                                                                        |
| 15052 | Error         | Server ioctl call %1 failed on vdev id %2: Not enough memory space (ENOMEM).                                                                       |
| 15053 | Error         | Server ioctl call %1 failed on vdev id %2: No space left on device (ENOSPC).                                                                       |
| 15054 | Error         | Server ioctl call %1 failed on vdev id %2: Already existed (EEXIST).                                                                               |
| 15055 | Error         | Server ioctl call %1 failed on vdev id %2: Device or resource is busy (EBUSY).                                                                     |
| 16001 | Error         | Console(%1): Converting file system failed: %2.                                                                                                    |
| 17001 | Error         | Rescan replica cannot proceed due to replication already in progress.                                                                              |
| 17002 | Error         | Rescan replica cannot proceed due to replication control area missing.                                                                             |
| 17003 | Error         | Rescan replica cannot proceed due to replication control area failure.                                                                             |
| 17004 | Error         | Replication cannot proceed due to replication control area failure.                                                                                |
| 17005 | Error         | Replication cannot proceed due to replication control area failure.                                                                                |
| 17006 | Error         | Rescan replica cannot proceed due to replication control area failure.                                                                             |
| 17007 | Error         | Rescan replica failed.                                                                                                                             |
| 17008 | Error         | Replication failed.                                                                                                                                |
| 17009 | Error         | Failed to start replica rescan.                                                                                                                    |
| 17010 | Error         | Failed to start replication.                                                                                                                       |
| 17011 | Error         | Rescan replica failed due to network transport error.                                                                                              |
| 17012 | Error         | Replicating replica failed due to network transport error.                                                                                         |
| 17013 | Error         | Rescan replica failed due to local disk error.                                                                                                     |
| 17014 | Error         | Replication failed due to local disk error.                                                                                                        |
| 17017 | Error         | Rescan replica failed due to replica failed with error.                                                                                            |
| 17018 | Error         | Replication failed due to replica failed with error.                                                                                               |
| 17019 | Error         | Replication control area exchange failed with error.                                                                                               |
| 17020 | Error         | Replication failed with error.                                                                                                                     |
| 19000 | Informational | "The replication configuration has been created successfully. Primary Server: %1, Virtual Tape: %2, Target Server: %3, Virtual Tape Replica: %4."  |
| 19001 | Informational | "The failover configuration has been created successfully. Primary Server: %1, Secondary Server: %2"                                               |
| 19004 | Warning       | "The allocated space at %1MB has reached the threshold, %2% of the total capacity(%3MB)."                                                          |
| 19050 | Informational | "[Remote Copy] The configuration for remote copy has been set up successfully. Server: %1, Virtual Tape: %2, Remote Server: %3, Tape Replica: %4." |

| Trap  | Severity      | Message                                                                                                                                                                  |
|-------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 19051 | Informational | [Remote Copy] The copying of the virtual tape %1 to the remote server has been started.                                                                                  |
| 19052 | Informational | [Remote Copy] The copying of the virtual tape %1 to the remote server has finished.                                                                                      |
| 19053 | Informational | "[Remote Copy] The configuration for remote copy is removed. Server: %1, Virtual Tape: %2, Remote Server: %3, Tape Replica: %4."                                         |
| 19054 | Informational | [Remote Copy] The replica of the virtual tape %1 has been moved to the virtual library %2 on the remote server successfully.                                             |
| 19055 | Informational | "[Remote Copy] The virtual tape has been copied to the remote server successfully. Server: %1, Virtual Tape: %2, Remote Server: %3, Tape Replica: %4."                   |
| 19056 | Error         | "[Remote Copy] The copying of the virtual tape to the remote server has failed while %1. Error: %2. (Server: %3, Virtual Tape: %4, Remote Server: %5, Tape Replica: %6)" |
| 19057 | Error         | [Remote Copy] The copying of the virtual tape to the remote server cannot proceed -- unable to connect to remote server %1.                                              |
| 19058 | Error         | [Remote Copy] The copying of the virtual tape to the remote server cannot proceed -- virtual tape %1 no longer has a replica or the replica does not exist.              |
| 19059 | Error         | [Remote Copy] The copying of the virtual tape to the remote server cannot proceed -- virtual tape %1 no longer has a replica or the replica does not exist.              |
| 19060 | Error         | [Remote Copy] The copying of the virtual tape to the remote server cannot proceed -- unable to open configuration file.                                                  |
| 19061 | Error         | [Remote Copy] The copying of the virtual tape to the remote server cannot proceed -- unable to allocate memory.                                                          |
| 19062 | Error         | [Remote Copy] The copying of the virtual tape to the remote server cannot proceed -- unexpected error %1.                                                                |
| 19063 | Error         | [Remote Copy] The copying of the virtual tape %1 to the remote server has been manually aborted by user                                                                  |
| 19064 | Error         | [Remote Copy] The copying of the virtual tape to the remote server cannot proceed -- failed to load the virtual tape %1.                                                 |
| 19065 | Error         | [Remote Copy] The copying of the virtual tape to the remote server cannot proceed -- virtual tape %1 is in the drive.                                                    |
| 19066 | Error         | [Remote Copy] The copying of the virtual tape to the remote server cannot proceed -- failed to set initialization status in VirtualLibrary System for virtual tape %1.   |
| 19200 | Error         | Console (%1): Failed to get the key list.                                                                                                                                |
| 19201 | Error         | Console (%1): Failed to get the key.                                                                                                                                     |
| 19202 | Error         | Console (%1): Failed to create key %2.                                                                                                                                   |
| 19203 | Informational | Console (%1): Key %2 has been created successfully.                                                                                                                      |

| Trap  | Severity      | Message                                                                                                                                                                   |
|-------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 19204 | Error         | Console (%1): Failed to delete Key %2.                                                                                                                                    |
| 19205 | Informational | Console (%1): Key %2 has been deleted successfully.                                                                                                                       |
| 19206 | Error         | Console (%1): Failed to update information for key %2.                                                                                                                    |
| 19207 | Informational | Console (%1): Information for key %2 has been updated successfully.                                                                                                       |
| 19208 | Error         | Console (%1): Failed to create key package %2.                                                                                                                            |
| 19209 | Informational | Console (%1): Key package %2 has been created successfully.                                                                                                               |
| 19210 | Error         | Console (%1): Failed to get key package information.                                                                                                                      |
| 19211 | Error         | Console (%1): Failed to save keys from key package.                                                                                                                       |
| 19212 | Informational | Console (%1): %2 keys from key package have been saved successfully.                                                                                                      |
| 20000 | Informational | SAN/IP driver started.                                                                                                                                                    |
| 20001 | Informational | SAN/IP driver stopped.                                                                                                                                                    |
| 20002 | Error         | SAN/IP driver failed to initialize.                                                                                                                                       |
| 21000 | Informational | SAN SCSI driver started.                                                                                                                                                  |
| 21001 | Informational | SAN SCSI driver stopped.                                                                                                                                                  |
| 21002 | Error         | SAN SCSI driver failed to initialize.                                                                                                                                     |
| 21010 | Warning       | SAN SCSI received an abort request.                                                                                                                                       |
| 21011 | Warning       | SAN SCSI received a reset bus request for a special command.                                                                                                              |
| 21012 | Warning       | SAN SCSI received a reset bus request.                                                                                                                                    |
| 21013 | Warning       | SAN SCSI failed to send a SCSI command.                                                                                                                                   |
| 21014 | Warning       | SAN SCSI failed to receive a SCSI reply.                                                                                                                                  |
| 21015 | Warning       | SAN SCSI failed to attach to a virtual device.                                                                                                                            |
| 21016 | Warning       | SAN SCSI failed to detach from a virtual device.                                                                                                                          |
| 21017 | Warning       | SAN SCSI failed to connect to a VTL Server.                                                                                                                               |
| 21018 | Warning       | "SAN SCSI received a disconnect request. This may be from the Client Monitor or due to a network failure, VTL Server shutdown/failover, or a change in a virtual device." |
| 21019 | Warning       | SAN SCSI received an unsupported request.                                                                                                                                 |
| 22000 | Informational | Fibre Channel Authentication started with %1.                                                                                                                             |
| 22001 | Error         | "Fibre Channel Authentication error %1, at %2."                                                                                                                           |
| 22002 | Informational | Fibre Channel Authentication stopped with %1.                                                                                                                             |
| 22003 | Warning       | Fibre Channel Authentication warning from system %1.                                                                                                                      |
| 22004 | Error         | Fibre Channel Authentication error. Client Name does not match on Server %1.                                                                                              |
| 22005 | Error         | Fibre Channel Authentication error. Signature does not match on Server %1.                                                                                                |
| 25000 | Informational | %1 started.                                                                                                                                                               |

| Trap  | Severity      | Message                                                                                                                   |
|-------|---------------|---------------------------------------------------------------------------------------------------------------------------|
| 25001 | Error         | %1 failed to start -- %2.                                                                                                 |
| 25002 | Informational | %1 paused.                                                                                                                |
| 25003 | Error         | %1 failed to pause -- %2.                                                                                                 |
| 25004 | Informational | %1 resumed.                                                                                                               |
| 25005 | Error         | %1 failed to resume -- %2.                                                                                                |
| 25006 | Informational | %1 stopped.                                                                                                               |
| 25007 | Error         | %1 failed to stop -- %2.                                                                                                  |
| 25008 | Informational | %1 shutdown.                                                                                                              |
| 25009 | Informational | %1 starting.                                                                                                              |
| 25010 | Informational | %1 stopping.                                                                                                              |
| 25011 | Error         | Failed to open service manager -- %1.                                                                                     |
| 25012 | Error         | Failed to open service -- %1.                                                                                             |
| 26000 | Error         | Failed to create TCP socket.                                                                                              |
| 26001 | Error         | Failed to bind TCP socket.                                                                                                |
| 26002 | Error         | Failed to create TCP service.                                                                                             |
| 26003 | Error         | Failed to create TCP thread.                                                                                              |
| 26100 | Error         | Failed to access the %1 driver -- %2.                                                                                     |
| 26101 | Error         | The SAN SCSI driver is the wrong version for this VTL SAN Client. Driver version %1 will not work with client version %2. |
| 26102 | Error         | Failed to open the %1 driver -- %2.                                                                                       |
| 26103 | Error         | Failed to start the %1 driver.                                                                                            |
| 26104 | Error         | Failed to stop the %1 driver.                                                                                             |
| 26105 | Error         | SAN SCSI cannot connect to VTL Server %1 -- %2.                                                                           |
| 26106 | Error         | SAN SCSI cannot attach to VTL SAN device %1/%2 -- %3.                                                                     |
| 26107 | Error         | SAN SCSI cannot detach from VTL SAN device %1/%2 -- %3.                                                                   |
| 26108 | Error         | SAN SCSI cannot disconnect from VTL Server %1 -- %2.                                                                      |
| 26110 | Error         | Failed to rescan SCSI port %1 -- %2.                                                                                      |
| 26200 | Error         | Failed to access '%1' -- %2.                                                                                              |
| 26201 | Error         | Failed to read the drive layout for '%1' -- %2.                                                                           |
| 26202 | Error         | Failed to assign drive %1 to drive letter %2. It is already in use.                                                       |
| 26203 | Error         | Failed to access drive %1 -- %2.                                                                                          |
| 26204 | Error         | Failed to dismount drive %1 -- %2.                                                                                        |
| 26205 | Error         | Failed to lock drive %1 -- %2.                                                                                            |
| 26206 | Error         | Failed to unlock drive %1 -- %2.                                                                                          |

| Trap  | Severity      | Message                                                                           |
|-------|---------------|-----------------------------------------------------------------------------------|
| 26207 | Error         | Failed to define device %1 -- %2.                                                 |
| 26208 | Error         | Failed to undefine device %1 -- %2.                                               |
| 26209 | Error         | Drive %1 is busy and cannot be detached. The SAN Client cannot stop at this time. |
| 26210 | Informational | Both %1 and %2 have the same disk signature (%3).                                 |
| 27000 | Error         | Failed to connect to VTL Server '%1' -- %2.                                       |
| 27001 | Error         | Failed to get the version of VTL Server '%1' -- %2.                               |
| 27002 | Error         | Failed to get the information for VTL Server '%1' -- %2.                          |
| 27003 | Error         | Failed to get the number of adapters for VTL Server '%1' -- %2.                   |
| 27004 | Error         | Failed to get the information for VTL Server '%1' adapter %3 -- %2.               |
| 27005 | Error         | Failed to get the number of devices for VTL Server '%1' -- %2.                    |
| 27006 | Error         | Failed to get the information for VTL Server '%1' device %3 -- %2.                |
| 27007 | Error         | Failed to get the list of IP addresses for VTL Server '%1' -- %2.                 |
| 27008 | Error         | Failed to get the media information for VTL Server '%1' device %3 -- %2.          |
| 28001 | Error         | Failed to add VTL Server '%1' -- %2.                                              |
| 28002 | Error         | Failed to add VTL Server '%1' adapter %2 -- %3.                                   |
| 28003 | Error         | Failed to add VTL Server '%1' adapter %2 channel %3 -- %4.                        |
| 28004 | Error         | Failed to add VTL Server '%1' device %2 -- %3.                                    |
| 28005 | Error         | Failed to add VTL Server '%1' device %2 volume %3 -- %4.                          |
| 29101 | Informational | VTL Server '%1' failed over.                                                      |
| 29102 | Informational | VTL Server '%1' recovered from failover.                                          |
| 29401 | Informational | Backing up VTL Server '%1' device %2.                                             |
| 29402 | Informational | Backed up VTL Server '%1' device %2.                                              |
| 29403 | Warning       | Backup of VTL Server '%1' device %2 failed.                                       |
| 29404 | Warning       | "VTL Notify user specified error %1, description '%2'."                           |
| 29405 | Error         | "Notify Timeout error, waiting on %1, timeout set to %2."                         |
| 29406 | Warning       | Notify Error waiting on %1.                                                       |
| 40000 | Informational | TLE Module Started                                                                |
| 40001 | Informational | TLE Module Stopped                                                                |
| 40002 | Error         | Block list full on Drive %1                                                       |
| 40003 | Error         | "Corrupt Repository, Rep VID %1"                                                  |
| 40004 | Error         | Unsupported device [%1][%2][%3]                                                   |
| 40005 | Error         | "Load Drive failed. Lib %1, Drive %2"                                             |
| 40006 | Error         | "TDE get drive info failed, Drive %1, EC %2"                                      |

| Trap  | Severity      | Message                                                                                                            |
|-------|---------------|--------------------------------------------------------------------------------------------------------------------|
| 40007 | Error         | "Unload tape from drive failed, Drive %1, EC %2"                                                                   |
| 40008 | Error         | Failed to create new tape in Virtual Library %1                                                                    |
| 40009 | Error         | "HW Error with Move Medium command, Lib %1, SrcEle %2 DestEle %3"                                                  |
| 40010 | Error         | Attach to tape %1 failed                                                                                           |
| 40011 | Error         | "Failed to read from Virtual Tape. Tape VID %1, EC %2"                                                             |
| 40012 | Informational | Unsupported SCSI command %1                                                                                        |
| 40013 | Error         | "Export Tape failed, not enough memory. Job id %1"                                                                 |
| 40014 | Error         | "Read tape info failed. Tape VID %1, EC %2"                                                                        |
| 40015 | Error         | "Export tape failed, unsupported block size %1"                                                                    |
| 40016 | Error         | "Failed to write to Virtual Tape. Tape VID %1, EC %2"                                                              |
| 40017 | Error         | "Failed to write to Physical Tape. Drive VID %1, EC %2"                                                            |
| 40018 | Error         | "Failed to load Physical Tape. Lib VID %1, Drive VID %2, BC %3"                                                    |
| 40019 | Error         | "Failed to write to Virtual Tape. Tape VID %1, EC %2"                                                              |
| 40020 | Warning       | Job %1 cancelled                                                                                                   |
| 40021 | Error         | Failed to locate Virtual Library %1                                                                                |
| 40022 | Error         | "Failed to get Physical Tape block size. Drive VID %1, EC %2"                                                      |
| 40023 | Error         | "Import failed, not enough memory %1"                                                                              |
| 40024 | Informational | "Import job %1 completed successfully, VLib VID %2, VLib slot %3, DestTape [%4] SrcTape [%5] Throughput %6 MB/min" |
| 40025 | Informational | "Export job %1 completed successfully. SrcTape [%2], DestTape [%3] Throughput %4 MB/min"                           |
| 40026 | Informational | "Export Job %1 submitted to Physical Library %2. SrcTape [%3], DestSlot [%4], %5"                                  |
| 40027 | Informational | "Direct Access Import completed successfully. VLib VID %1, Physical Drive VID %2, Slot %3, DestTape [%4], %5"      |
| 40028 | Informational | "Import job submitted. Job id %1, VLib VID %2, Slot %3, DestTape [%4], %5"                                         |
| 40029 | Error         | Not enough memory to complete the operation                                                                        |
| 40030 | Error         | "Failed to read from repository. Rep VID %1, EC %2"                                                                |
| 40031 | Error         | "Failed to write to repository. Rep VID %1, EC %2"                                                                 |
| 40032 | Warning       | Physical Tape %1 not available to start auto archive job. Waiting for tape...                                      |
| 40033 | Informational | Export job %1 active. Tape Drive used %2                                                                           |
| 40034 | Informational | Import job %1 active. Tape drive used %2                                                                           |
| 40035 | Informational | Successfully attached to repository %1                                                                             |
| 40036 | Error         | Failed to attach to repository %1                                                                                  |
| 40037 | Informational | "Physical Library assigned to exclusive use for TLE. Vid %1, [%2][%3]"                                             |

| Trap  | Severity      | Message                                                                               |
|-------|---------------|---------------------------------------------------------------------------------------|
| 40038 | Informational | "Physical Library unassigned. Vid %1, [%2][%3]"                                       |
| 40039 | Error         | Read Element command to Physical Library %1 failed. EC %2                             |
| 40040 | Error         | Attach to device %1 failed. EC %2                                                     |
| 40041 | Informational | "Physical Tape Drive assigned to exclusive use for VTL. VID %1, [%2][%3]"             |
| 40042 | Informational | "Physical Tape Drive unassigned. Vid %1, [%2][%3]"                                    |
| 40043 | Error         | "Move Medium command failed in Physical Library %1. SrcEle %2, DestEle %3, EC %4"     |
| 40044 | Error         | Unload command failed on Physical Tape Drive %1. EC %2                                |
| 40045 | Error         | Read from Physical Tape Drive %1 failed. EC %2                                        |
| 40046 | Error         | Write to Physical Tape Drive %1 failed. EC %2                                         |
| 40047 | Error         | Write FM to Physical Tape Drive %1 failed. EC %2                                      |
| 40048 | Error         | "Mode sense command to Physical device %1 failed. Pagecode %2, EC %3"                 |
| 40049 | Error         | Mode select command to Physical device %1 failed. EC %2                               |
| 40050 | Error         | Rewind command to Physical Tape Drive %1 failed. EC %2                                |
| 40051 | Error         | Inquiry command to Physical device %1 failed. EC %2                                   |
| 40052 | Informational | Inventory of Physical Library %1 completed successfully                               |
| 40053 | Informational | Virtual Library %1 initialized. [%2][%3]                                              |
| 40054 | Informational | Virtual Tape Drive %1 initialized. [%2][%3]                                           |
| 40055 | Informational | Virtual Tape Drive %1 deleted from Virtual Library %2                                 |
| 40056 | Informational | Virtual Tape Drive %1 created successfully in Virtual Library %2                      |
| 40057 | Informational | Virtual Library %1 created successfully. [%2][%3]                                     |
| 40058 | Informational | Virtual Library %1 deleted successfully. [%2][%3]                                     |
| 40059 | Informational | "Virtual Tape added to Virtual Library %1, slot %2. Total Tapes in Library %3. %4 %5" |
| 40060 | Informational | Stand alone Virtual Tape Drive %1 created successfully. [%2][%3]                      |
| 40061 | Informational | Stand alone Virtual Tape Drive %1 deleted. [%2][%3]                                   |
| 40062 | Informational | Virtual Tape %1 moved to vault from device %2                                         |
| 40063 | Informational | Virtual Tape %1 from vault imported to Virtual Library %2 slot %3                     |
| 40064 | Informational | Virtual Tape %1 from vault imported to Virtual Tape Drive %2                          |
| 40065 | Error         | "Read data from Virtual Tape failed. Attach handle %1, EC %2"                         |
| 40066 | Error         | "Write data to Virtual Tape failed. Attach handle %1, EC %2"                          |
| 40067 | Error         | Failed to add Physical Drive %1 to repository %2. EC %3                               |
| 40068 | Error         | Cannot create new Tape. EC %1                                                         |
| 40069 | Error         | Cannot expand Tape %1. EC %2                                                          |

| Trap  | Severity      | Message                                                                                                                                              |
|-------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 40070 | Error         | Cannot delete Tape %1                                                                                                                                |
| 40071 | Error         | "Cannot import Tape, dest slot %1 in Virtual Library %2 is full"                                                                                     |
| 40072 | Informational | "Properties of Tape %1 has been changed. Barcode %2, MaxCapacity %3 MB"                                                                              |
| 40073 | Informational | "Tape Created in Stand Alone Virtual Tape Drive. Tape VID %1, Drive VID %2"                                                                          |
| 40074 | Error         | "Export to Physical Tape failed. Job ID %1, EC %2, SrcTape [%3] DestTape [%4]"                                                                       |
| 40075 | Informational | "Export Job %1 submitted to Physical stand alone Tape Drive %2, SrcTape [%3], %4"                                                                    |
| 40076 | Error         | "Import Physical Tape failed. Job ID %1, EC %2, SrcTape [%3] DestTape [%4]"                                                                          |
| 40077 | Error         | Import Physical Tape failed. Duplicate Virtual Tape Barcode. Job ID %1 DestTape [%2]                                                                 |
| 40078 | Error         | Import Physical Tape failed. Duplicate Virtual Tape Barcode. Dest Tape [%1]                                                                          |
| 40079 | Informational | "Deleted tape marked for delayed deletion. Tape [%1], VID %2"                                                                                        |
| 40080 | Warning       | Tape drive %1 in physical library %2 not accessible. Locked by other party                                                                           |
| 40081 | Warning       | Tape [%1] in physical library %2 not accessible. Locked by other party                                                                               |
| 40082 | Warning       | Slot %1 in physical library %2 not accessible. Locked by other party                                                                                 |
| 40083 | Warning       | Inventory physical library %1: Tape [%2] or Slot %3 not accessible. Locked by other party                                                            |
| 40084 | Warning       | Tape [%1] is blank. Cannot export blank tapes                                                                                                        |
| 40085 | Error         | Reverse block command failed on physical tape drive VID %1 Error [%2]                                                                                |
| 40087 | Error         | Error in retrieving the hostname of this VTL server. Error: %1                                                                                       |
| 40088 | Error         | Failure in looking up the IP address of the VTL server (%1). Please verify that DNS is configured correctly for both ACSLS and VTL server. Error: %2 |
| 40089 | Error         | Out of system resources. Could'nt fork a process. Error: %1                                                                                          |
| 40090 | Error         | Failed to execute a program. Error: %1                                                                                                               |
| 40091 | Error         | Failed to open %1. Error: %2                                                                                                                         |
| 40092 | Error         | DNS configuration for VTL server is incorrect. DNS or /etc/hosts is returning %1 as the IP of VTL server (%2)                                        |
| 40093 | Error         | Failed to successfully query %1 server with IP %2. Error received: %3.                                                                               |
| 40094 | Error         | Waited %1 seconds to get a response to a query from %2 (%3). Timing out.                                                                             |
| 40095 | Error         | Failed to mount %1 on drive %2. Error from %3 (%4): %5.                                                                                              |
| 40096 | Error         | Waited %1 seconds to get a response from %2 (%3) after trying to mount %4 on drive %5. Timing out.                                                   |
| 40097 | Error         | Failed to dismount %1 from drive %2. Error from %3 (%4): %5.                                                                                         |
| 40098 | Error         | Waited %1 seconds to get a response from %2 (%3) after trying to dismount %4 from drive %5. Timing out.                                              |
| 40099 | Error         | Failed to retrieve drive information in ACS %1. Error from %2 (%3): %4.                                                                              |

| Trap  | Severity      | Message                                                                                                                            |
|-------|---------------|------------------------------------------------------------------------------------------------------------------------------------|
| 40100 | Error         | Waited %1 seconds to get a response from %2 (%3) after trying to retrieve drive information in ACS %4. Timing out.                 |
| 40101 | Error         | Failed to retrieve volume information in ACS %1 and Pool %2. Error from %3 (%4): %5.                                               |
| 40102 | Error         | Waited %1 seconds to get a response from ACSLS (%2) after trying to retrieve volume information in ACS %3 and Pool %4. Timing out. |
| 40103 | Error         | Failed to retrieve LSM information in ACS %1. Error from %2 (%3): %4.                                                              |
| 40104 | Error         | Waited %1 seconds to get a response from %2 (%3) after trying to retrieve LSM information in ACS %4. Timing out.                   |
| 40105 | Error         | %1: The number of drives %2 is more than max supported (%3).                                                                       |
| 40106 | Error         | %1: The number of volumes %2 is more than max supported (%3).                                                                      |
| 40107 | Informational | %1: Successfully mounted %2 on drive %3                                                                                            |
| 40108 | Informational | %1: Successfully dismounted %2 from drive %3                                                                                       |
| 40109 | Error         | "Log sense command to Physical device %1 failed. Pagecode %2, EC %3"                                                               |
| 40110 | Error         | Failed to retrieve volume information in ACS %1. Error from %2 (%3): %4.                                                           |
| 40111 | Error         | Waited %1 seconds to get a response from Library Station (%2) after trying to retrieve volume information in ACS %3. Timing out.   |
| 40112 | Warning       | Physical Tape %1 not available to start tape caching job. Waiting for tape...                                                      |
| 40113 | Warning       | A Manual Export job is not allowed because tape <%1> has tape caching set.                                                         |
| 40114 | Warning       | The export job is not allowed because physical tape [%1] in library [%2][%3] is being used by tape caching.                        |
| 40115 | Informational | Please add tapes.                                                                                                                  |
| 40116 | Error         | Hardware compression failed. EC [ %1 ]                                                                                             |
| 40117 | Error         | Hardware decompression failed. EC [ %1 ]                                                                                           |
| 40118 | Error         | Software decompression of a block compressed using hardware failed. EC [ %1 ]                                                      |
| 40119 | Informational | Global [%1] Compression %2 on Repository %3                                                                                        |
| 40120 | Warning       | The tape [%1] has no data. No export job will be submitted.                                                                        |
| 40121 | Warning       | "The direct link tape VID %1, BarCode [%2] has been deleted."                                                                      |
| 40122 | Informational | "Export Job %1 submitted to Physical Library %2. SrcTape [%3], DestTape [%4], DestSlot [%5], %6"                                   |
| 40123 | Error         | "Failed to load tape because it is a cleaning tape. Lib VID %1, Drive VID %2, BC %3"                                               |
| 40124 | Error         | Write command to Configuration Repository Failed. Please check repository LUNs                                                     |
| 40125 | Informational | Disk space allocated for tape VID %1 Barcode [%2] in library VID %3 has been reclaimed successfully                                |
| 40126 | Error         | Failed to reclaim the tape VID %1 Barcode [%2] in library VID %3.                                                                  |

| Trap  | Severity      | Message                                                                                                              |
|-------|---------------|----------------------------------------------------------------------------------------------------------------------|
| 40127 | Informational | Disk space allocated for tape VID %1 Barcode [%2] in vault has been reclaimed successfully                           |
| 40128 | Error         | Failed to reclaim disk space allocated for tape VID %1 Barcode [%2] in vault                                         |
| 40129 | Informational | No Free physical drive to load direct link tape VID %1 BarCode [%2].                                                 |
| 40130 | Warning       | Unable to renew cache for tape VID %1. Data will be redirected to physical tape [%2].                                |
| 40131 | Informational | The tape shredding job is successful on the tape [%1].                                                               |
| 40132 | Informational | The tape shredding job was failed on the tape [%1].                                                                  |
| 40133 | Error         | Unable to move tape [%1] to IE slot.                                                                                 |
| 40134 | Error         | Unable to mount tape [%1] in library [%2] VID %3.                                                                    |
| 40135 | Error         | Unable to dismount tape [%1] in library [%2] VID %3.                                                                 |
| 40136 | Error         | Space command to Physical Library %1 failed. EC %2.                                                                  |
| 40137 | Error         | Failed to add import/export job to the job queue. Maximum of 127 jobs reached. Job ID:%1 Physical tape barcode:[%2]. |
| 40138 | Informational | The maximum number of slots supported in this library [%1 %2] are %3.                                                |
| 40139 | Warning       | Door opened condition reported on Physical Library VID-%1 %2 %3.                                                     |
| 40140 | Informational | Start tape shredding on tape [%1] VID:%2.                                                                            |
| 40141 | Informational | The tape shredding job is cancelled on the tape [%1] VID:%2.                                                         |
| 50000 | Error         | iSCSI: Missing targetName in login normal session from initiator %1                                                  |
| 50001 | Informational | iSCSI: Login request to target %1 from initiator %2.                                                                 |
| 50002 | Error         | iSCSI: Login request to nonexistent target %1 from initiator %2                                                      |
| 50003 | Error         | iSCSI: iSCSI CHAP authentication method rejected. Login request to target %1 from initiator %2                       |



# ILOM command reference

The following table summarizes Integrated Lights Out Manager (ILOM) commands you can use to manage the service processor. For more information on ILOM commands, see the *ILOM Administration Guide*.

| Description                                                                                                                              | Command                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>User Commands</b>                                                                                                                     |                                                                                                                                                                             |
| Add a local user.                                                                                                                        | <code>create /SP/users/user1 password=password<br/>role=administrator operator</code>                                                                                       |
| Delete a local user.                                                                                                                     | <code>delete /SP/users/user1</code>                                                                                                                                         |
| Change a local user's properties.                                                                                                        | <code>set /SP/users/user1 role=operator</code>                                                                                                                              |
| Display information about all local users.                                                                                               | <code>show -display [targets properties all]<br/>-level [value all] /SP/users</code>                                                                                        |
| Display information about LDAP settings.                                                                                                 | <code>show /SP/clients/ldap</code>                                                                                                                                          |
| Change LDAP settings.                                                                                                                    | <code>set /SP/clients/ldap binddn=proxyuser<br/>bindpw=proxyuserpassword<br/>defaultrole=administrator operator<br/>ipaddress=ipaddress</code>                              |
| <b>Network and Serial Port Setting Commands</b>                                                                                          |                                                                                                                                                                             |
| Display network configuration information.                                                                                               | <code>show /SP/network</code>                                                                                                                                               |
| Change network properties for the ILOM.<br>Changing certain network properties, like the IP<br>address, disconnects your active session. | <code>set /SP/network pendingipaddress=ipaddress<br/>pendingipdiscovery=dhcp static<br/>pendingipgateway=ipgateway<br/>pendingipnetmask=ipnetmask commitpending=true</code> |
| Display information about the external serial<br>port.                                                                                   | <code>show /SP/serial/external</code>                                                                                                                                       |
| Change the external serial port configuration.                                                                                           | <code>set /SP/serial/external pendingspeed=integer<br/>commitpending=true</code>                                                                                            |
| Display information about the serial connection<br>to the host.                                                                          | <code>show /SP/serial/host</code>                                                                                                                                           |

| Description                                                                                                                                                             | Command                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Change the host serial port configuration.<br>Note: This speed setting must match the speed setting for serial port 0, COM1 or /dev/ttyS0 on the host operating system. | <code>set /SP/serial/host pendingspeed=<i>integer</i><br/>commitpending=true</code>                                                                                                                                              |
| <b>Alert Commands</b>                                                                                                                                                   |                                                                                                                                                                                                                                  |
| Display information about PET alerts. You can configure up to 15 alerts.                                                                                                | <code>show /SP/alert/rules/1...15</code>                                                                                                                                                                                         |
| Change alert configuration.                                                                                                                                             | <code>set /SP/alert/rules/1...15 destination=<i>ipaddress</i><br/>level=down critical major minor</code>                                                                                                                         |
| <b>System Management Access Commands</b>                                                                                                                                |                                                                                                                                                                                                                                  |
| Display information about HTTP settings.                                                                                                                                | <code>show /SP/services/http</code>                                                                                                                                                                                              |
| Change HTTP settings, such as enabling automatic redirection to HTTPS.                                                                                                  | <code>set /SP/services/http port=<i>portnumber</i><br/>secureredirect enabled disabled<br/>servicestate=enabled disabled</code>                                                                                                  |
| Display information about HTTPS access.                                                                                                                                 | <code>show /SP/services/https</code>                                                                                                                                                                                             |
| Change HTTPS settings.                                                                                                                                                  | <code>set /SP/services/https port=<i>portnumber</i><br/>servicestate=enabled disabled</code>                                                                                                                                     |
| Display SSH DSA key settings.                                                                                                                                           | <code>show /SP/services/ssh/keys/dsa</code>                                                                                                                                                                                      |
| Display SSH RSA key settings.                                                                                                                                           | <code>show /SP/services/ssh/keys/rsa</code>                                                                                                                                                                                      |
| <b>SNMP Commands</b>                                                                                                                                                    |                                                                                                                                                                                                                                  |
| Display information about SNMP settings. By default, the SNMP port is 161 and v3 is enabled.                                                                            | <code>show /SP/services/snmp engineid=<i>snmpengineid</i><br/>port=<i>snmpportnumber</i> sets=enabled disabled<br/>v1=enabled disabled v2c=enabled disabled<br/>v3=enabled disabled</code>                                       |
| Display SNMP users.                                                                                                                                                     | <code>show /SP/services/snmp/users</code>                                                                                                                                                                                        |
| Add an SNMP user.                                                                                                                                                       | <code>create /SP/services/snmp/users/<i>snmpusername</i><br/>authenticationpassword=<i>password</i><br/>authenticationprotocol=MD5 SHA<br/>permissions=rw ro privacypassword=<i>password</i><br/>privacyprotocol=none DES</code> |
| Delete an SNMP user.                                                                                                                                                    | <code>delete /SP/services/snmp/users/<i>snmpusername</i></code>                                                                                                                                                                  |
| Display information about SNMP public (read-only) communities.                                                                                                          | <code>show /SP/services/snmp/communities/public</code>                                                                                                                                                                           |
| Add this device to an SNMP public community.                                                                                                                            | <code>create /SP/services/snmp/communities/public/<i>comm1</i></code>                                                                                                                                                            |
| Delete this device from an SNMP public community.                                                                                                                       | <code>delete /SP/services/snmp/communities/public/<i>comm1</i></code>                                                                                                                                                            |
| Display information about SNMP private (read-write) communities.                                                                                                        | <code>show /SP/services/snmp/communities/private</code>                                                                                                                                                                          |
| Add this device to an SNMP private community.                                                                                                                           | <code>create /SP/services/snmp/communities/private/<i>comm2</i></code>                                                                                                                                                           |

| Description                                                    | Command                                                         |
|----------------------------------------------------------------|-----------------------------------------------------------------|
| <b>Host System Commands</b>                                    |                                                                 |
| Delete this device from an SNMP private community.             | <code>delete /SP/services/snmp/communities/private/Comm2</code> |
| Start the host system.                                         | <code>start /SYS</code>                                         |
| Stop the host system.                                          | <code>stop /SYS</code>                                          |
| Reset the host system.                                         | <code>reset /SYS</code>                                         |
| Start a session to connect to the host console.                | <code>start /SP/console</code>                                  |
| Stop the session connected to the host console.                | <code>stop /SP/console</code>                                   |
| <b>Clock Settings</b>                                          |                                                                 |
| Set the ILOM clock to synchronize with a primary NTP server.   | <code>set /SP/clients/ntp/server/1 address=ntpIPAddress</code>  |
| Set the ILOM clock to synchronize with a secondary NTP server. | <code>set /SP/clients/ntp/server/2 address=ntpIPAddress2</code> |



Sun Microsystems, Inc. 4150 Network Circle, Santa Clara, CA 95054 USA Phone 1-650-960-1300 or 1-800-555-9SUN Web [sun.com](http://sun.com)



ARGENTINA: 5411-4317-5636 • AUSTRALIA: 1-800-550-786 • AUSTRIA: 43-1-601-26-0 • BALKANS: 301-6188-111 • BELGIUM: 32-2-704 89 83 • BRAZIL: 55-11-51872100 • BRUNEI: 65-216-8333 • CANADA: 1-800-422-8020 (GENERAL); 416-964-2001 (LEARNING MANAGEMENT SYSTEM SALES, TORONTO) • CHILE: 562-372-4500 • COLOMBIA: 571-629-2323  
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