Automated Tape Management and Backup for Digital UNIX

Overview Manual

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This manual provides an overview of Digital's automated tape management and backup system using the Digital UNIX operating system.

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Digital Equipment Corporation
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Preface

Purpose of This Manual

This manual provides an overview of the Automated Tape Management and Backup for Digital UNIX product, hereafter referred to as the Storage Solution.

Who Should Use This Manual

This manual is intended for system analysts, system managers, and anyone who installs and manages the hardware and software that make up the Storage Solution.

Structure of This Manual

This manual is organized as follows:

Chapter 1, Overview-Provides brief descriptions of the hardware and software and how they are interconnected to affect the Storage Solution.

Chapter 2, Preparing for Installation -Describes what you need to do before beginning your installation of the hardware and software that make up the Storage Solution.

Chapter 3, Installation Guidelines-Provides guidelines for the installation process and pointers to product-specific information.

Chapter 4, Support Contacts-Describes who to contact when you need assistance in planning, installing, managing and operating your Storage Solution.

Chapter 5, Documentation Lists-Lists the documentation that may be helpful in planning and installing Storage Solution components.

Glossary-Describes those terms unique to the concepts and components described in this manual.

Conventions Used in This Manual

This manual uses the following conventions:

Convention	Meaning
Note	A note calls the reader's attention to any item of information that may be of special importance.
Caution	A caution contains information essential to avoid damage to the equipment.
italic type	*Italic type* indicates complete titles of manuals.
bold type	**Bold type** indicates text that is highlighted for emphasis.

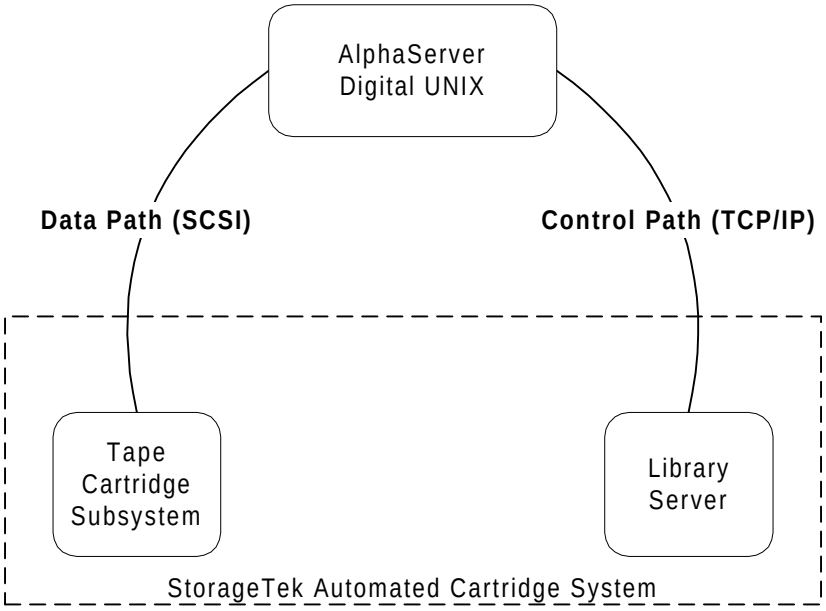
1
Overview

Storage Solution Overview

The Digital AlphaServer system-StorageTek Storage Solution provides reliable, high-speed data transfer to tape cartridges, and flexible tape management facilities. The basic high-level Storage Solution consists of two components: an AlphaServer system running Digital UNIX storage and management software, and a StorageTek **automated cartridge system** (ACS). The ACS is also called a **library**.

Figure 1-1 illustrates the connectivity paths between the Digital AlphaServer system and the StorageTek ACS. The **control path** carries robotic control commands over a TCP/IP connection from the AlphaServer system to the library server. The **data path** carries data over a fast, wide, differential SCSI-2 interface from the AlphaServer system to the tape devices of the tape cartridge subsystem.

Figure 1-1: Conceptual Overview



Control Path

In an automated environment using StorageTek ACS components, the control path between the Digital AlphaServer system and the ACS library server is implemented by using standard TCP/IP network connections. Over this network connection, the **robotics control link** is established. The control path is responsible for loading and unloading the requested tape cartridge onto an appropriate tape drive.

Data Path

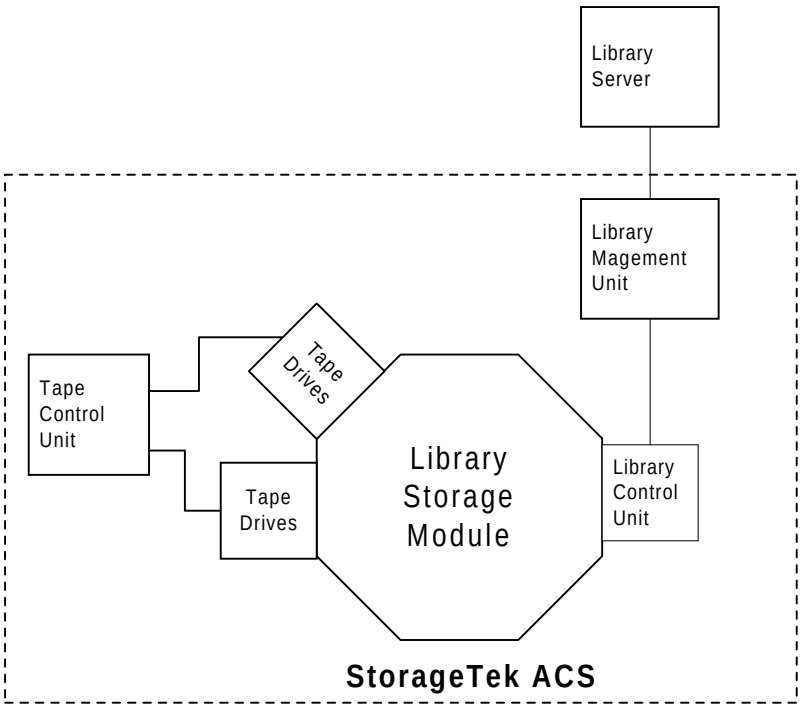
The data path provides the means for moving data to and from the ACS tape cartridges. The data path consists of all the components between the Digital AlphaServer system and the ACS. These components include the Digital UNIX operating system, the Digital SCSI controller, data cables, data converters, and the ACS tape controllers and drives. When tape drives are controlled by a FIPS-60 controller, a Computer Network Technologies (CNT) SCSI gateway is also part of the data path. The CNT SCSI gateway converts SCSI data to FIPS-60 format and vice versa.

Automated Cartridge System

As shown in Figure 1-2, the StorageTek ACS is composed of several components. Collectively, these components make up an automated tape library capable of mechanically loading and unloading tape cartridges into and out of tape drives. The ACS takes its direction from those networked systems such as the AlphaServer system, which are configured to work with the library.

The ACS consists of a **library storage module** (**LSM**)**,** a **library control unit** (**LCU**)**,** a **library management unit** (**LMU**), a **tape cartridge subsystem,** which consists of a **tape drive unit** (**TU**) and a **control unit** (**CU**), and a **library server**. An ACS is a collection of one or more physically connected LSMs. The ACS components are briefly described in the following subsections.

Figure 1-2: ACS Functional Example



Library Server

The library server services network client requests for ACS resources. In the Storage Solution, processes running on the Digital AlphaServer system make requests for tape cartridges stored within the StorageTek ACS. The library server processes these requests and packages them in a form that the LMU understands.

The library server may have other non-Digital clients connected to it and arbitrates the requests from among its various clients to secure ACS resources.

Library Management Unit

The LMU manages the operation of one or more LCUs. The LMU takes direction from the library server and sends control commands to the appropriate LCU within the library.

Library Control Unit

Taking direction from the LMU, the LCU controls the actual robotic mechanism within the LSM. A single LMU connects to several LCUs, but each LCU connects to only one LSM.

The LMU and LCU are functional elements. In some configurations they are discrete hardware entities, whereas in others, they are integrated into a single enclosure. Consult the StorageTek documentation for specific information regarding configuration options and specifications.

Library Storage Module

The LSM is the basic building block used to create an ACS. The LSM is a structural component that houses the tape cartridges and the robotic mechanism. Two or more LSMs can be physically connected to form a single, larger ACS. In multiLSM

configurations such as this, a pass-through mechanism is installed, allowing LSMs to exchange cartridges, as necessary.

Multiple LSMs, configured independently of each other, would result in multiple, smaller ACSs.

Consult the StorageTek documentation for specific information regarding configuration options and specifications.

Tape Cartridge Subsystem

A tape cartridge Subsystem consists of tape drive units (TU) and their respective tape control units (TCU or CU). A TU is connected directly to an LSM. The TU contains the tape drives, the mechanical and electrical enclosure, and the mechanical connection to the LSM. The number of TUs per LSM varies, depending on the type of LSM.

The CU requirements and configuration vary greatly and depend on the drive technology used. In some cases the CU requires a separate enclosure, in others the CU is integrated into the TU.

Consult the StorageTek documentation for specific information regarding configuration options and specifications.

Automated Cartridge Systems Overview

The following sections provide brief overviews of StorageTek's hardware and software products.

Your Storage Solution can include the following StorageTek automated cartridge systems hardware:

- 4400 automated cartridge system
- PowderHorn 9310/9311 automated cartridge system
- WolfCreek 9360 automated cartridge system

Each of these ACSs is described in the following subsections.

4400 Automated Cartridge System

The 4400 ACS is a large library having a capacity of 6,000 cartridges. The 4400 ACS can be field upgraded to the advanced PowderHorn ACS.

PowderHorn 9310/9311 Automated Cartridge System

The PowderHorn 9310/9311 ACS is an enhanced version of the 4400 ACS. PowderHorn is a large library having a capacity of 6,000 cartridges and advanced robotics allowing up to 350 exchanges per hour.

WolfCreek 9360 Automated Cartridge System

The WolfCreek 9360 ACS is a robotic library intended for smaller applications. WolfCreek can be upgraded as follows:

- **Performance**-The performance can be increased from the basic speed of 90 exchanges per hour to 190 or 350 exchanges per hour. An exchange is one robotic mount and dismount.
- **Storage Capacity**-The storage capacity can be increased from the basic capacity of 500 cartridges to 750 or 1,000 cartridges. Additional WolfCreek ACSs can be added to further increase capacity.

Tape Cartridge Subsystems Overview

The ACS that you are using can include the following StorageTek tape cartridge subsystems:

- 4480 tape cartridge subsystem
- Silverton 4490 tape cartridge subsystem
- TimberLine 9490 tape cartridge subsystem
- RedWood SD-3 Helical tape cartridge subsystem

Each of these tape cartridge subsystems is described in the following subsections.

4480 Tape Cartridge Subsystem

The 4480 tape cartridge subsystem is comprised of one or more cartridge drives and one or more control units (CUs). Each cartridge drive frame can have either two or four 18-track tape transports for storing and retrieving data. For every two cartridge drives, the cartridge subsystem includes one control unit (CU) that channels data to the tape transports.

Silverton 4490 Tape Cartridge Subsystem

The Silverton 4490 tape cartridge subsystem is comprised of one or more cartridge drives and one or more control units (CUs). Each cartridge drive frame can have either two or four 36-track high-performance tape transports for storing and retrieving data. For every two cartridge drives, the cartridge subsystem includes one control unit (CU) that channels data to the tape transports.

TimberLine 9490 Tape Cartridge Subsystem

The TimberLine 9490 tape cartridge subsystem is comprised of one or more cartridge drives and one or more control units (CUs). Each cartridge drive frame can have up to four 36-track high-performance tape transports for storing and retrieving data. The TimberLine 9490 provides direct SCSI-2 fast, wide, differential connectivity.

RedWood SD-3 Helical Tape Cartridge Subsystem

The RedWood SD-3 Helical tape cartridge subsystem is a high-performance, high-storage capacity tape storage subsystem. The SD-3 provides direct SCSI-2 fast, wide, differential connectivity.

StorageTek REEL Products Overview

Your Storage Solution uses a suite of StorageTek REEL software products to manage the storage and retrieval of backup data. The StorageTek REEL products are as follows:

- REELbackup
- REELlibrarian
- REELaccess

Each of these software products is described briefly in the following subsections.

REELbackup

REELbackup backs up a network of computers. Backing up is the scheduled movement of online data to offline storage media such as tapes, thus allowing for data retrieval in the event that online data is destroyed or accidentally deleted. REELbackup can simultaneously back up several disks to a single tape while running several other tapes.

REELbackup simplifies the data retrieval process by enabling users to retrieve files, directories, disk volumes, machine network nodes, or the entire network; all with a consistent user interface. The AlphaServer system supports the following REELbackup clients:

HP 9000	RS/6000	Sun
Pyramid	Sequent	Silicon Graphics
ATT GIS 3000	Digital Alpha	Data General AViiON
Unisys U/6000	Stratus	

REELlibrarian

REELlibrarian manages tape libraries and user retrieval requests by using a client/server model. Within REELlibrarian, tapes are cataloged, identified, and tracked through a central management facility that resides on the network. This facility receives and processes tape service requests, reserves and allocates tape devices, and issues and verifies tape mount requests. The AlphaServer system supports the following REELlibrarian clients:

HP 9000	RS/6000	Sun
Pyramid	Sequent	Silicon Graphics
ATT GIS 3000	Digital Alpha	Data General AViiON
UNISYS U/6000	Stratus	

Note

Digital will work with these vendors to configure site-specific Storage Solutions.

REELaccess

REELaccess connects REELlibrarian and REELbackup to the automated cartridge system (ACS) via the automated cartridge system library software (ACSLS) or LibraryStation. REELaccess translates REELbackup and REELlibrarian requests into ACSLS or LibraryStation requests.

REELaccess is not part of the Digital UNIX offering, but is required when connecting Digital AlphaServer systems to ACS devices. Although REELbackup and REELlibrarian can work directly with human operators, REELaccess provides the automated connection between REELbackup and REELlibrarian and the ACS devices served by ACSLS or LibraryStation. The AlphaServer system supports the following REELaccess clients:

RS/6000	Sun

Automated Cartridge System Library Software

ACSLS extends connectivity to ACS libraries from many computing platforms running UNIX. ACSLS translates requests from REELaccess into commands for use by the ACS.

LibraryStation Software

The LibraryStation software extends the range of an MVS-based ACS. In this way, the ACS can be shared by other computing systems, which are called clients. LibraryStation supports cartridge tape devices connected to the following StorageTek libraries:

4400 PowderHorn 9310/9311 WolfCreek 9360

LibraryStation has been qualified for the following client systems:

Amdahl UTS Tape Daemon	CDC	CRAY	Digital's DCSC
DISCOS Unitree	Hitachi	MVS/CSC	NearNet 7900
REEL Products (with REELaccess)	RMLS/CSC	RS/6000 (with Unitree)	TANDEM

Because LibraryStation provides a communications interface that emulates ACSLS, you can use REELaccess to automate your REELbackup/REELlibrarian processes using ACSs controlled by LibraryStation.

Example Configurations

Storage Solutions can take on any number of system configurations depending on your particular tape storage management needs. The following sections describe two typical Storage Solution implementations.

Typical Shared Environment ACS Configuration Example

Figure 1-3 shows an example of how the Storage Solution can be configured into an existing mainframe storage environment. In this example, the site already has the mainframe, StorageTek ACS, and possibly the RS/6000. If an RS/6000 is not available on site, StorageTek provides an appropriate controlling platform for the REELaccess product.

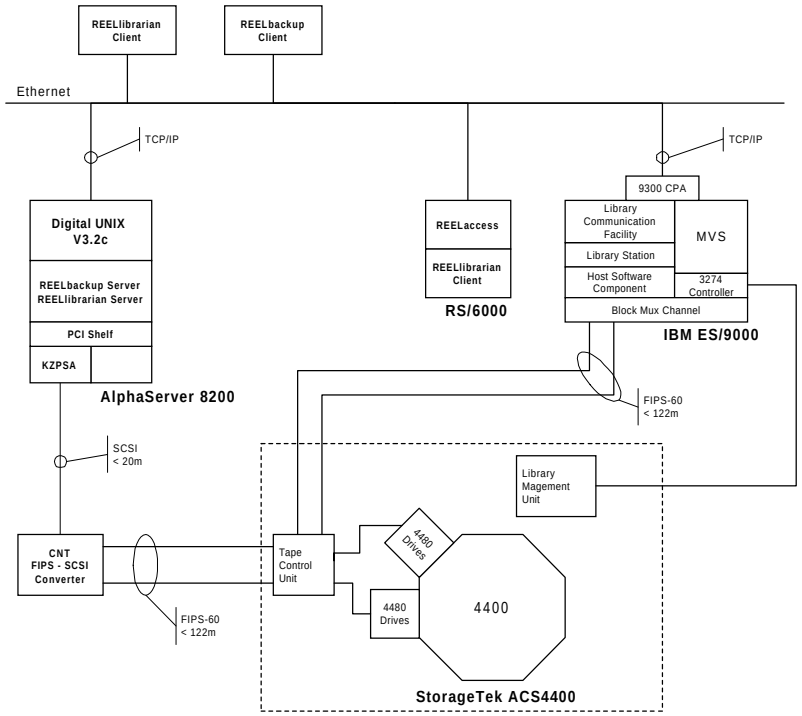
As part of the delivered Storage Solution, Digital provides the following:

- Digital AlphaServer system
- CNT SCSI-FIPS converter
- REELbackup and REELlibrarian software for server and clients
- Data path connectivity to the StorageTek tape control unit

The key benefits for this Storage Solution are as follows:

- Preserves customer investment in storage technology such as FIPS-60.
- Provides for sharing of resources including the library and the tape drives.
- Provides single-point library management.
- Provides an automated Storage Solution.

Figure 1-3: Shared Environment Configuration



Typical AlphaServer System-Only ACS Configuration

Figure 1-4 shows how the Storage Solution can be introduced into a site where no automated storage solution exists. In this example, the Digital AlphaServer system connects directly to the library tape drives via SCSI lines.

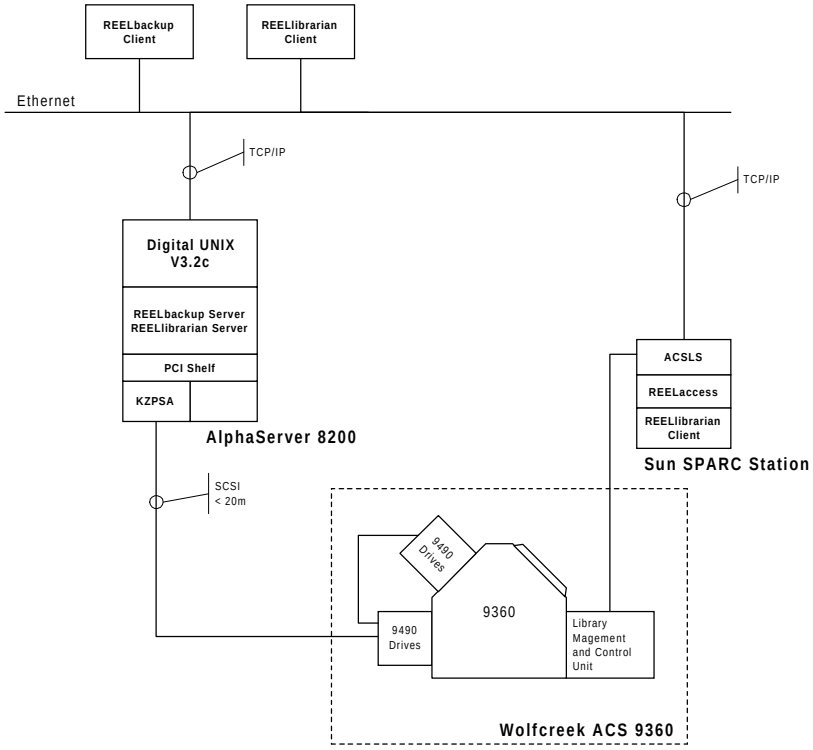
As part of the delivered Storage Solution, Digital provides the following:

- Digital AlphaServer system (if not already present)
- StorageTek WolfCreek 9360 ACS, tape drives, and library server as part of the Digital/StorageTek partnership
- Connectivity to the tape drives

The key benefits for this Storage Solution are as follows:

- Provides an automated Storage Solution.
- Provides centralized data backup management.
- Provides centralized media management.

Figure 1-4: Digital AlphaServer system-Only Configuration



2
Preparing for Installation

StorageTek Tape Cartridge Subsystems

If you need to order StorageTek tape cartridge subsystems, the first document to refer to is the StorageTek *System Assurance Guide* for the system that you are installing. This guide contains information about planning, ordering, installing, and the follow-up activities that are required during the sale, delivery and installation.

This guide also contains a helpful checklist and an extensive glossary.

For standalone cartridge subsystems, all you need is a valid SCSI connection between the AlphaServer system and the tape drives. If these tape drives use a FIPS-60 tape control unit, you also need a CNT SCSI gateway to convert to and from the SCSI and FIPS-60 protocols.

StorageTek Automated Cartridge Systems

If you are going to connect your Digital UNIX systems to any of StorageTek's ACSs, in addition to the SCSI connection, you must also address the network connection to the ACS library server.

Library servers are the means by which computers take advantage of StorageTek ACS resources. For the Storage Solution, these servers are either ACSLS running on a Sun SPARCstation or RS/6000, or LibraryStation running on a non-UNIX system. Ensure that there is a TCP/IP connection between the AlphaServer system and the library server.

Software and Hardware Prerequisites

The following are required for the StorageTek ACS for Digital UNIX product:

- Digital UNIX V3.1c or higher
- AlphaServer 8200, 8400, or 2100 system
- Fast, wide, differential controller
- Computer Network Technology FIPS to SCSI gateway unit
- StorageTek ACSLS software Version 5 or higher, or LibraryStation V1.1 or higher
- StorageTek REELaccess software

Hardware Verification

The hardware environment consists of a Digital AlphaServer system running Digital UNIX V3.2c or higher. The processor is attached to a CNT SCSI gateway via a SCSI-2 fast, wide, differential connection such as a KZPSA on the AlphaServer 8200 PCI backplane.

The AlphaServer 8200 is connected via a LAN TCP/IP network to the library server. The library server can be an RS/6000 or Sun SPARCstation running ACSLS, or a mainframe running LibraryStation. Either an RS/6000 or Sun SPARCstation (provided by StorageTek) is required for REELaccess software.

3
Installation Guidelines

Introduction

Installation considerations vary from site to site, depending on the particular Digital AlphaServer system and tape storage components used. In all cases, however, there are both hardware and software issues to evaluate.

For the best results, follow an orderly sequence. This provides incremental steps that you can verify before moving on to the next step.

Installation Sequence

Follow this sequence:

1. Network connection
2. Cartridge subsystems
3. SCSI connection or CNT SCSI gateway (if applicable)
4. REEL products

StorageTek Components

If you purchased new StorageTek equipment as part of your Storage Solution, either a standalone cartridge subsystem or an ACS, have these components installed first. This equipment is installed by StorageTek customer service engineers and is coordinated by the account manager.

Digital AlphaServer System Host-to-SCSI Connection

The Digital AlphaServer system is connected to the StorageTek tape drives through a SCSI controller. After the StorageTek tape drives are set up, you can connect them to the Digital AlphaServer system If the tape drives are FIPS-60 (Bus-Tag) controlled, you need a CNT SCSI Gateway to FIPS-60 converter.

Hardware Setup

Each Digital AlphaServer system (AlphaServer 8200, AlphaServer 8400, or AlphaServer 2100) offers a variety of SCSI connection options. Ensure that your controller is already installed. This is usually performed by Digital field service engineers. The account manager coordinates the installation.

Connect the SCSI cable to the drives.

Software Setup

After the tape drives are connected, verify that they are known to the system. The best way to verify data path connectivity is to manually insert a tape cartridge into each tape drive and initialize the tape using the UNIX initialize command.

Computer National Technology (CNT) SCSI Gateway-to-FIPS-60 Converter

If the StorageTek drive that you are using requires a FIPS-60 controller, your Storage Solution must include a CNT SCSI gateway. This unit converts the SCSI commands from the Digital AlphaServer system to FIPS-60 commands that are recognized by the tape control unit (TCU) and vice versa. After you have installed and configured the CNT SCSI gateway, it is transparent to normal operations. The FIPS-60 drives with which the converter communicates appear as SCSI drives to your Digital AlphaServer system.

The installation is performed by Digital field service engineers or CNT customer service engineers, and is coordinated by the account manager.

Host Computer Software

The software hub of the Storage Solution is the REEL manager software, which is comprised of the REELbackup and REELlibrarian products. These software products are installed on your Digital AlphaServer system and on the other TCP/IP-connected clients in your network.

Installing REELbackup

REELbackup provides high performance backup and recovery services on UNIX-based systems. As a client/server product, the main server component is installed on your Digital AlphaServer system. This is called the REELbackup **master node.** REELbackup can be installed on other Digital UNIX nodes in the cluster as **client nodes.**

Refer to the StorageTek *REELbackup Installation Guide* and the *Master Guide* for installation details.

Installing REELlibrarian

REELlibrarian provides comprehensive tape management support on UNIX systems. Users can conduct secure, ad-hoc sessions with tape data. Tapes are stored in libraries (manual or robotic) and are tracked by an online catalog. Like REELbackup, REELlibrarian is a client/server product having a Digital AlphaServer system master node and possible Digital UNIX clients.

Refer to the StorageTek *REELlibrarian Installation Guide* and the *Master Guide* for installation details.

4
Documentation Lists

Introduction

The particular documentation that you have depends on the configuration of your Storage Solution. The following sections list all of the possible documentation that you may have.

StorageTek Documentation

The following subsections list the StorageTek documentation:

UNIX-based Library Server Documentation

- *UNIX-based Library Server System Administrator's Guide*
- *UNIX-based Library Server Programmer's Guide*
- *UNIX-based Library Server Installation and Service Manual*

Tape Cartridge Subsystem Documentation

StorageTek cartridge subsystems (CS) system management documentation includes one or more of the following:

- *Physical Planning Guide*
- *Cartridge Subsystem Planning and Migration Guide*
- *Cartridge Subsystem General Information Manual*
- *Cartridge Subsystem Installation Manual*
- *Cartridge Subsystem Operator's Guide*

StorageTek tape cartridge subsystems (CS) technical documentation includes one or more of the following:

- *Cartridge Subsystem Technical Reference Manual*
- *Cartridge Subsystem Service Manual*
- *Cartridge Subsystem Illustrated Parts Catalog*
- *Cartridge Subsystem Diagnostic Guide*

Automated Cartridge System Documentation

StorageTek automated cartridge system (ACS) system management documentation includes one or more of the following:

- *Physical Planning Guide*
- *Cartridge Subsystem Planning and Migration Guide*
- *Cartridge Subsystem General Information Manual*
- *Cartridge Subsystem Installation Manual*
- *Cartridge Subsystem Operator's Guide*

StorageTek automated cartridge system (ACS) technical documentation includes one or more of the following:

- *Cartridge System Maintenance Manual*
- *Cartridge System Service Manual*
- *Cartridge System Illustrated Parts Catalog*
- *Cartridge System Diagnostic Guide*
- *SunView 1 Beginner's Guide*
- *Getting Started with SunOS: Beginner's Guide*

REELlibrarian Documentation

- *REELlibrarian Installation Guide*
- *REELlibrarian Loading Sheet*
- *REELlibrarian Master Guide*

REELaccess Documentation

- *REELaccess Installation Guide*
- *REELaccess Loading Sheet*
- *REELaccess Administrator and Operator Guide*
- *REELaccess User Guide*

REELbackup Documentation

- *REELbackup Installation Guide*
- *REELbackup Loading Sheet*
- *REELbackup Master Guide*

Digital Equipment Corporation Documentation

Digital UNIX O/S V3.2c

AlphaServer 8200/8400/2100 Documentation set

CNT Documentation

- *Installation Guide*
- *User's Manual/Configuration Guide*

Glossary

automated cartridge system (ACS)

A robotic system that automatically loads and unloads tape cartridges into and out of tape drives. This system is made up of elements such as cartridge subsystems, library storage modules, controllers, and a library management unit. An automated cartridge system is also known as a library or ACS.

control path

The communication path through which ACS resource requests are passed.

Control Unit

The hardware component for controlling the StorageTek tape drives. These electronics and cabling can be built into the drive cabinet or housed within a separate control unit cabinet.

data path

The communications path through which storage data is passed to and from tape devices.

Fast, wide, differential SCSI-2 interface

A 20 megabyte per second, 16-bit SCSI bus.

FIPS-60 controller

A hardware device that sends data and commands to devices compliant with the Federal Information Processing Standard (FIPS) as defined in publication FIPS-60.

library

The collective hardware and controlling software for a tape storage system that is also known as an automated cartridge system.

library control unit

The controlling element for the robotics within an LSM.

library management unit

The controlling element for the entire robotic system. The unit can connect to several library control units.

library server

The hardware (CPU) and software used to connect the ACS to the systems running the backup and tape management software.

library storage module (LSM)

The physical enclosure for the robotic mechanism and the storage bins for the tape cartridges.

Robotics control link

The communication connection through which control information is sent from the system to the robotic mechanism.

Robotic mechanism

The electro-mechanical tape handler contained within an LSM.

SCSI controller

A hardware function within the computer that sends data and control commands to a Small Computer System Interface (SCSI) device.

SCSI Gateway

A stand-alone hardware component from Computer Network Technology Corporation (CNT) for converting SCSI data and commands into FIPS-60 data and commands and vice versa.

tape cartridge subsystem

A cabinet containing tape drives and controlling logic that is connected to an LSM within the ACS.

tape drive unit

A tape drive within a tape cartridge subsystem.

TCP/IP connection

Transmission Control Protocol/Internet Protocol, which is a communication and computer interconnect standard.