Sun StorageTek® SL8500 Modular Library System Host Connectivity

Technical Brief

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Contents

Preface

The Sun StorageTek™ SL8500 Modular Library System has undergone several advancements in capacity, performance, and host connectivity.

This technical brief contains information about the host connection capabilities including: order information, firmware and software requirements, plus examples of each connection type.

This section of the technical brief provides descriptions of the terminology, operating system and library management software, and an example of a default configuration diagram used throughout this document.

Terminology

The following terminology is used throughout this document and mean the same unless otherwise noted:

- SL8500 modular library system, SL8500 library, SL8500, or just “library”
- StreamLine Library Console is now called the StorageTek Library Console (SLC)
- Media, cartridges, tape cartridges, volumes, tape volumes, or just “tapes”
- Tape drives, or just “drives”
- Rail (hardware) and library storage module or LSM (software)
- Library complex (hardware) and automated cartridge system ACS (software). An ACS can contain multiple libraries within a complex.
- Slots (hardware) and cells (software)
- Connections:
  - Host library connections, host connections, host interface, interface connections, interface, host communications, occur over the **control path** or just **path**.
  - Host to tape drive connections, interface connections, are all over the **data path**.

Organization

The organization of this technical brief is:

Chapter and Title	Use this chapter to...
Chapter 1 "Introduction"	Learn about the evolution—or the ongoing advancements—of host the connectivity to the SL8500 library.
Chapter 2 "Library Complex"	Understand what an SL8500 Library Complex is and how to create one.
Chapter 3 "Dual TCP/IP"	Find out how to connect two separate host paths to the library using an optional feature using an active/active design.
Chapter 4 "Partitioning"	Learn about the additional flexibility partitioning provides and the different host connects that support this optional feature.
Chapter 5 "Multiple Host Connections"	Find out about the newest host connectivity feature to an SL8500 Library Complex that allows up to *four host* connections to a library complex.
Chapter 6 "Potential Problems"	Learn about potential problems with networks and host connectivity.
Appendix A "Service and Support"	This appendix is intended to support service representatives with configuring the SL8500 library host connections.
Appendix B "Work Sheets"	This appendix provides work sheets to help plan for the host connection to an SL8500 library.

Operating System Support

The SL8500 library uses a TCP/IP[1] protocol over an Ethernet physical interface to manage and communicate with the host and library management software applications. This interface enables both:

- Open system platforms with ACSLS
- Enterprise-level mainframes with HSC

to connect to and communicate with the SL8500.

1. **TCP/IP** Transmission Control Protocol/Internet Protocol

TCP = One of the main protocols in networks that enable two hosts to establish a connection and exchange streams of data. TCP guarantees delivery of data and also guarantees that packets are delivered in the order they were sent.

IP = specifies the format of packets and the addressing scheme

Library Management Software

There are two library management software packages that can access the SL8500 library.

- Automated Cartridge System Library Software (ACSLS)
- NearLine Control Solution (NCS), which consists of a Host Software Component (HSC) and a Storage Management Component (SMC).

Note – These two library management software packages are mentioned throughout this document. For more information about each software, refer to the appropriate product documentation.

ACSLS

Automated Cartridge System Library Software (ACSLS) is a Sun StorageTek server software for *open systems* that controls a StorageTek Automated Cartridge System (ACS), which includes the SL8500 modular library and library complex.

ACSLS accesses and manages information stored in an ACS through command processing across a network. The software includes a system administration component, interfaces to client system applications, and library management facilities.

HSC and SMC

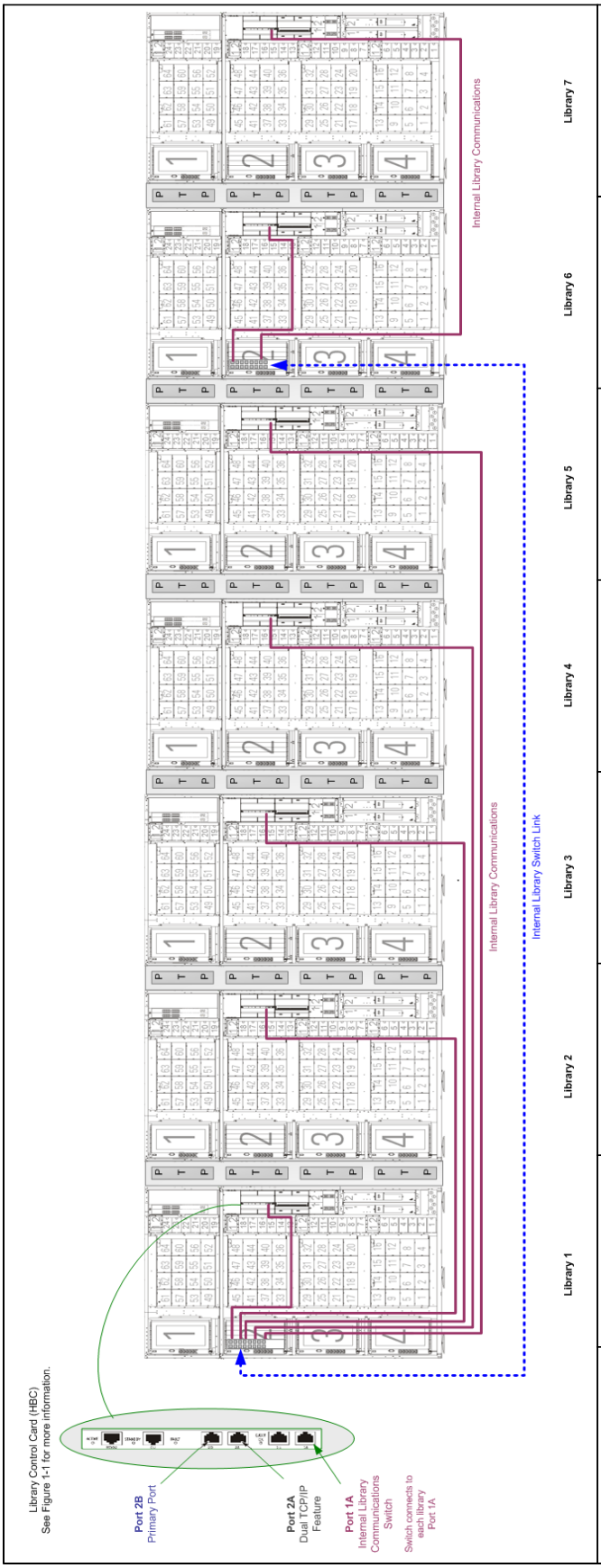
- The Host Software Component (HSC) resides on *mainframe* operating systems and controls the library. The HSC receives requests from the programmatic interface and translates them into commands which are carried by the control path to the library.
- The Storage Management Component (SMC) resides on the MVS host along with the HSC.

  SMC intercepts mount and dismount messages, translates them into move requests, and routes them to the library.

HSC is the overall manager of the library, the interface between a *mainframe* operating system and an ACS. HSC maintains a control data set, records of the cartridges stored in each ACS.

Default Configuration Drawing

The following default configuration uses seven modules using six pass-thru ports in an SL8500 Library Complex. This drawing is used throughout this brief to help show the evolution of the host connectivity for the SL8500 library.



Components	Library 1	Library 2	Library 3	Library 4	Library 5	Library 6	Library 7
Expansion Modules							
Library Firmware							
Library Console							
Software							
Port: IP Address							
LSMs							
Features:							
Pass-thru Ports							
Dual TCP/IP							
Partitioning							
Multi-Host							

CHAPTER 1

Introduction

The evolution—or the ongoing advancements—of the host connectivity to the SL8500 library has progressed from a single Ethernet port to a multi-host, multi-connection library that offers redundancy and flexibility to support an array of customer requirements.

Evolution

The host connectivity evolution includes:

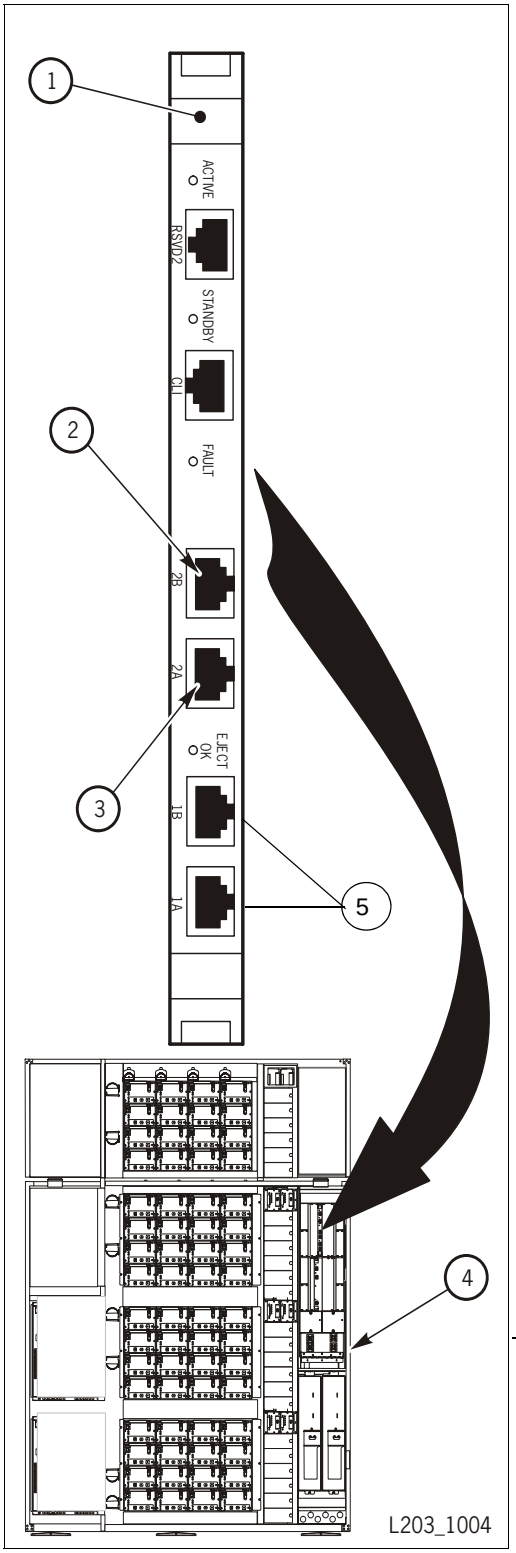
- The initial release; a single port to the "Library Controller" on page 2 that connected a host to a single library providing a capacity of 1,448 to 6,000 tape cartridges and from 1 to 64 tape drives.
- The next step was to add the Pass-thru Port (PTP).
  This optional feature created the SL8500 "Library Complex" on page 5, which increased capacity and performance by connecting multiple libraries together using the *internal library communications interface (ILC)*—but connection to the host was still through that single interface port on the library controller.
- That single interface port was also a single point of failure.
  To remedy this, the "Dual TCP/IP" on page 11 feature was developed and added. This optional feature enabled an additional port on the library controller for host communications and redundancy.
- The next improvement to host connectivity addresses a direct customer concern—sharing resources. How can the SL8500 library support customers with both mainframe and open system environments?

  The answer: An optional featured called "Partitioning" on page 31.
  Partitioning the SL8500 library means the customer can have:

  - More than one operating system and application manage the library.
  - Multiple libraries from one physical piece of hardware.
- The latest enhancement increases redundancy and connectivity by providing "Multiple Host Connections" on page 47. This optional feature allows customers with a Library Complex to connect up to four host connections to the complex. In addition to redundancy and connectivity, this feature also helps reduce contention and improve performance of the library and tape drives.

Library Controller

FIGURE 1-1 Library Controller Card



The SL8500 library uses a TCP/IP protocol over an Ethernet physical interface to manage and communicate with the host and library management applications.

This interface enables either:

- Open system platforms with ACSLS

or

- Enterprise-level mainframes with HSC

to connect to and communicate with the SL8500.

The HBC card is the library controller responsible for coordinating all component operations within the library and providing the interface connection with the host.

Connections:
There are two separate Ethernet connections on the HBC card for host-to-library communications.

- **Port 2B** provides the primary connection for host communications—this is the standard connection for SL8500 libraries.
- **Port 2A** provides the Dual TCP/IP connection—this is an *optional feature* for SL8500 libraries.

Both ports comply with the Institute of Electrical and Electronics Engineers standard—IEEE 802.3—for Ethernet networks.

Both ports are capable of auto-negotiating the:

- Method of transmission
- Speed of the transmission

Below the two host connections are two separate inter-library connections—Ports 1A and 1B.

These connections provide communications between libraries in a complex.

- Port 1A provides the library-to-library connection. Port 1A is also the recommended connection port for the Service Delivery Platform (SDP).
- Port 1B is currently reserved.

Figure callouts:

1. HBC card (library controller)
2. Port 2B—primary TCP/IP host connection
3. Port 2A—secondary, dual TCP/IP host connection
4. Electronics control module
5. Inter-library communications: Ports 1A (bottom) and 1B (top)

Network Recommendations

For an SL8500 modular library, a private network connection to an Ethernet hub or switch is recommended for maximum throughput and minimum resource contention.

Library Complex:

When creating an SL8500 Library Complex, which is done by connecting libraries together with pass-thru ports, remember:

1. *In the past*, all hosts needed to connect to *only one library* in the complex; preferably to the first or rightmost library in the complex.

   Now with the "Multiple Host Connections" optional feature, customers can connect up to four host interface connections to the complex.

2. Each host connection to the libraries can provide all the host-to-library communications to the entire complex. This is accomplished by using the Inter-Library Communications—ILC—kit (part number 314842401) and the internal cabling to the other libraries through Port 1A.

Dual TCP/IP:

When implementing the Dual TCP/IP feature, it is strongly recommended that you and the system administrator work closely together to define the configuration.

Remember, the simplest topology (private network connections) is often the best. Simplification will:

- Offer maximum throughput
- Provide minimum resource contention
- Lend itself to higher security for library communication
- Supply the least expensive alternative
- Provide quick identification of any problems within the network

Partitioning:

Essential elements for understanding partitions are:

- **Clear communication between all parties,** such as system programmers, network administrators, both ACSLS and HSC administrators, and Sun service representatives.
- Only a single library may be partitioned—pass-thru port (PTP) operations are not allowed.
- Partitioned LSMs cannot communicate with other LSMs within the library unless they are in the same partition.

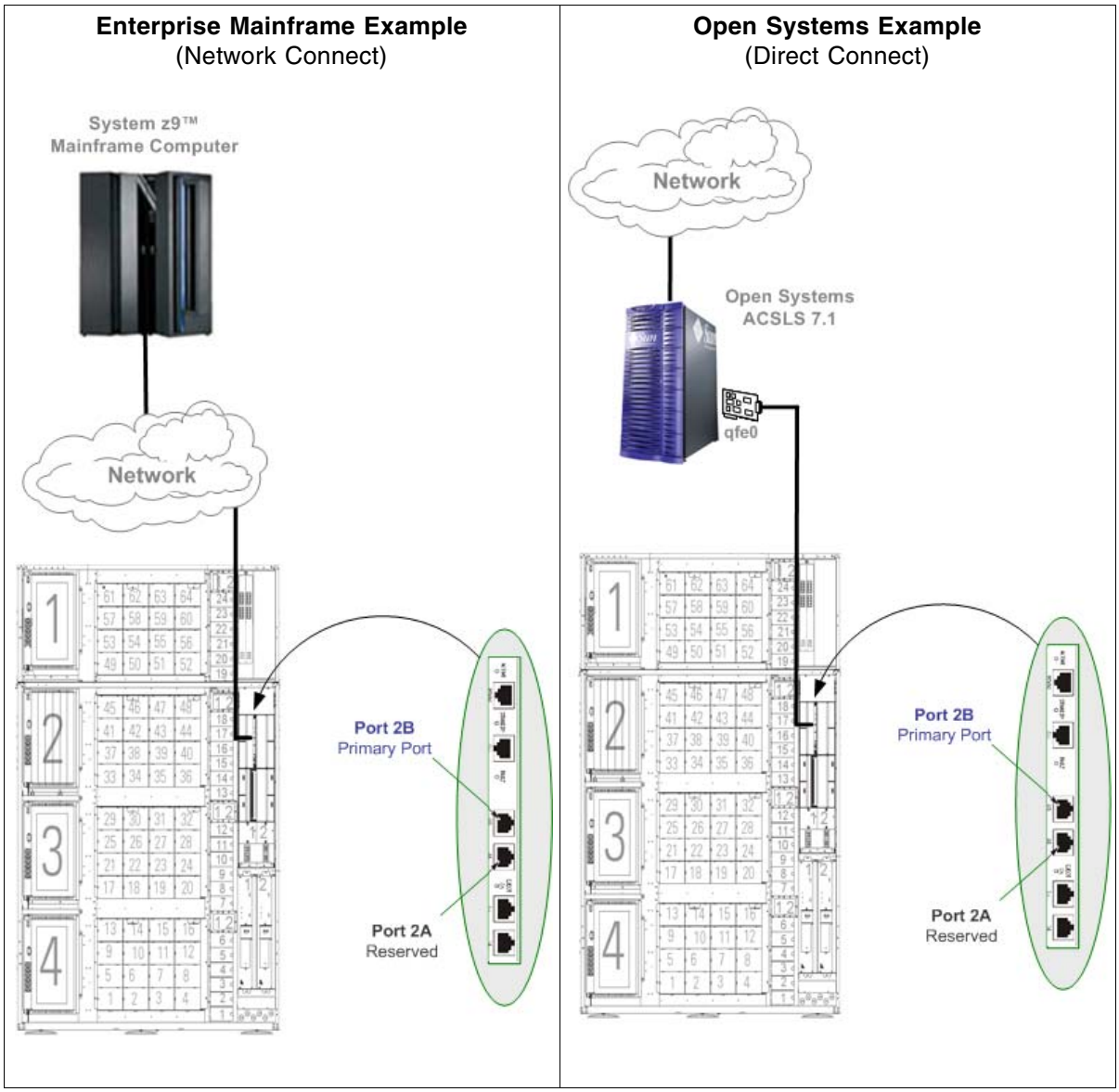
These are only suggestions, however. The customer's network and their desired topology are ultimately the determining factors. For certain topologies, a more complicated setup is required. Many will require consultation between the system administrator and another level of Sun services.

Host Connection Examples

FIGURE 1-2 shows two examples of host connections to an SL8500 library:

- Enterprise Mainframe using HSC as the library management software
- Open Systems using ACSLS as the library management software

FIGURE 1-2 Host Connection Types



CHAPTER 2

Library Complex

This chapter describes the SL8500 Library Complex, which is created by connecting two or more libraries together with pass-thru ports (PTPs).

The PTP is an electro-mechanical device that allows one library storage module (LSM) to pass up to two tape cartridges to another LSM in the same complex.

SL8500 PTPs consist of a separate frame that is installed between the Drive and Electronics Module and Robotics Interface Module of one library with the same modules of an adjacent library. Each PTP frame has four separate mechanisms that can pass up to *two* cartridges (per LSM) between the libraries at once.

Currently an SL8500 Library Complex can support up to *10* libraries connected together using nine Pass-thru Ports.

Requirements

The order numbers for a library complex include:

- Order number: X-SL8501P-PTP-Z and XSL8500P-MECH-Z
  - If in the 1st or 6th library: XSL8501P-HUB-Z
  - If 2N power is needed: XSL8500-AC-SW-Z
  - If racks are needed: XSL8500-RACK-Z
  - Frame-only and mechanisms will be added later: X-SL8500P-BLANK-Z

The requirements include the following levels *or higher*:

- Library firmware of **FRS_2.00**
- StorageTek Library Console: FRS_2.00

- ACSLS: 7.1 plus PUT0501 for Near Continuous Operation

or

- NCS (NearLine Control Solution) Version 6.0 and 6.1
  - HSC: 6.0 plus PTFs (*minimum*) or
  - HSC: 6.1 which added Near Continuous Operation (NCO)

Note – Upgrading library firmware can be a disruption to customer operations. You may want to schedule time with the customer to perform this service.

Pass-thru Port Descriptions

Assembly	All SL8500 libraries come equipped and ready for the addition of the PTP frame and feature—no additional walls are needed. There are eight PTP locations in an SL8500 library, two locations per rail (or LSM). These locations are on the curved portions of the Robotics Interface Module near the tape drives. Therefore, they provide quick access to the tape drives.
Power	The "Home" library provides power for the PTPs from the same +48 VDC power bus as the robotic rails. Both the N+1 and 2N power configurations currently support the PTP hardware—no additional power supplies are needed.
Library Management	Both Sun StorageTek software applications (ACSLS and HSC) support pass-thru port operations—no additional software is needed.
Growth	**Important:** For non-disruptive growth, Sun StorageTek recommends adding libraries from right to left when facing the front doors (this is the preferred installation method). However, the library complex can grow in the other direction—from *left* to *right*—but this requires a disruption to the operating system to renumber the LSMs and reconfigure the ACSLS or HSC software.
What You Need	To implement the pass-thru port feature, you must have: ■ Accessory racks: 1 rack (*required*) 2 racks for power redundancy ■ Inter-library Communications kit (ILC) for up to 5 libraries Each kit supports up to 5 libraries that are connected together
Service	If service is required, the pass-thru port mechanism slides out of the frame from the rear of the library, which does not affect normal library operations. The mechanism is a self-contained device that uses +48 VDC motors to position and move a two-slot array within a Y-shaped track. A mechanical switch and sensors on each side of the track determine the location of the array, either home or away.
Terminology	The following terms and definitions apply to SL8500 PTP operations: ■ **Home library:** The library that provides power, signal, and control lines to the PTP mechanisms. This is the library on the *right* as viewed from the front. ■ **Away library:** The library that is always located on the *left* side of a Home library, as viewed from the front. ■ **Source:** The home slot location containing the cartridge that will be passed through to an adjacent library. ■ **Destination:** The drive or slot location in the adjacent library where the cartridge will be mounted or stored.

Host Connections

The HBC card provides the interface connection for communications to the:

- Hosts and library management software through Port 2B[1]
- Additional libraries in the complex through Port 1A[2]

FIGURE 2-1 shows a configuration with three libraries in a complex connected together by two pass-thru ports.

1. Port 2B[1] of Library 1 has the host Ethernet connection for all 3 libraries.
2. Port 1A[2] of Library 1 goes to an Ethernet switch in Rack 2.

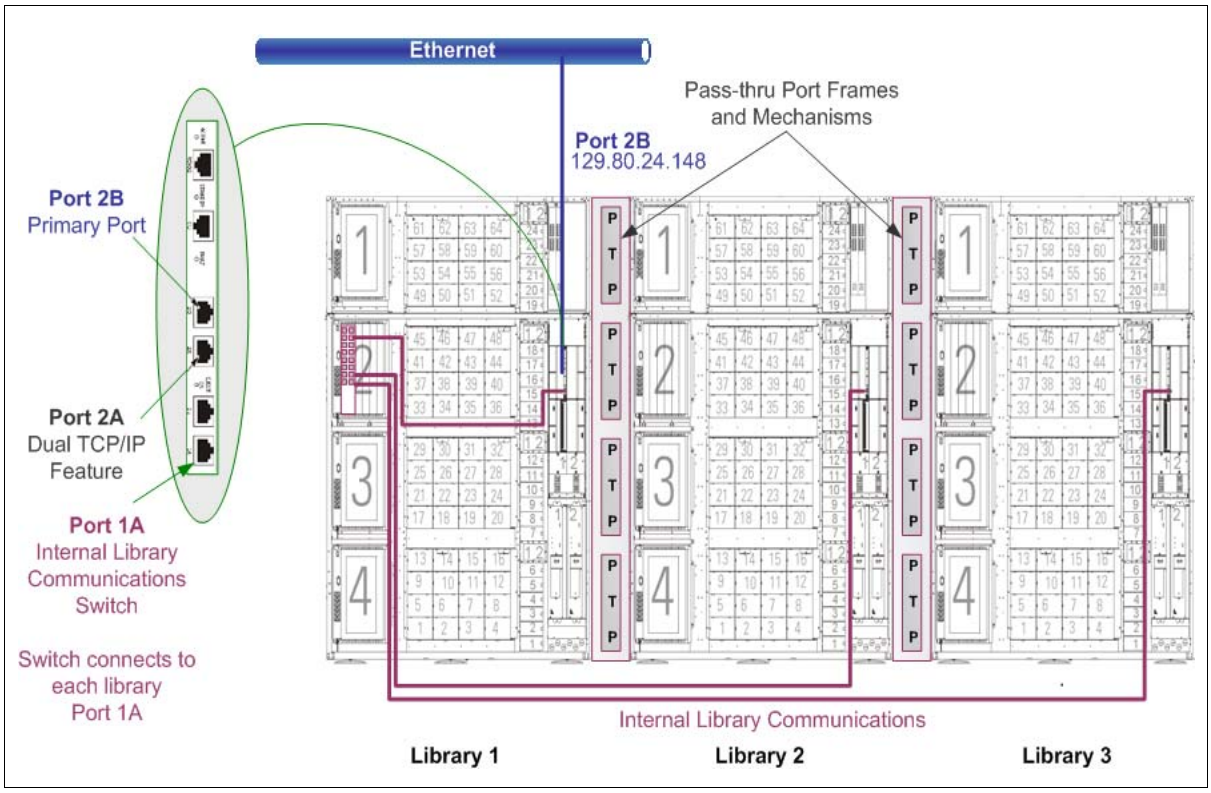
   This Ethernet switch provides an internal "private" network for library complex.
3. Each additional library (2 and 3) connects to this Ethernet switch using Port 1A on their HBC card. This provides the host connection to these libraries (2 and 3).

For example, the path for the host connection to Library 2 is:

a. In on Library 1 Port 2B, through Library 1 Port 1A, to the Ethernet switch.

b. The Ethernet switch connects the host to Library 2 Port 1A.

FIGURE 2-1 Library Complex Example—Three Libraries with One Host Connection



1. Port 2B = The primary host communications port comes standard with the library.
2. Port 1A = Inter-library communications (ILC) port.

FIGURE 2-2 on page 9 shows an SL8500 Library Complex with seven libraries connected together by six pass-thru ports (the default diagram).

1. Port 2B of Library 1 provides the primary interface with one host Ethernet connection for all seven libraries.
2. Port 1A of Library 1 goes to an Ethernet switch in Rack 2.

   This Ethernet switch provides the private network for all other libraries in the complex with the host connection going to Library 1 Port 2B.

   Note: Each internal library communication (ILC) kit supports up to 5 libraries. If there are more than 5 libraries in a complex, an additional ILC kit is required to connect those libraries to Library 1.
3. An Inter-switch Link (ISL) connects the Ethernet switch in Library 1 to another Ethernet switch in Library 6.

   Additional libraries (6 and 7) connect to the second Ethernet switch using Port 1A on their HBC cards.

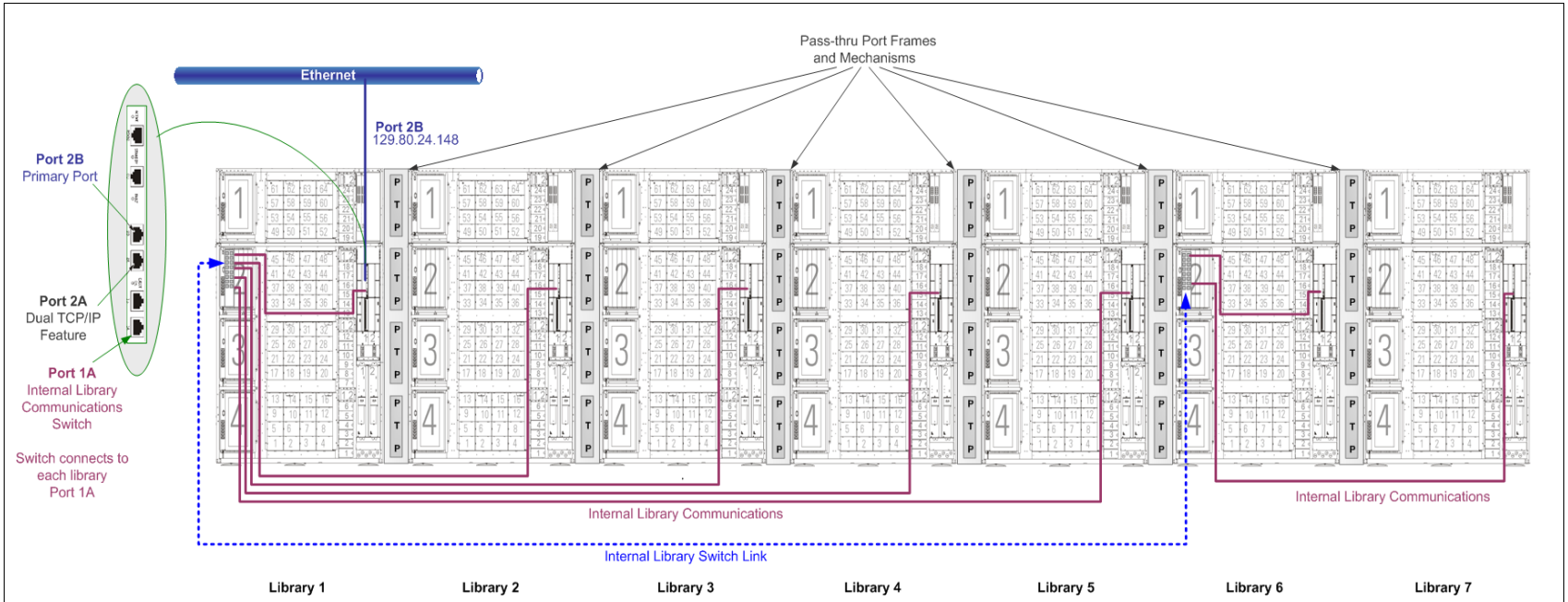
   Communications for the second group of libraries goes through the Inter-switch link to Library 1.

   Note: Customers can connect up to 10 libraries in this configuration.

   For example, the path for the host connection to Library 7 is:

   a. In on Library 1 Port 2B, through Library 1 Port 1A, to the Ethernet switch.
   b. The Ethernet switch in Library 1 connects to the Ethernet switch in Library 6 using the Inter-switch Link.
   c. The Ethernet switch in Library 6 connects the host to Library 7 Port 1A.

FIGURE 2-2 Library Complex Example—Seven Libraries with One Host Connection



Components	Library 1	Library 2	Library 3	Library 4	Library 5	Library 6	Library 7
Expansion Modules	One	Two	Three	Three	Four	Three	None
Library Firmware	FRS_2.00	FRS_2.00	FRS_2.00	FRS_2.00	FRS_2.00	FRS_2.00	FRS_2.00
Library Console	FRS_2.00	FRS_2.00	FRS_2.00	FRS_2.00	FRS_2.00	FRS_2.00	FRS_2.00
Software	ACSLS: 7.1 plus PUT0501						
Port: IP Address	**2B:** 129.80.24.148						
LSMs	0, 1, 2, 3, 4	5, 6, 7, 8	9, 10, 11, 12	13, 14, 15, 16	17, 18, 19, 20	21, 22, 23, 24	25, 26, 27, 28
Features:							
Pass-thru Port	Yes	Yes	Yes	Yes	Yes	Yes	—

CHAPTER 3

Dual TCP/IP

The SL8500 library provides two separate Ethernet connections on the HBC card for host to library communications—Ports 2A and 2B.

- Port 2A provides the Dual TCP/IP connection—this is an *optional feature*
- Port 2B provides the primary connection—this is the standard connection

This chapter describes the requirements and provides examples when using the Dual TCP/IP feature, which provides two public network interfaces to the library and/or library complex.

The figures in this chapter show host connections to only one SL8500 library. The Dual TCP/IP feature supports connections to an SL8500 Library Complex, which supports up to 10 libraries connected together using nine Pass-thru Ports (PTPs).

- See "Library Complex" on page 5 for more information about this option.
- See FIGURE 3-7 on page 29 for an example of this type of configuration.

Requirements

Order numbers for Dual TCP/IP include:

- Dual TCP/IP Host Interface: XSL8500-DTCPIP

Requirements include the following levels *or higher*:

- Library firmware of **FRS_3.08**
- StorageTek Library Console: FRS_x.xx
- ACSLS 7.1—see "ACSLS and Dual TCP/IP Support" on page 14

or

- NCS 6.0 or 6.1—see "HSC and Dual TCP/IP Support" on page 21

Note – Upgrading library firmware can be a disruption to customer operations. You may want to schedule time with the customer to perform this service.

Network Entries Worksheet

When preparing the network and connections—as a best practice—complete a network entries worksheet for each port of the SL8500 library.

Description		IP Address
Port 2B	Host name to Port 2B	
	HBC Card Port 2B	
	Gateway Port 2B	
	Netmask	
Port 2A	Host name to Port 2A	
	HBC Card Port 2A	
	Gateway Port 2A	
	Netmask	

Important:

- When connecting more than one interface to an SL8500 library, the connections should be through **different subnets** for redundancy.

  If one subnet should fail, communications between the hosts and the libraries continue over the other subnet.

- When connecting an interface to Port 2A, a service representative must configure the routing and possibly assign policies for that port (2A) using the command line interface.

  Note: Port 2B is the default port for the library; no routing tables are required when connecting to that port.

  See "Port Configurations" on page 63 for more information.

- **The ports need to be on different Layer 2 broadcast domains**[1].

1. A broadcast domain is a logical network segment where any computer or other device connected to the network can directly communicate to any other device on that domain without having to go through a routing device, provided they share the same subnet address and are in the same virtual network. See FIGURE 3-6 on page 27.

Dual TCP/IP Descriptions

Dual TCP/IP provides *two separate* host connections (paths) between the library management software (ACSLS or HSC) and the library controller (HBC card).

- Dual TCP/IP is an **active/active** design.

  When both host connections are available, ACSLS and HSC uses them both to communicate with the library; however, they use them differently:

  - HSC uses each connection alternately.
  - ACSLS continuously monitors both connections using one path as primary (Port 2B) and occasionally using the second path (Port 2A).

  This helps ensure that both paths are working properly so that if one fails, there is a high degree of confidence that the other path is operational.
- Both ACSLS and HSC detect when a path is unavailable and automatically resend transmissions over the other path. The SL8500 also resends transmissions over the other path when a path becomes unavailable.
- After retrying for four to five minutes, ACSLS, HSC, and the SL8500 will mark the path as unavailable and use the remaining path.

  When a path is marked as unavailable, ACSLS, HSC, and the SL8500 continues to monitor the path. When the path becomes available again, ACSLS, HSC, and the SL8500 will automatically re-connect to the path.

Note: Dual TCP/IP provides *two separate* host connections not redundant connections. Redundancy for these configurations should be designed within the network.

ACSLS and Dual TCP/IP Support

The purpose of dual TCP/IP is to automatically recognize and avoid a failing communication path. Since this is automated, there is no need to manually switch from an inoperative connection. The best solution is having ACSLS keep two connections to the library open because ACSLS will use all active connections.

If one connection is inoperative, ACSLS will just use the remaining operative connection, while continuing to try to reestablish communication on the failing connection.

ACSLS provides the ability to configure two TCP/IP connections to a single library using "`acsss_config`" or the Dynamic Configuration "`config`."

When configuring libraries, the user is asked how many connections there are to the library and then the name of the devices (IP addresses).

In order to take full advantage of Dual TCP/IP support on the SL8500, use the "`route`" command to manipulate the routing tables on the ACSLS server.

Is there a preferred configuration?
The preferred configuration for Dual TCP/IP implementations is two network interfaces on two separate subnets for the ACSLS server. This provides maximum throughput and minimum resource contention with regard to network communications while adding a second physical connection improving reliability.

For more information about ACSLS, the SL8500, and Dual TCP/IP, refer to the *ACSLS Installation Configuration and Administration Guide* (ICAG).

Notes:

1. Always refer to the Customer Resource Center (CRC) for the latest Tech Tips, code updates, and information.
2. Make sure you use and reference the ACSLS documentation to configure the routing tables on the ACSLS server to support Dual TCP/IP.
3. The minimum level of software required is:

For ACSLS 7.1 for Solaris on SPARC or AiX.

- Apply PUT0601 and the following PTFs:
  - ACSLS 7.1.0 for Solaris on SPARC: PTF849144S
  - ACSLS 7.1.0 for AiX:PTF849144A
- For ACSLS 7.1.1 for Solaris on X86.
  - Apply PTF849144*x*
- For ACSLS HA.
  - Refer to the ACSLS documentation for information about Dual TCP/IP.
  - Contact Sun Professional Services to configure HA systems

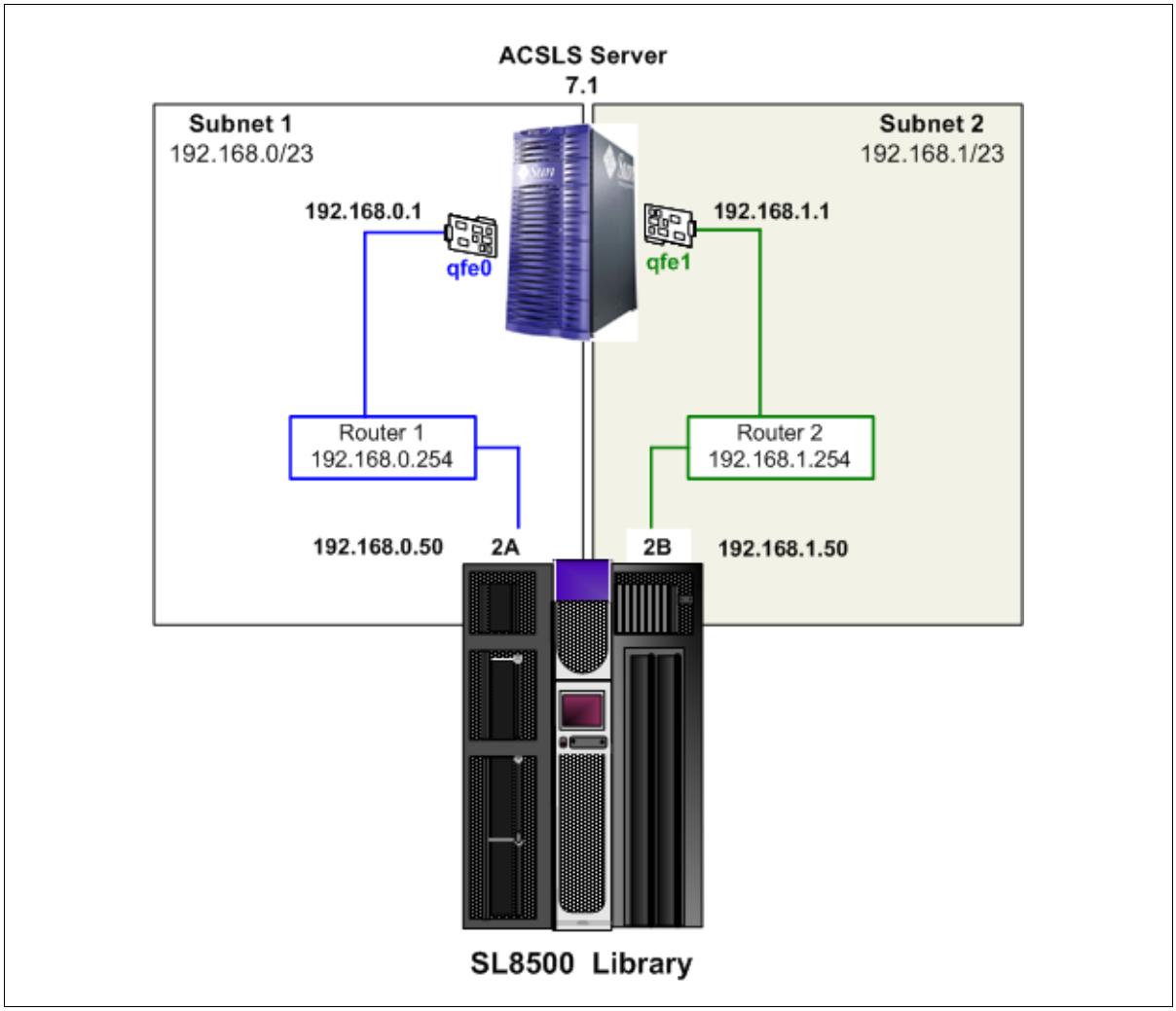
The following pages provide some examples of supported configurations.

ACSLS Configuration One

The following example is one of the preferred configurations for ACSLS with the Dual TCP/IP feature.

In this configuration, the ACSLS server contains two network interfaces that reside on two separate subnets—both going directly to the SL8500 library on the same two subnets as the server, one port each.

FIGURE 3-1 ACSLS Configuration One



In this example, the SL8500 uses a one-to-one relationship with the network interfaces on the ACSLS server in which the:

- qfe0 interface communicates with the 2A interface on the SL8500
- qfe1 interface communicates with the 2B interface on the SL8500

Note: *qfe0* and *qfe1* are simply network interface card (NIC) identifiers for these ACSLS examples.

Routing
In this example, all connections are on the same subnet (192.168.x.x), so no special routing requirements are necessary. However, you may want to include a default gateway for the outside network connections.

Note – You must also configure the routing on the ACSLS server and/or system mainframes. Refer to the appropriate ACSLS or HSC documentation.

Using the UNIX "route" commands, you force a relationship; to do this:

- For Solaris: as root, enter the following commands:

```
# route add 192.168.0.50 -ifp qfe0 192.168.0.254
# route add 192.168.1.50 -ifp qfe1 192.168.1.254
```

- For AIX: as root, enter the following commands:

```
# route add 192.168.0.50 -if qfe0 192.168.0.254
# route add 192.168.1.50 -if qfe1 192.168.1.254
```

The first route command routes any communication with 192.168.0.50 to go through qfe0 on the ACSLS server and then go through Router 1.

The second command routes any communication with 192.168.1.50 to go through qfe1 on the ACSLS server and then go through router 2.

- To validate the routes in the routing table, enter:

```
# netstat -r
```

TABLE 3-1 Routing Table ACSLS Configuration One

Destination	Gateway	Flags	Ref	Use	Interface
192.168.0.50	192.168.0.254	UGH*	1	0	qfe0
192.168.1.50	192.168.1.254	UGH	1	0	qfe1
192.168.0.0	192.168.0.1	U	1	7	qfe0
192.168.1.0	192.168.1.1	U	1	0	qfe1
BASE-ADDRESS.MCAST.NET	192.168.0.1	U	1	0	qfe0
default	192.168.0.254	UG	1	33	
localhost	localhost	UH	4	77	lo0

* U = User, G = Group, H = Host

You can see the first two entries are the ones that were just added.

All communication with 192.168.0.50 will go through qfe0 and communication with 192.168.1.50 will go through qfe1.

Remember: You must also configure the SL8500 routing tables.
Refer to the *SL8500 Installation Manual*, PN 96138 and/or the *SL8500 Dual TCP/IP Feature Technical Brief*, PN TT0019 for more information.

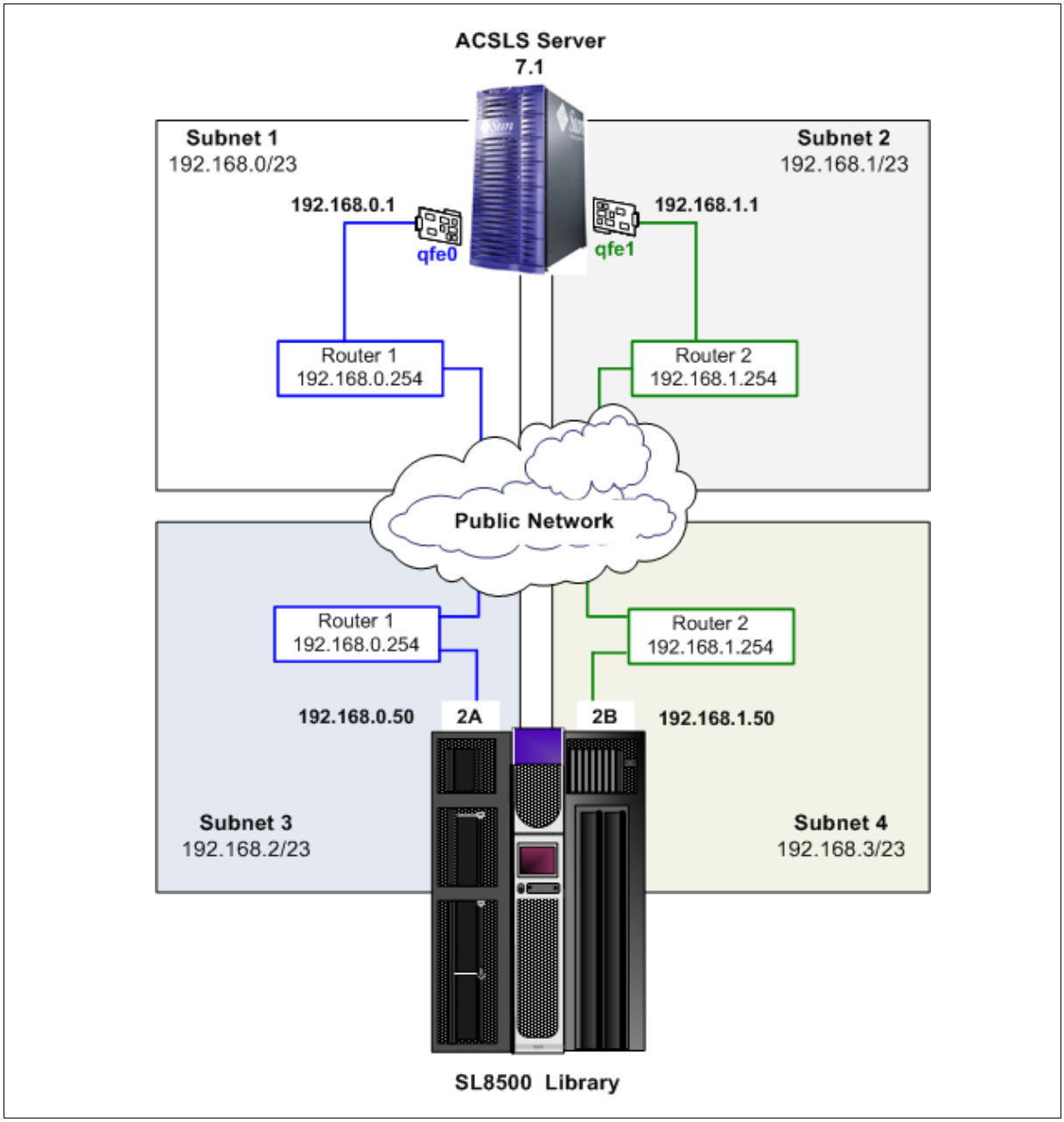
ACSLS Configuration Two

The following is another preferred example of an ACSLS configuration with Dual TCP/IP.

In this configuration, the ACSLS server contains two network interfaces that reside on two separate subnets, same as the previous example. However, both interfaces pass through a public network and into two different subnets before connecting to the SL8500 library.

Even with this difference, the commands stay the same.

FIGURE 3-2 ACSLS Configuration Two



In this example, the SL8500 uses a one-to-one relationship with the network interfaces on the ACSLS server in which the:

- qfe0 interface communicates with Port 2A
- qfe1 interface communicates with Port 2B

Routing
Because this example is using *two* host IP address *into two* SL8500 ports and involves multiple routers, you need to describe the route using the router *closest* to the SL8500 (the format is host router address via SL8500 port router addresses).

Using the UNIX "route" commands, you force this relationship; to do this:

- For Solaris: as user root, enter the following commands:

```
# route add 192.168.0.50 -ifp qfe0 192.168.0.254
# route add 192.168.1.50 -ifp qfe1 192.168.1.254
```

- For AIX: as user root, enter the following commands:

```
# route add 192.168.0.50 -if qfe0 192.168.0.254
# route add 192.168.1.50 -if qfe1 192.168.1.254
```

The default routes for the ACSLS remain the same as configuration one.

The routes within the subnets know how to route communication to the SL8500 through the public network and still enforce the one-to-one relationship between the interfaces.

- To validate the routes in the routing table, enter:

```
# netstat -r
```

Destination	Gateway	Flags	Ref	Use	Interface
192.168.0.50	192.168.0.254	UGH*	1	0	qfe0
192.168.1.50	192.168.1.254	UGH	1	0	qfe1
192.168.0.0	192.168.0.1	U	1	7	qfe0
192.168.1.0	192.168.1.1	U	1	0	qfe1
BASE-ADDRESS.MCAST.NET	192.168.0.1	U	1	0	qfe0
default	192.168.0.254	UG	1	33	
localhost	localhost	UH	4	77	lo0

* U = User, G = Group, H = Host

Remember: You must also configure the SL8500 routing tables.
Refer to the *SL8500 Installation Manual*, PN 96138 and/or the *SL8500 Dual TCP/IP Feature Technical Brief*, PN TT0019 for more information.

ACSLS High Availability Configuration

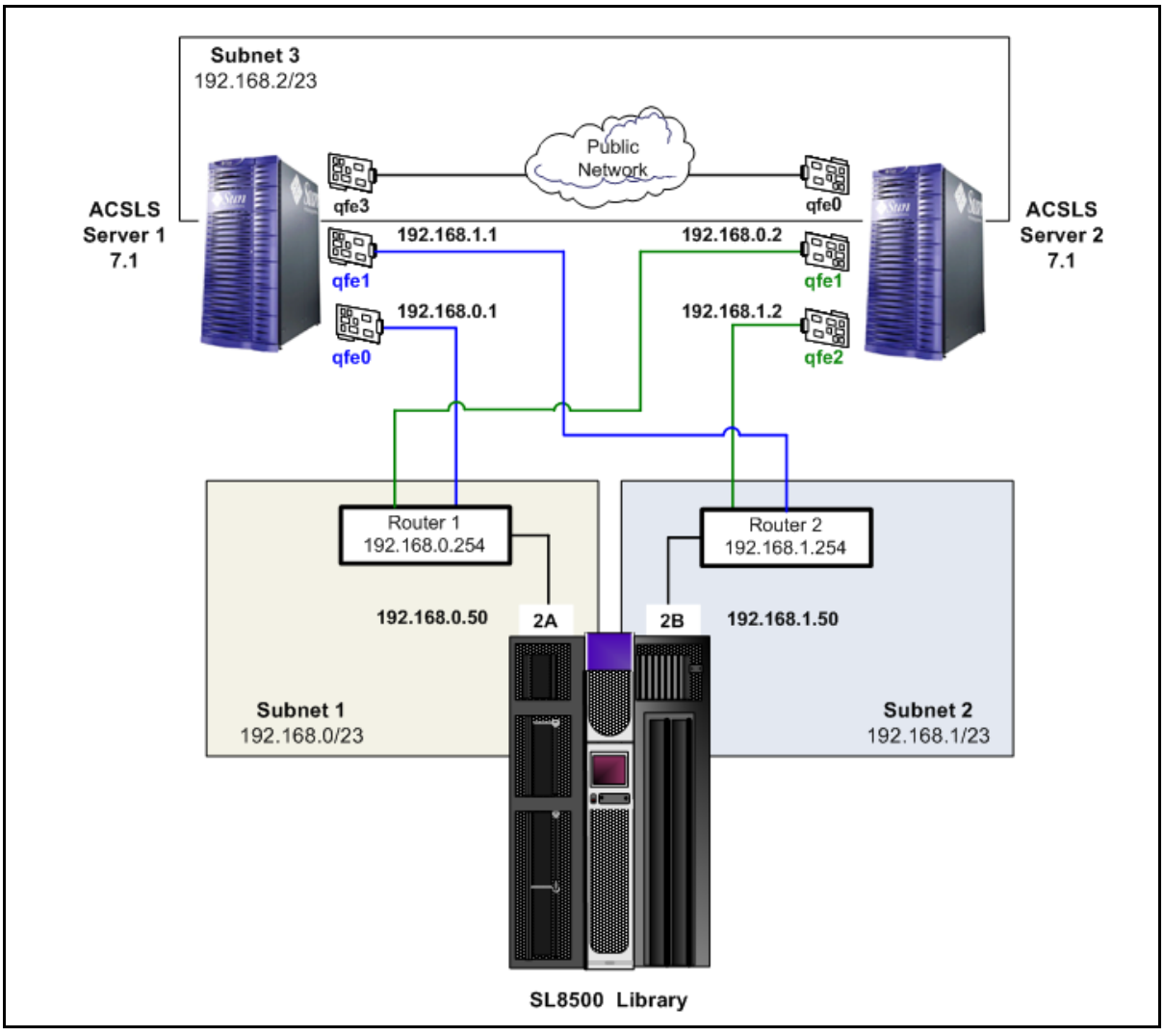
The following example is a preferred configuration for an ACSLS High Availability environment.

The purpose of the High Availability (HA) environment is to build in redundancy and eliminate single points of failure by using and connecting together two ACSLS servers.

In this configuration, two ACSLS servers connect six network interfaces (three on each server) to two separate subnets.

A third subnet inter-connects the two ACSLS servers through a public network.

FIGURE 3-3 ACSLS HA Configuration



The big difference with this configuration is that ACSLS HA uses two different servers—each using different network interfaces. This means that custom route entries must be added to both ACSLS servers.

For the Solaris user:

- On ACSLS server 1, enter:

```
# route add 192.168.0.50 -ifp qfe0 192.168.0.254
# route add 192.168.1.1 -ifp qfe1 192.168.0.254
```

- On ACSLS server 2, enter:

```
# route add 192.168.0.2 -ifp qfe1 192.168.0.254
# route add 192.168.1.2 -ifp qfe2 192.168.1.254
```

You must add the IP addresses for both servers to the SL8500 configuration.

It is important that you separate the SL8500 network interfaces over two different subnets when using ACSLS HA.

Remember: You must also configure the SL8500 routing tables.
Refer to the *SL8500 Installation Manual*, PN 96138 and/or the *SL8500 Dual TCP/IP Feature Technical Brief*, PN TT0019 for more information.

Retaining Customized Routing Table Entries

Any customized routing table entries will be lost after a system reboot. This is the nature of the system routing tables and is an expected behavior. In order to support the Dual TCP/IP feature on the SL8500, it is necessary to add custom entries to the routing tables. There are a couple ways to handle this:

1. Create scripts to add custom routes to be initialized at boot time. These scripts can then be placed in the *rc directory structure* for automatic execution at boot time. Refer to the system documentation for information about how to implement these scripts.
2. Install the appropriate PTFs for the operating system. Refer to the PTF README files for installation instructions. This allows the ACSLS startup script to add the custom routing entries at boot time. The PTFs include new script entries that check for customized route table entries.

Removing Special Routing Commands

Use the route command to remove any special routing commands that have been added erroneously or are no longer needed to the earlier configuration.

Example: As the user root, type the following commands:

```
# route delete 192.168.0.50 192.168.0.254
```

This command removes the route to 192.168.0.50 (the SL8500) using the default route of 192.168.0.254. The route is then removed.

HSC and Dual TCP/IP Support

HSC provides support to configure two TCP/IP connections using the **LMUPATH** control statement.

This statement allows users to define network LMU attachments in a dual TCP/IP environment for an SL8500.

You must also specify a second LMUADDR parameter to define the dual TCP/IPs. HSC then automatically determines whether the connection is dual TCP/IP or dual LMU.

Once this is completed, vary the ACS offline and back online to pick up the revised LMUPATH statement that includes the second connection.

For more information about HSC, the SL8500, and Dual TCP/IP, refer to the:

HSC Systems Programmer's Guides

Notes:

1. Always refer to the Customer Resource Center (CRC) for the latest Tech Tips, code updates, and information.
2. Make sure you use and reference the HSC Programmer's Guide to configure the routing tables on the mainframe systems to support Dual TCP/IP.
3. The minimum level of software required is:

   NCS 6.0 or 6.1 with the appropriate PTFs (below):

- **HSC/MVS/VM:**
  - SOS600 L1H131L
  - SMS600 L1H131K
  - SOS610 L1H131N
  - SMS610 L1H131M
- **MSP:**
  - MSP PTF LF61005 includes MVS PTF L1H131N

The following pages provide some examples of supported configurations.

Dual IP Connection

The LMUPATH control statement allows users to define network LMU attachments. In a Dual TCP/IP connection environment for an SL8500, specify a second LMUADDR parameter to define dual IP. The HSC automatically determines whether or not the connection is dual IP or dual LMU.

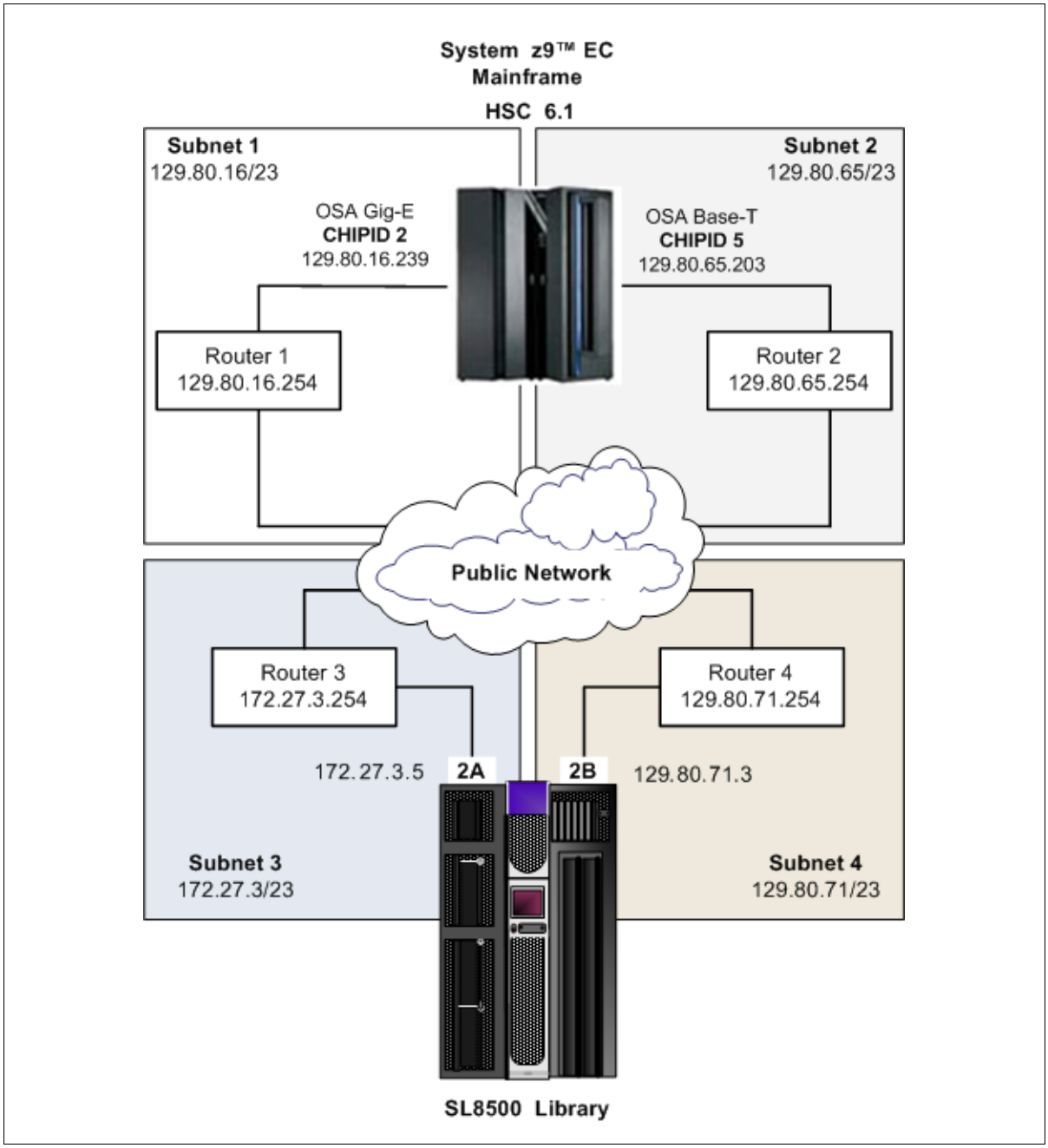
Note: Vary the ACS offline and back online to pick up the revised LMUPATH statement that includes the second connection.

HSC Configuration One

The following is a preferred configuration for mainframe systems using Dual TCP/IP.

In this configuration, the mainframe host contains two network interfaces that reside on two separate subnets go through a public network; then connect to two different subnets before connecting to the SL8500 library.

FIGURE 3-4 HSC Configuration One



1. Complete a Network Entries Worksheet for each port of the SL8500.

Description		IP Address
Port 2A	Host name to Port 2A	129.80.16.239
	HBC Card Port 2A	172.27.3.5
	Gateway Port 2A	172.27.3.254
	Netmask	/23
Port 2B	Host name to Port 2B	129.80.65.203
	HBC Card Port 2B	129.80.71.83
	Gateway Port 2B	129.80.71.254
	Netmask	/23

2. Define a second DEVICE and LINK statement in your TCP/IP profile data set for a second mainframe network connection:

```
; OSA CARD #1
DEVICE ECCQD01 MPCIPA NONROUTER AUTORESTART
LINK ZIPBMVS IPAQENET ECCQD01
; OSA CARD #2
DEVICE ECCQA01 MPCIPA NONROUTER AUTORESTART
LINK ZIPB2MVS IPAQENET ECCQA01
```

3. Define a second home address in your TCP/IP profile data set. For example:

```
HOME
129.80.16.239 ZIPBMVS
129.80.65.203 ZIPB2MVS
```

4. Define a second router on the second subnetwork in the routing paragraph of your TCP/IP profile data set. For example:

```
BEGINROUTES
; NETWORK MASK FIRSTHOP LINKNAME PACKETSIZE
ROUTE 129.80.16.0/24 = ZIPBMVS MTU 1492
ROUTE 129.80.65.0/24 = ZIPB2MVS MTU 1492
ROUTE 172.27.3.5 HOST 129.80.16.254 ZIPBMVS MTU 1492
ROUTE 129.80.71.83 HOST 129.80.65.254 ZIPB2MVS MTU 1492
ROUTE DEFAULT 129.80.16.254 ZIPBMVS MTU 1492
ROUTE DEFAULT 129.80.65.254 ZIPB2MVS MTU 1492
ENDROUTES
; NETWORK MASK ROUTER LINKNAME PACKETSIZE
ROUTE Sl8500-port-2A-IP-Address HOST 129.80.16.254 MVSHOST1 MTU 1492
ROUTE Sl8500-port-2B-IP-Address HOST 129.80.64.254 MVSHOST2 MTU 1492
BEGINROUTES
; NETWORK MASK FIRSTHOP LINKNAME PACKETSIZE
ROUTE 129.80.16.0/24 = ZIPBMVS MTU 1492
ROUTE 129.80.65.0/24 = ZIPB2MVS MTU 1492
ROUTE 172.27.3.5 HOST 129.80.16.254 ZIPBMVS MTU 1492
ROUTE 129.80.71.83 HOST 129.80.65.254 ZIPB2MVS MTU 1492
ROUTE DEFAULT 129.80.16.254 ZIPBMVS MTU 1492
ROUTE DEFAULT 129.80.65.254 ZIPB2MVS MTU 1492
ENDROUTES
```

5. Define two dedicated static routes to the SL8500 destination port (2A and 2B) IP addresses over two different routers.

6. Start the second mainframe network connection device.

```
V TCPIP,tcp-stc-name,START,device_name
```

7. Define a second LMUADDR parameter for the port 2A IP address.

```
LMUPATH ACS(00) LMUADDR(129.80.71.83,172.27.2.5)
```

8. Enter the LMUPDEF command containing the LMUPATH statements that define the host name or IP address for each ACS.

```
LMUPDEF DSN("xxx.xxx.xxx(xxx)")
LMUPDEF DSN("YOUR.DSN(MEMBER)")
```

   In this example, LMUPDEF loads the LMUPATH parameters from "YOUR.DSN(MEMBER)".

9. Allow the trained SL8500 service representative to enter the network connections to the SL8500 library for either port 2A and 2B, whichever is applicable.

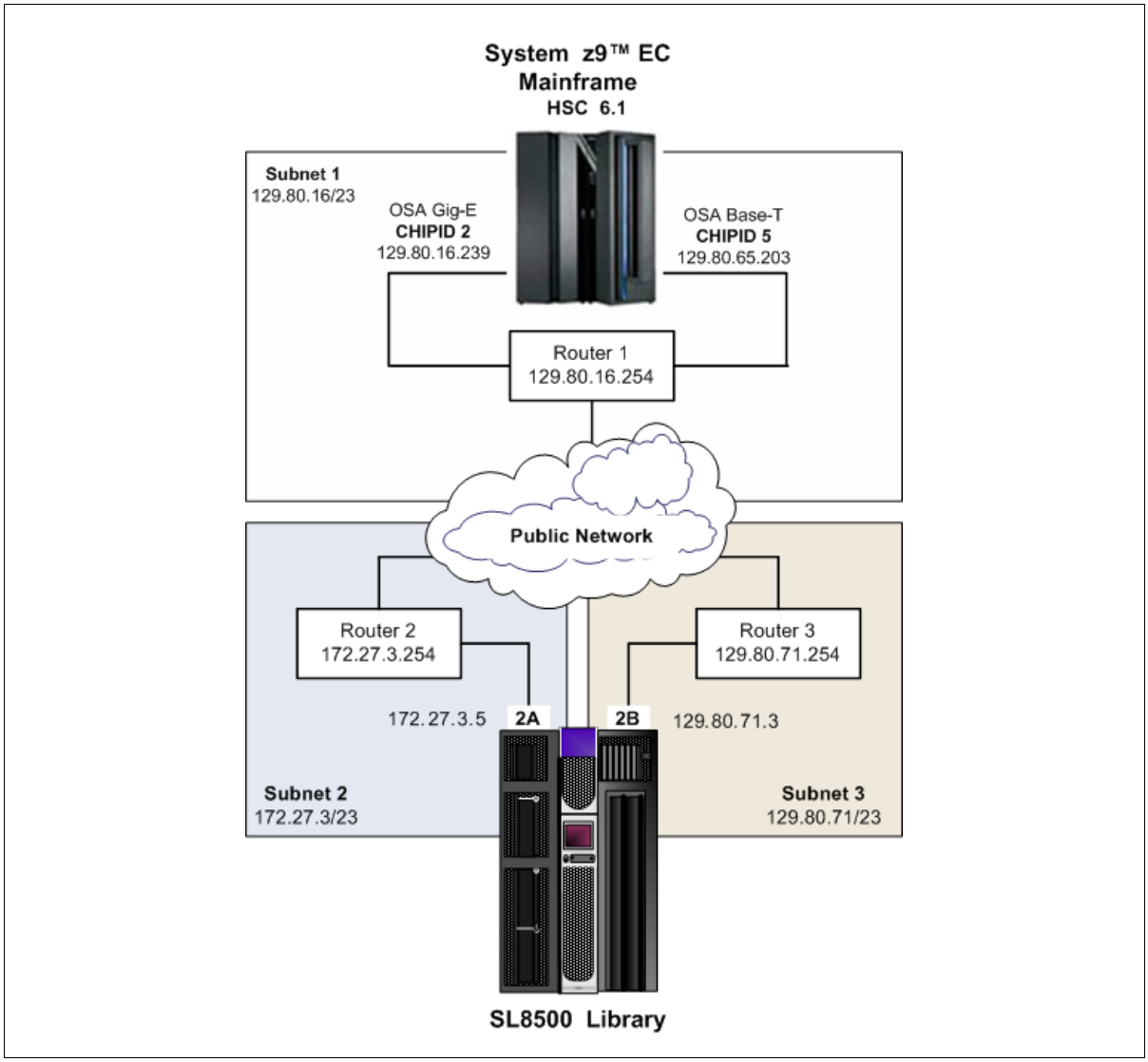
10. Vary the ACS offline and back online to pick up the revised LMUPATH statement that includes the second connection. This can be done one host at a time to minimize down time.

HSC Configuration Two

The following is a preferred configuration for mainframe systems using Dual TCP/IP. In this configuration, one mainframe address connect to two SL8500 connections.

To establish one host IP route from the HSC to two routes to the SL8500, use the process described in this section.

FIGURE 3-5 HSC Configuration Two



Routing

Because this example is using *one* host IP address *into two* SL8500 ports, you need to use the network ip policy routing commands (the format is host router address via port router addresses and the device of the router).

1. Complete the Network Entries Worksheet (see Table 26 for a sample) for each set of routes to the SL8500.

Description		IP Address
Port 2A	Host name to Port 2A	129.80.16.239
	HBC Card Port 2A	172.27.3.5
	Gateway Port 2A	172.27.3.254
	Netmask	/23
Port 2B	Host name to Port 2B	129.80.16.239
	HBC Card Port 2B	129.80.71.83
	Gateway Port 2B	129.80.71.254
	Netmask	/23

2. Define two dedicated static routes to the SL8500 destination port (2A and 2B) IP addresses over one router.

```
BEGINROUTES
; DESTINATION FIRSTHOP LINKNAME PACKETSIZE
ROUTE 129.80.16.0/24 = &SYSNAME.MVS MTU 1492
ROUTE 172.27.3.5 HOST 129.80.16.254 &SYSNAME.MVS MTU 1492
ROUTE 129.80.71.83 HOST 129.80.16.254 &SYSNAME.MVS MTU 1492
ROUTE DEFAULT 129.80.16.254 &SYSNAME.MVS MTU 1492
ENDROUTES
```

3. Define a second LMUADDR parameter for port 2A IP address.

```
LMUPATH ACS(00) LMUADDR(129.80.71.83,172.27.2.5)
```

4. Enter the LMUPDEF command containing the LMUPATH statements that define the host name or IP address for each ACS.

```
LMUPDEF DSN("xxx.xxx.xxx(xxx)")
LMUPDEF DSN("YOUR.DSN(MEMBER)")
```

5. In the following example, LMUPDEF loads LMUPATH parameters from YOUR.DSN(MEMBER).
6. Allow the trained SL8500 service representative to enter the network connections to the SL8500 library for either port 2A and 2B.
7. Vary the ACS offline and back online to pick up the revised LMUPATH statement that includes the second connection. This can be done one host at a time to minimize down time.

```
.vary acs xx, offline
.vary acs xx, online
```

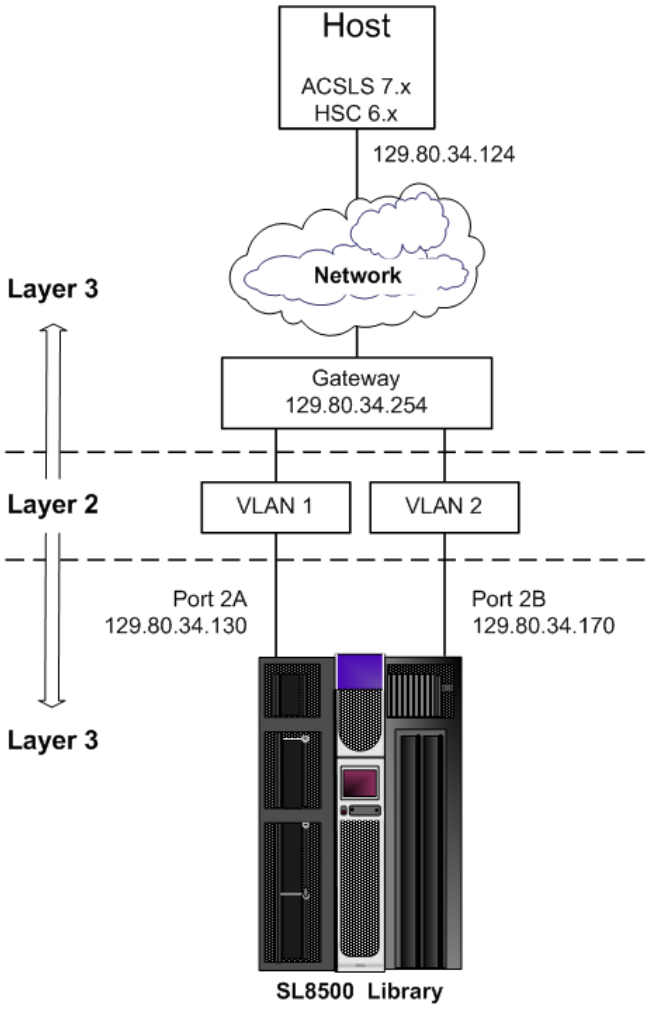
Same Subnet Configuration

This document suggests that when connecting more than one interface to an SL8500 library or library complex that the connections should be through different subnets—or the ports need to be on different broadcast domains.

FIGURE 3-6 configuration uses:

- A single subnet: 129.80.34.xxx and
- Virtual local area network switches or VLANs.

FIGURE 3-6 Same Subnet Configurations



VLANs are broadcast domains that exist within a defined set of switches. Ports on these switches can be grouped together to provide a logical network.

Communications destined for devices, such as ports on an SL8500, that do not belong to that VLAN are not sent.

In that respect, VLANs provide the services traditionally provided by routers in network configurations.

Virtual LANs operate on Layer 2—the data link layer of the OSI model. Administrators often configure a VLAN to map directly to an IP network, or subnet, which gives the appearance of involving Layer 3—the network layer of the OSI model.

Note: Routers and IP subnets are Layer 3 devices. These devices serves as the basis for all other configuration drawings in this document.

Note: It is possible to have multiple subnets on one VLAN or have *one subnet* spread across multiple VLANs.

Host Connections

FIGURE 3-7 on page 29 shows an SL8500 Library Complex with seven libraries connected together by six pass-thru ports with the Dual TCP/IP feature.

The HBC card in Library 1 provides:

1. Port 2B[2] of Library 1 provides the *primary* interface for one host Ethernet connection to all 7 libraries.
2. Port 2A[3] of Library 1 provides an *optional* interface for another host Ethernet connection to all 7 libraries.
3. Port 1A[4] of Library 1 goes to an Ethernet switch in Rack 2.

   This Ethernet switch provides a private network for all other libraries in the complex with the host connection going to Library 1.

   Note: Each internal library communication (ILC) kit supports up to 5 libraries. If there are more than 5 libraries in a complex, an additional ILC kit is required to connect those libraries to Library 1.

An Inter-switch link connects the Ethernet switch in Library 1 to another Ethernet switch in Library 6.

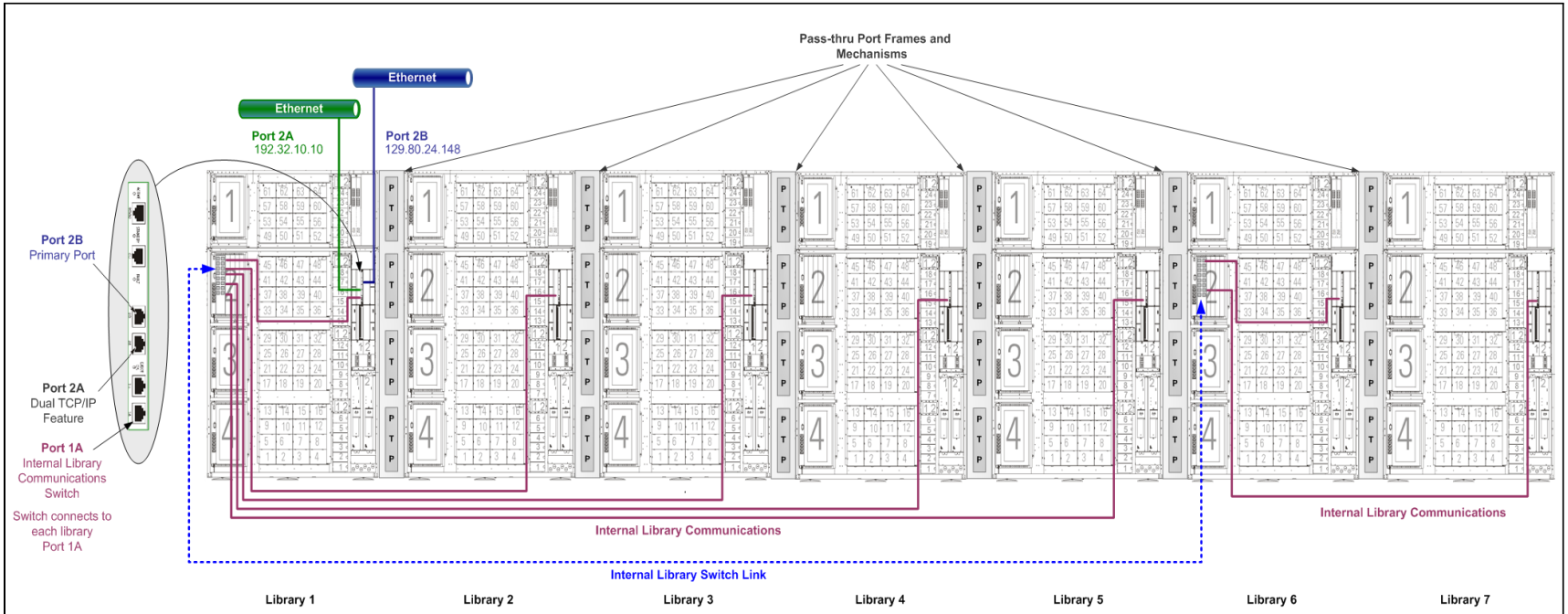
Additional libraries (6 and 7) connect to this second Ethernet switch using Port 1A.

Communications for the second group of libraries goes through the Inter-switch link to Library 1 and the two host connections.

Note: Customers can connect up to 10 libraries in this configuration.

2. Port 2B = The primary host communications port comes standard with the library.
3. Port 2B = The primary host communications port comes standard with the library.
4. Port 1A = Inter-library communications (ILC) port.

FIGURE 3-7 Library Complex Example—Seven Libraries with the Dual TCP/IP Feature and Two Host Connections



Components	Library 1	Library 2	Library 3	Library 4	Library 5	Library 6	Library 7
Expansion Modules	One	Two	Three	Three	Four	Three	None
Library Firmware	FRS_3.08	FRS_3.08	FRS_3.08	FRS_3.08	FRS_3.08	FRS_3.08	FRS_3.08
Software	ACSLS 7.1 **or** HSC 6.1						
Port: IP Address	**2A:** 192.32.10.10 **2B:** 129.80.24.148						
LSMs	0, 1, 2, 3, 4	5, 6, 7, 8	9, 10, 11, 12	13, 14, 15, 16	17, 18, 19, 20	21, 22, 23, 24	25, 26, 27, 28
Features:							
Pass-thru Port	Yes	Yes	Yes	Yes	Yes	Yes	—
Dual TCP/IP	Yes — Optional feature that allows connection of two host ports to a library						

CHAPTER 4

Partitioning

The definition of a **partition** according to the Merriam–Webster dictionary is to:

- Divide into parts or shares.
- Separate or divide by a partition, such as a wall... or a *rail*.

This chapter provides an overview about the SL8500 library architecture as it relates to partitioning.

Requirements

The order numbers for partitioning an SL8500 library are:

- Order number: SL8500-UPG-PART
- Upgrade number: XSL8500-UPG-PART

The requirements include the following levels or higher:

- Library firmware **FRS_3.7x**
- StorageTek Library Console at Version FRS_3.25

- ACSLS Versions 7.1 and 7.1.1 with PUT0701
- ACSLS HA 2 also requires PTF 6514766

- NCS (NearLine Control Solution) Version 6.1
- HSC (MVS) Version 6.1 with PTF L1H13GW and L1H13JK
- HSC (VM) Version 6.1 with PTF L1H13GX and L1H13JJ

Note – Upgrading library firmware can be a disruption to customer operations. You may want to schedule time with the customer to perform this service.

Hosts without the latest level of software (ACSLS or HSC) or without the latest PUTs and PTFs will not be able to bring a partitioned ACS online.

Software and firmware levels can be downloaded and ready in advance of activation. When the time and window is available, these codes can be activated. This preparation can limit down time of the library and operating system.

Purpose

Partitioning the SL8500 library means the customer can have:

- More than one operating system and application manage the library.
- An improvement in the protection or isolation of files.
- An increase in system and library performance.
- A higher level of data organization.
- An increase in user efficiency.

Partitions may be customized to fit different requirements, for example:

- allowing for special partitions to protect or archive data
- enabling multiple organizations, companies, or departments access
- isolating clients at service centers
- separating different encryption key groups
- dedicating partitions as test systems for new technologies or data migration to new tape drives

Guidelines

Essential elements for understanding partitions are:

- **Clear communication between all parties,** such as system programmers, network administrators, both ACSLS and HSC administrators, and Sun service representatives.
- Only a single library may be partitioned—pass-thru port (PTP) operations are not allowed. However, if libraries are currently connected using PTPs, and you—the customer—want to keep that structure for future development; a service representative can disconnect the local network interface and connections within the library to disable this configuration. *You will not need to disassemble the complex.*
- Customers must be current on maintenance levels of their library management software (ACSLS and HSC).
- Depending on the library configuration, each rail has:
  - Minimum capacity of *362* cartridges[1].
  - Maximum capacity of 2,522 cartridges[2].
  - From 1 to 16 tape drives.
- Each rail is the smallest element of a partition, but partitions may include more than one rail. If a partition includes more than one rail, those rails must be *adjacent*.

1. The basic configuration of an SL8500 library is 1,448 cartridges; spread across four LSMs provides 362 cartridges per rail.
2. The maximum configuration of an SL8500 library is 10,088 cartridges; spread across four LSMs provides 2,522 cartridges per rail.

- Hosts with a common database—HSC hosts using a common Control Data Set (CDS)—can share a partition; these hosts are called a "host group."
- When partitioned, the library controller reports rails assigned to another partition within the library as "unallocated" (HSC) or as a new "SL8500_Unalloc LSM" (ACSLS). This provides two things:
  - It displays the entire library, and
  - If partitioning is changed (rails added to or removed from a partition), cartridge locations remain constant.

Remember:

- Partitioned LSMs cannot communicate with other LSMs within the library unless they are in the same partition.
- Elevators and CAPs are *shared resources*—each partition can fully use these resources for enter and eject operations.
- No elevator pass-thru operations will occur between LSMs unless they are defined in the same partition, except when using the CAP to service Rail 1, regardless of its configured partition.
- Elevator operation is under the control of the library controller when CAP operations are issued. The library controller uses the elevators and HandBots to access the entire capacity of the CAPs for enters and ejects without regard for the partitions.
- Partitions can share the ownership of the CAPs. That is, if one host/partition has CAP A reserved, a different host/partition can have CAP B reserved, or one host/partition can have both CAPs reserved.
- Automatic mode is not supported in a partitioned library.
- Duplicate VOLSERs[3] are supported by the library; however, ACSLS and HSC do not, unless:
  - The duplicate VOLSERs are in different partitions.
  - With HSC managed partitions, the duplicate VOLSERs are in different control data sets.
  - With ACSLS managed partitions, the duplicate VOLSERs are on different ACSLS servers.
- All drives, storage slots and cartridges within a partition are solely owned by that host or host group.
- Library complex considerations:
  When breaking apart an established library complex to partition libraries within it, you need to understand the numbering and addressing scheme of the library.
- Rails do not need to be included in a partition, they can remain unassigned to allow for future growth.

3. VOLSER = volume serial number—the cartridge tape label.

Steps and Tasks for Partitioning

One essential message for content management and partitioning is planning.

TABLE 4-1 is a checklist to help plan partitions in an SL8500 library:

TABLE 4-1 Partitioning Task Checklist

✓	Step	Task	Responsibility*
❑	**1. Team**	Create a Team. When planning for content and partitions, use a process similar to that of the system assurance process; which is the exchange of information among team members to ensure all aspects of the implementation are planned carefully and performed efficiently. Team members should include representatives from both the customer and Sun Microsystems.	■ Customer ■ Administrators ■ Operators ■ Sun SE, PS ■ Sun Svc Rep
❑	**2. Codes**	Review the versions and levels of software and firmware. Update as required.	■ Customer ■ Sun SE, PS ■ Sun Svc Rep
❑	**3. Planning**	■ Create a planning team ■ Define the customer expectations ■ Complete the assessment ■ Identify the configurations ■ Complete the planning diagrams	■ Customer ■ Administrators ■ Sun SE, PS ■ Sun Svc Rep
❑	**4. Media**	Verify the distribution of cartridges and required tape drives are available and ready.	■ Customer ■ Operators
❑	**5. Library**	Install and configure a library (as necessary).	■ Sun Svc Rep
❑	**6. License**	License the partitioning feature.	■ Sun Svc Rep
❑	**7. Partitions**	Create partitions.	■ Customer ■ Administrators ■ Operators
❑	**8. Hosts**	Momentarily stop all host activity if currently connected.	■ Customer
❑	**9. Use**	Instruct the customer how to: ■ Partition and re-partition the library ■ Override a CAP reservation	■ Customer ■ Sun SE, PS ■ Sun Svc Rep
❑	**10.Reference**	Make sure the customer has access to the appropriate documents.	■ Customer ■ Sun SE, PS ■ Sun Svc Rep
■ SE = Systems engineer ■ PS = Professional services representative ■ Service = Sun Service representative (Svc Rep) ■ Customer = System administrators, network administrators, system programmers, operators			

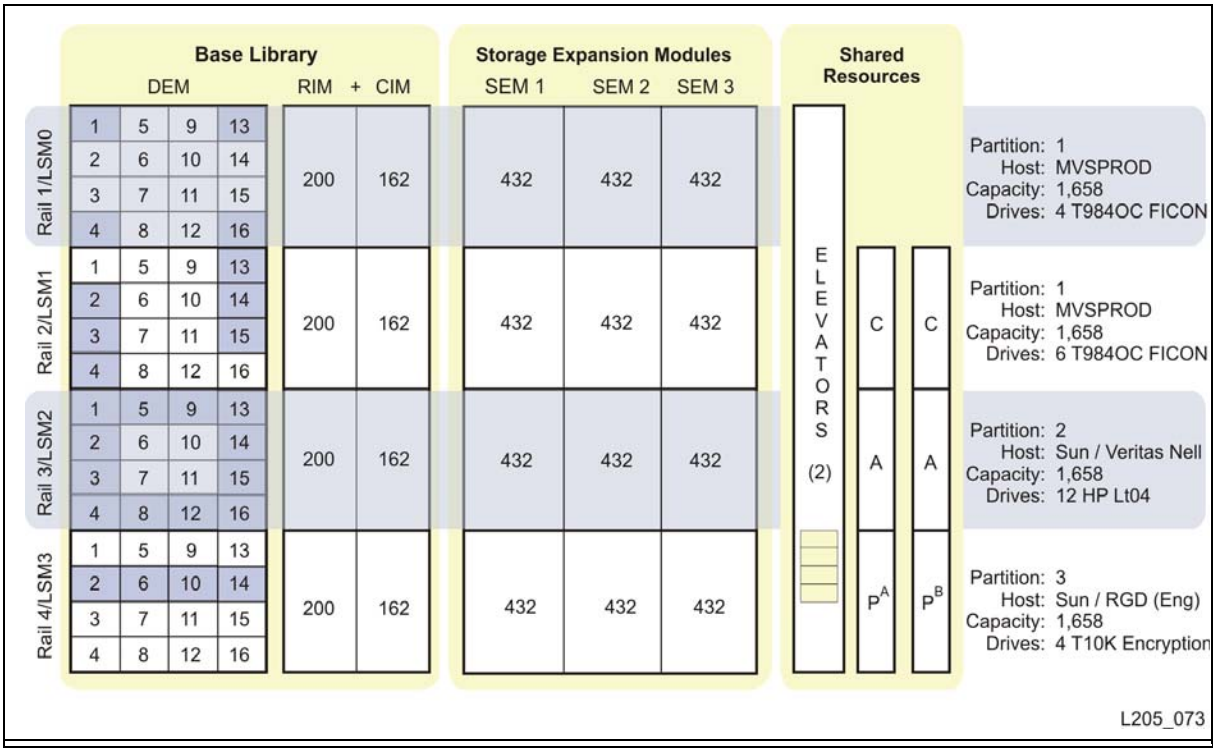
Planning Assessment

TABLE 4-2 Planning Assessment

Identify and define the customer requirements	
Complete a plan using the figures in this chapter. Place this information with the library.	
Is this a new installation or an existing installation?	❑ New ❑ Existing If existing, cartridge migration may be required to configure the partitions correctly. Cartridge migration required? Yes ❑ No ❑
How many partitions are there going to be in the library?	
How many rails are there going to be for a partition?	1. 2. 3. 4.
What is the name and purpose for each partition?	1. 2. 3. 4.
What type of operating systems for each partition?	1. 2. 3. 4.
What type of library management software for each partition?	1. ACSLS: ❑ HSC: ❑ 2. ACSLS: ❑ HSC: ❑ 3. ACSLS: ❑ HSC: ❑ 4. ACSLS: ❑ HSC: ❑
What type of applications are being used?	1. 2. 3. 4.
How many cartridges are needed for each partition?	1. 2. 3. 4.
How many free slots are needed for each partition?	1. 2. 3. 4.
What are the tape drive types and quantities?	1. 2. 3. 4.

Figure 4-1 provides an example to show the flexibility that partitions provide for host connections, applications, capacities, tape drive types, and interfaces.

FIGURE 4-1 Partition Planning Example



Rail 1 and Rail 2 Combined as one Partition (ACS 0)			
Partition ID	**hli1** / MVS combined	Partition ID	**hli1** / MVS combined
Hosts	z/OS V1R1	Hosts	z/OS V1R1
ACSLS or HSC	HSC Version 6.1	ACSLS or HSC	HSC Version 6.1
Applications	Tivoli Version 5.3	Applications	Tivoli Version 5.3
Cartridge capacity	1,000	Cartridge capacity	580
Free slots	658	Free slots	1,078
Tape Drive types	4 T9840 C FICON	Tape Drive types	6 T9840 C FICON

Rail 3 (ACS 0)		**Rail 4 (ACS 1)**	
Partition ID	**hli2** / Open Systems	Partition ID	**hli3** / Encryption
Hosts	Solaris 9	Hosts	Solaris 10
ACSLS or HSC	ACSLS	ACSLS or HSC	ACSLS
Applications	Veritas NBU 4.5 Media Manager DataCenter	Applications	Oracle, Siebel, SAP, SQL, NetWorker
Cartridge capacity	1106	Cartridge capacity	830
Free slots	552	Free slots	828
Tape Drive types	12 HP LTO 3, 2Gb FC	Tape Drive types	4 T10K, 4Gb FC, Crypto

Appendix B “Work Sheets” on page 75 provides work sheets for planning partitions with the six different library configurations. Make copies as necessary.

Creating Partitions

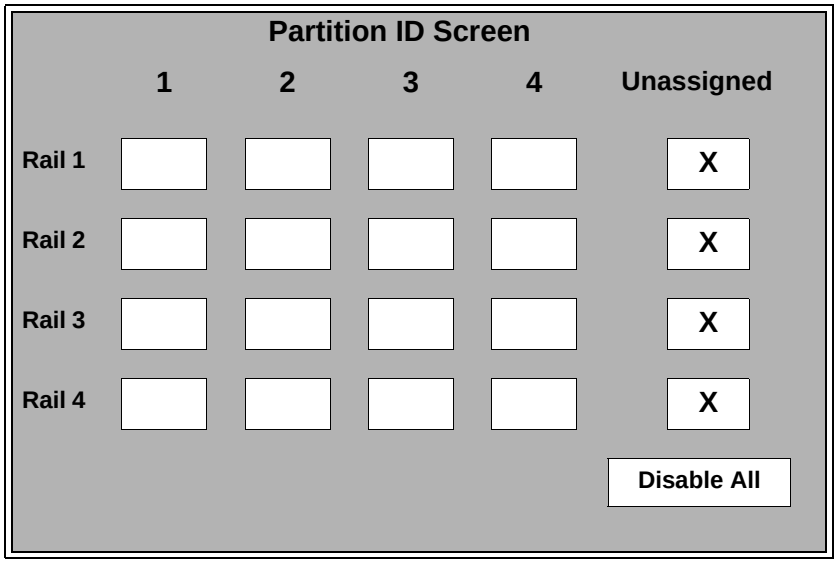
Once the partitioning feature is licensed and enabled, customer can use the StorageTek Library Console (SLC) to configure from one to four partitions.

For example:

1. At the StorageTek Library Console, select Tools ➪ Partitions.
2. Select the Partition ID and desired rails for that partition. For example:

FIGURE 4-2 Partitioning Examples Using the Library Console

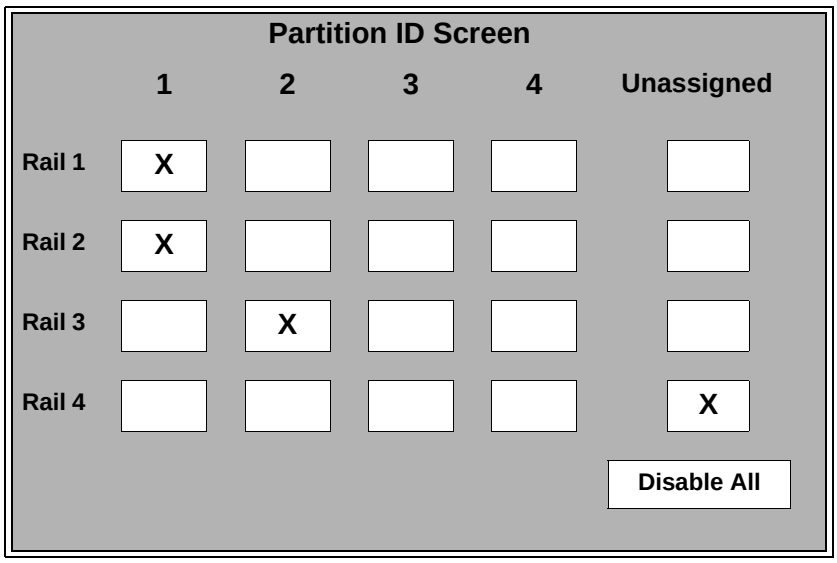
This example has no partitions created; all of them are unassigned.



This example has two partitions created:

- Rails 1 and 2 create Partition 1.
- Rail 3 creates Partition 2.
- Rail 4 is still unassigned for a future partition.

Note: Rails must be *adjacent* to join them and create a single partition.



3. Click Apply to implement the partitions.
   Remember to click Refresh to display the changes.

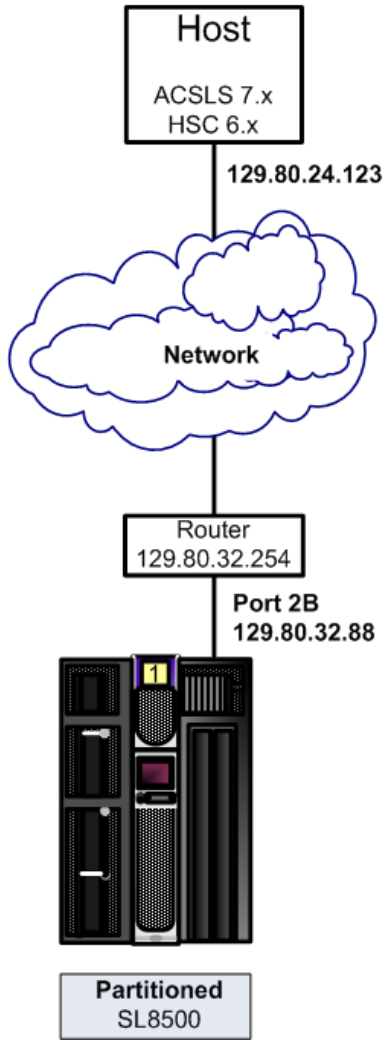
Host Connections

Partitions provide an additional flexibility to an SL8500 Library, partitions also support the different host interface configurations with one exception; you cannot partition a library complex, one that contains pass-thru ports.

Host connections include:

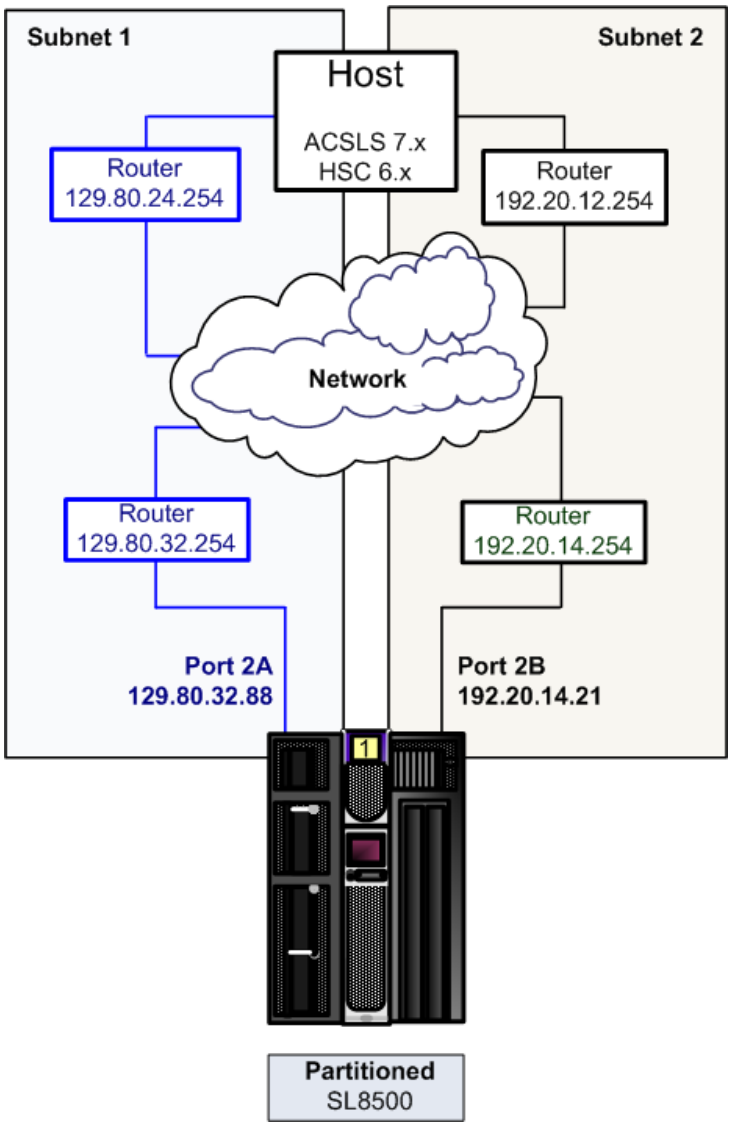
- FIGURE 4-3: Single IP port for all partitions (Port 2B preferred).
- FIGURE 4-4 on page 39: Dual TCP/IP feature for all partitions. Each host would configure both ports to take advantage of Dual TCP/IP (Preferred connection).
- FIGURE 4-5 on page 40: Dual TCP/IP feature for two different operating systems/library management software. Each system would configure a single port for communication to that host.

FIGURE 4-3 Partitioned Library with One Host Connection



This figure shows a simple network connection to a partitioned SL8500 Library—from one to four partitions can be configured in this type of configuration.

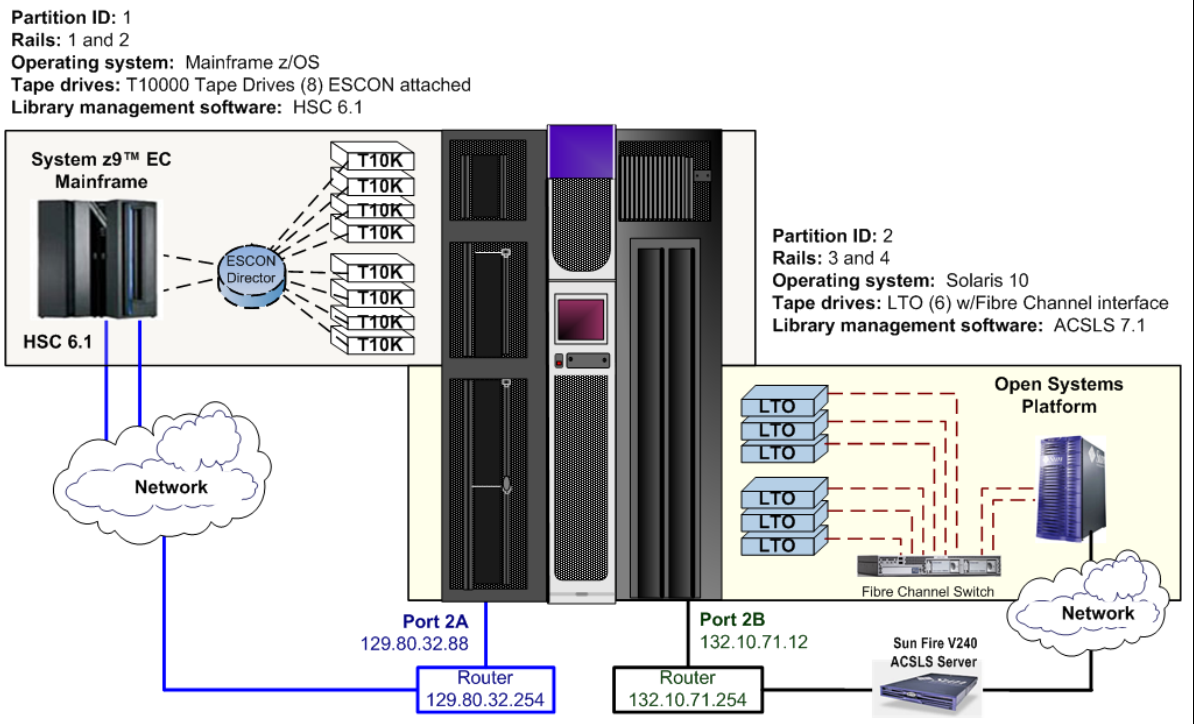
FIGURE 4-4 Partitioned Library with a Dual TCP/IP Feature Single Host-type



This figure shows how a single host with the Dual TCP/IP feature can provide redundancy for the entire system—host, network, library, and the partitions.

Note: Redundancy is provided by the network configuration using the two separate host connections from the Dual TCP/IP feature.

FIGURE 4-5 Partitioned Library with a Dual TCP/IP Feature Multiple Host-types



This figure shows two separate—and different—types of operating systems and library management software; each with a dedicated interface port and rails for partitions.

Partitioning an Existing Configuration

Enhancing upon the SL8500's flexible and scalable configurations, FIGURE 4-6 shows an *example* of converting an existing library complex of four libraries, into a smaller complex of two libraries, and two standalone, partitioned, libraries.

Important: A partition is considered an ACS and change as you configure and partition; however, the LSMs will always keep the same numbering scheme.

FIGURE 4-6 Partitioning Configuration Example

Before: *Without partitioning*

Four libraries in the complex
A, B, C, and D

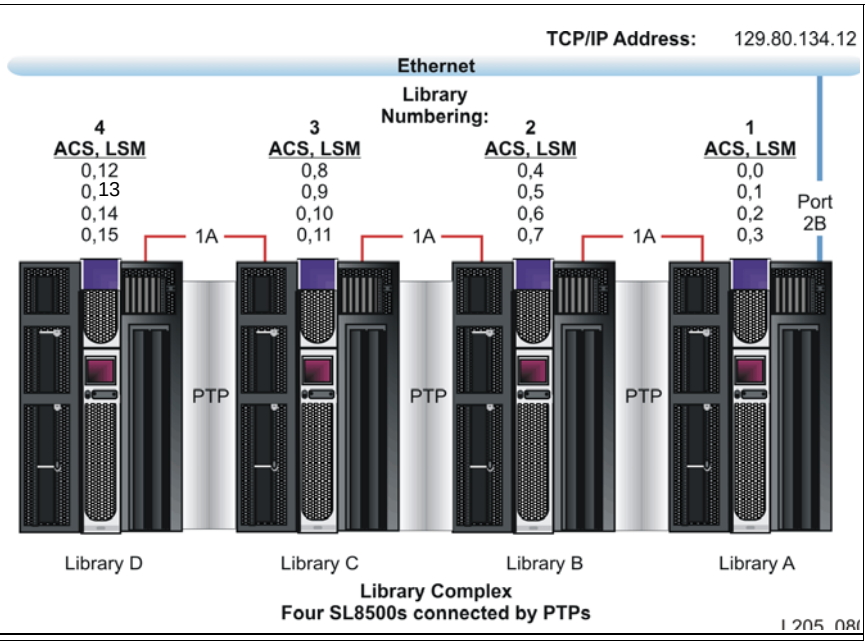
Connected together with PTPs

Port 1A provides inter-library communications

Port 2B provides the single host connection for *all* four libraries.

Addressing Scheme
ACS 0 = libraries A, B, C, D with 16 LSMs

Library numbering (four libraries)
Library A = 1
Library B = 2
Library C = 3
Library D = 4



After: *With Partitioning*

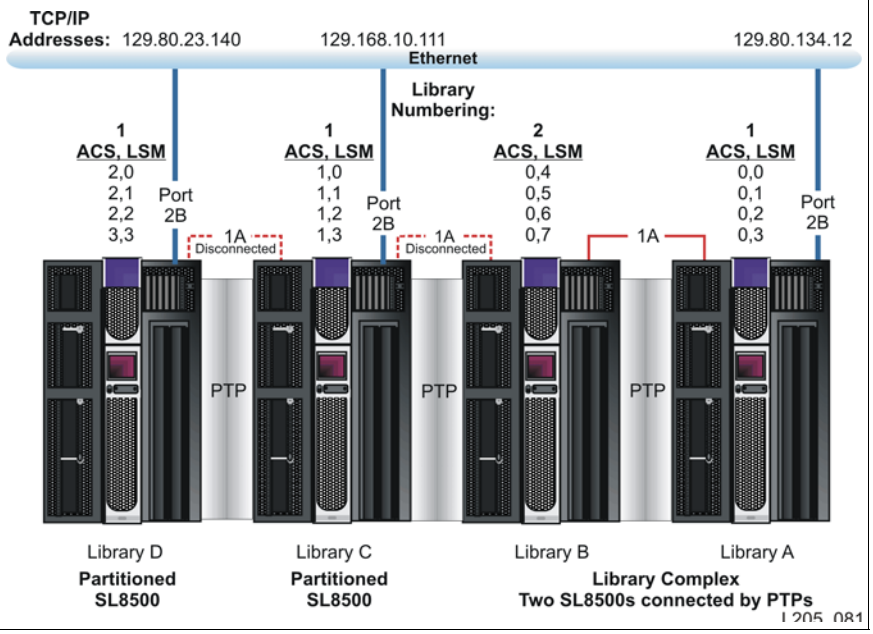
Four libraries
2 libraries in a complex (A, B)
2 libraries partitioned (C, D)

Port 1A disconnected between:
libraries B & C
libraries C & D

Port 2B host connections:
Existing for libraries A, B
Added connection to library C
Added connection to library D

Addressing Scheme = Four ACSs
ACS 0 = libraries A, B with 8 LSMs
ACS 1 = library C with 4 LSMs
ACS 2 = library D with 3 LSMs
ACS 3 = library D with 1 LSM

Library numbering (four libraries)
Library A = 1
Library B = 2
Library C = 1
Library D = 1



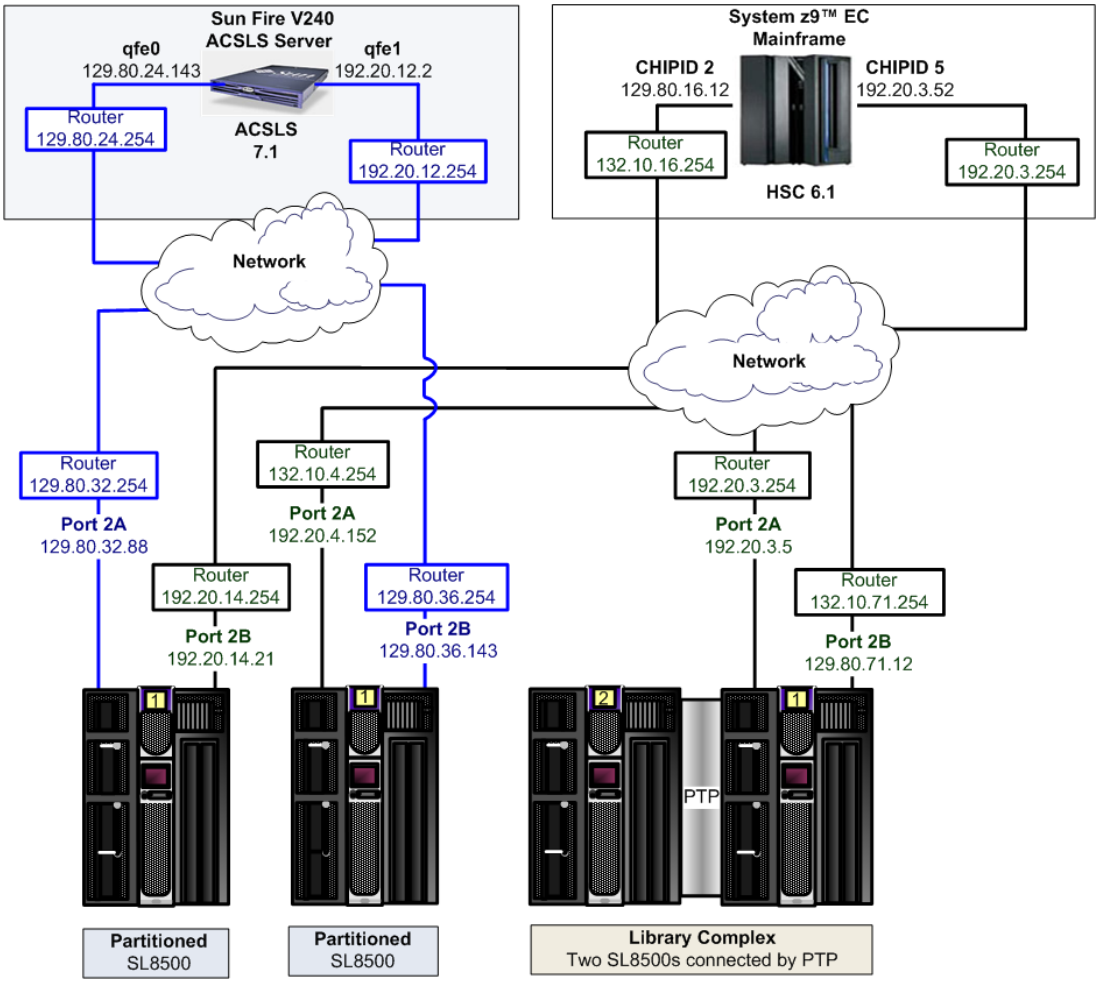
Network Configuration Example

FIGURE 4-7 on page 43 shows a network example for the configuration in FIGURE 4-6 on page 41.

Notice the varying scalability of the SL8500 components for this example:

Components	Description
Expansion modules	Each library can have a different size—number of expansion modules—even when the library is in a Library Complex.
Firmware	Libraries can have different versions of firmware as long as they are not in the same complex or ACS.
Software	Only partitioned libraries can support multiple operating systems and library management software. Libraries in a complex can support only one library management software.
Port = IP Address	When connecting more than one interface to an SL8500 library, the connections should be through different subnets for redundancy. The ports need to be on different Layer 2 broadcast domains.
Library ID	Uses five parameters: Library, Rail, Column, Side, and Row <L,R,C,S,W>.
ACS	The ACS component increases sequentially depending on the number of complex within the account. The following example has 3 different ACSs.
LSMs	LSMs start at 0 and increase sequentially with the complex or ACS.
Features	
Dual TCP/IP	This feature is supported in standalone libraries, library complexes, and partitioned libraries.
Pass-thru Port	This feature is not supported for partitioned libraries.
Dual CAP	Each and every library has the option to have or not have the Dual CAP feature.
HandBots (4/8)	Each and every library has the option to have or not have the 8 HandBot feature.
Partitioning	Only standalone libraries with the required firmware level or higher can have the partitioning feature enabled.

FIGURE 4-7 Network Configuration Example



Components	Partitioned SL8500	Partitioned SL8500	Library Complex with PTP	
Expansion modules	Five	Three	Left = Three	Right = One
Firmware	3.7x	3.7x	3.11c	3.11c
Software	ACSLS 7.1 PUT0701 HSC 6.1 PTF L1H13GW	ACSLS 7.1 PUT0701 HSC 6.1 PTF L1H13GW	HSC 6.1 *only* with PTF L1H13GW	
Port = IP Address	Port 2A = 129.80.32.88 Port 2B = 192.20.14.21	Port 2A = 192.28.4.152 Port 2B = 129.80.36.143	Port 2A = 192.27.3.5 Port 2B = 132.10.71.12	
Library ID	Standalone 1,0,0,0,0	Standalone 1,0,0,0,0	Left = 2,0,0,0,0	Right = 1,0,0,0,0
ACS	ACS 2	ACS 1	ACS 0	
LSMs	0,1,2,3	0,1,2,3	4,5,6,7	0,1,2,3
Features				
Pass-thru Port	Not supported	Not supported	Yes	
Dual TCP/IP	Yes	Yes	Yes	
Partitioning	Licensed and created (3)	Licensed and created (2)	Not supported	

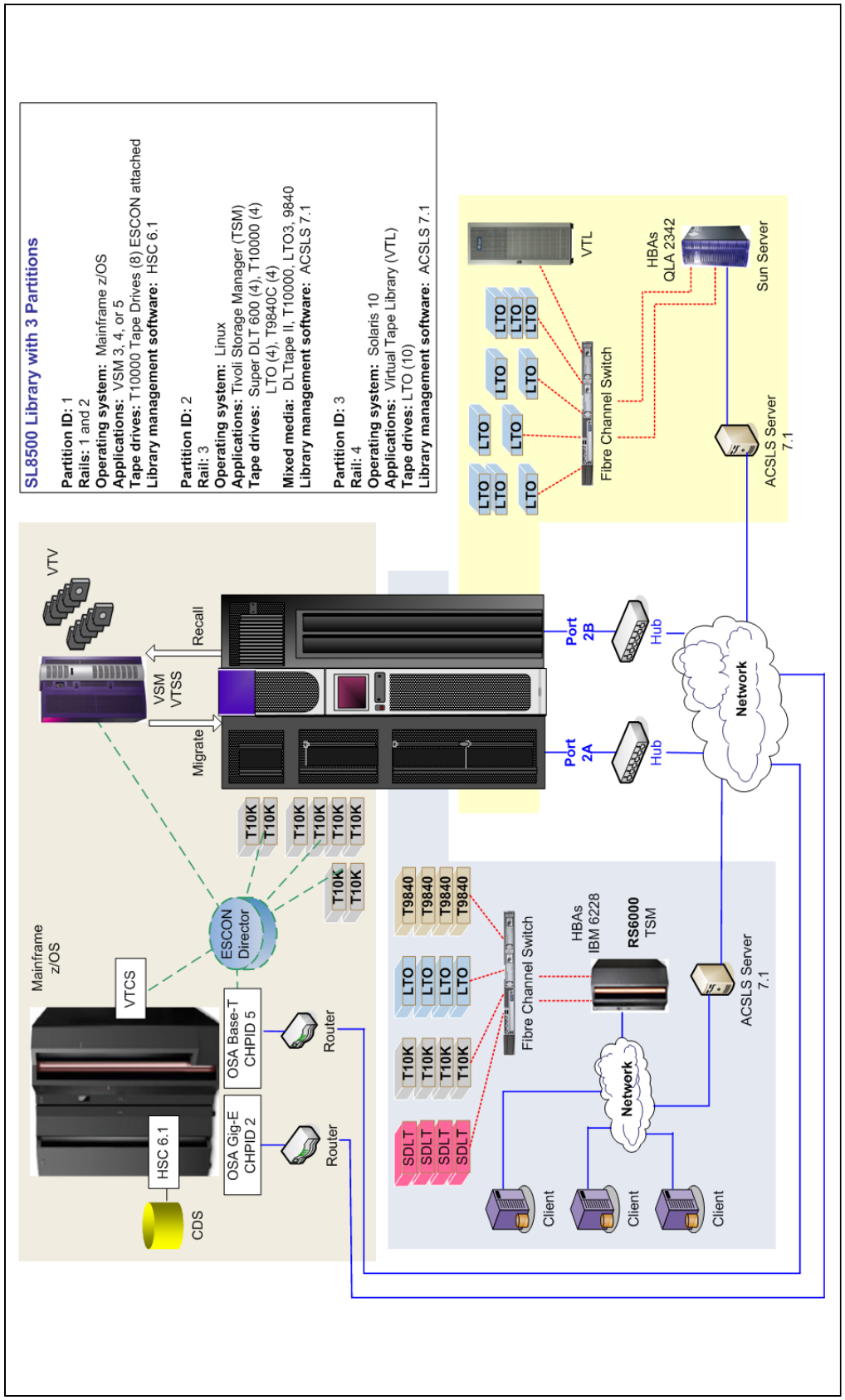


FIGURE 4-8 Conceptual Partitioning Drawings

Writer's Conceptual Drawings

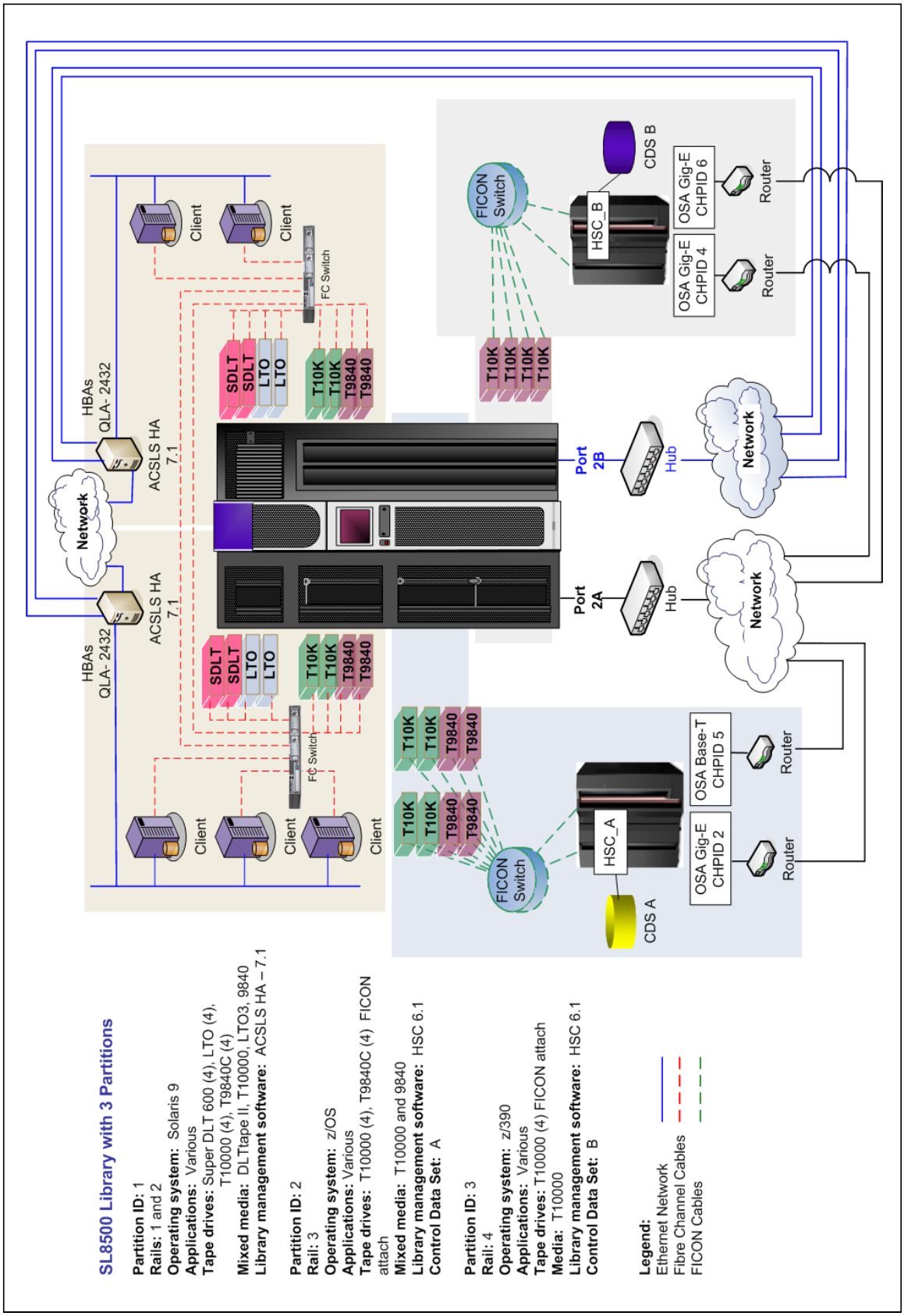


FIGURE 4-8 Conceptual Partitioning Drawings (Continued)

CHAPTER 5

Multiple Host Connections

The newest host connectivity feature to an SL8500 Library Complex is Multi-Host. This feature allows up to *four* connections to a library complex that contains 2 or more libraries.

Requirements

Order numbers for multiple host connections to an SL8500 library are:

- Number: XSL8500-MTCPIP

Requirements include the following levels or *higher*:

- Library firmware **FRS_3.95**
- StorageTek Library Console at Version FRS_3.38

- ACSLS Versions 7.1 and 7.1.1 with PUT0701
- ACSLS HA 2 also requires PTF 6514766

or

- NCS (NearLine Control Solution) Version 6.1
- HSC (MVS) Version 6.1 with PTF L1H13GW and L1H13JK
- HSC (VM) Version 6.1 with PTF L1H13GX and L1H13JJ

Note – Upgrading library firmware can be a disruption to customer operations. You may want to schedule time with the customer to perform this service.

Hosts without the latest level of software (ACSLS or HSC) or without the latest PUTs and PTFs will not be able to use multiple connections to a library complex.

Software and firmware levels can be downloaded and ready in advance of activation. When the time and window is available, these codes can be activated. This preparation can limit down time of the library and operating system.

Library Management Software

Both ACSLS **or** HSC can support up to *four* connections to an SL8500 Library Complex, also called an ACS.

Specifics for ACSLS

When ACSLS has two connections to one SL8500, you must configure the SL8500 and ACSLS server routing tables. Refer to the *ACSLS Installation, Configuration, and Administrator Guide* ➪ ACSLS Dual TCP/IP Support section for more information.

Make the first connection that you specify in `acsss_config` or `config acs new` to the SL8500 library with the most activity.

Specifics for HSC

When HSC has two connections to one SL8500, refer to the: *HSC Systems Programmers Guide* ➪ Appendix A: HSC Support for the SL8500 Library ➪ TCP/IP Communications ➪ Important Considerations section for more information.

Optimization: HSC will distribute communications to the libraries evenly. Connections to multiple libraries distribute the communication with HSC among all of the connected libraries, as opposed to having one library handle all communication with HSC.

The following example shows multiple LMUADDR parameters consisting of four IP addresses. In this case, the first, second, third, and fourth IP addresses indicate a TCP/IP connection to each of four separate SL8500 libraries connected in ACS 00.

TABLE 5-1 HSC LMU Path and Address Parameters

LMUPATH ACS(00) LMUADDR(123.456.789.012,123.456.789.013,123.456.789.014,123.456.789.015)

Host Connections

For example, connections can be:

- Four connections to four separate SL8500 libraries (FIGURE 5-1)
- Two connections each of two SL8500 libraries (FIGURE 5-2)
- Two connections to one SL8500 library plus two other connections (FIGURE 5-3)
- Four connections to four SL8500 libraries in a large complex (FIGURE 5-4)

Important:
To optimize library performance and minimize inter-library communication among the SL8500s, ***connect to the libraries with the most activity.***

When connecting to more than one library and to more than one library in a complex, the connections should be through different subnets for redundancy. If one subnet fails, communications between the hosts and the libraries continue over the other subnets.

Multi-Host Network Entries Work Sheet

When preparing the network and connections—as a best practice—complete a network entries worksheet for each port of the SL8500 library.

Description		IP Address / Name
Connection 1	HBC Card Port: 2A ❑ 2B ❑	
	Host name	
	Gateway	
	Netmask	
Connection 2	HBC Card Port: 2A ❑ 2B ❑	
	Host name	
	Gateway	
	Netmask	
Connection 3	HBC Card Port: 2A ❑ 2B ❑	
	Host name	
	Gateway	
	Netmask	
Connection 4	HBC Card Port: 2A ❑ 2B ❑	
	Host name	
	Gateway	
	Netmask	

Important:

- When connecting more than one interface to an SL8500 library or library complex, the connections should be at least two different subnets for redundancy.

  If one subnet fails, communications between the hosts and the libraries continue over the other subnets.

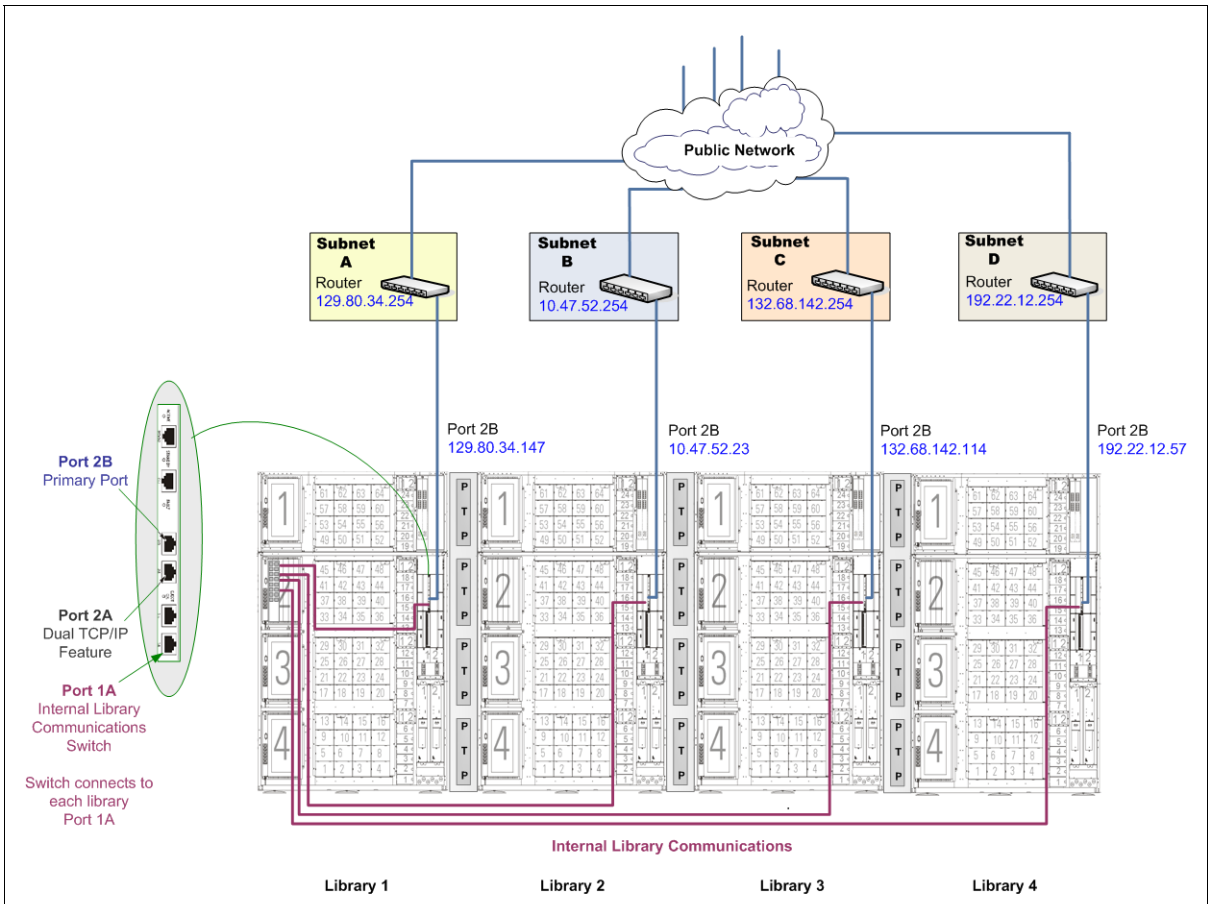
- When connecting an interface to Port 2A, a service representative must configure routing and possibly assign policies for that port using the command line interface.

  Port 2B is the default port for the library, no routing tables are required when connecting to that port.

- **The ports need to be on different Layer 2 broadcast domains**.

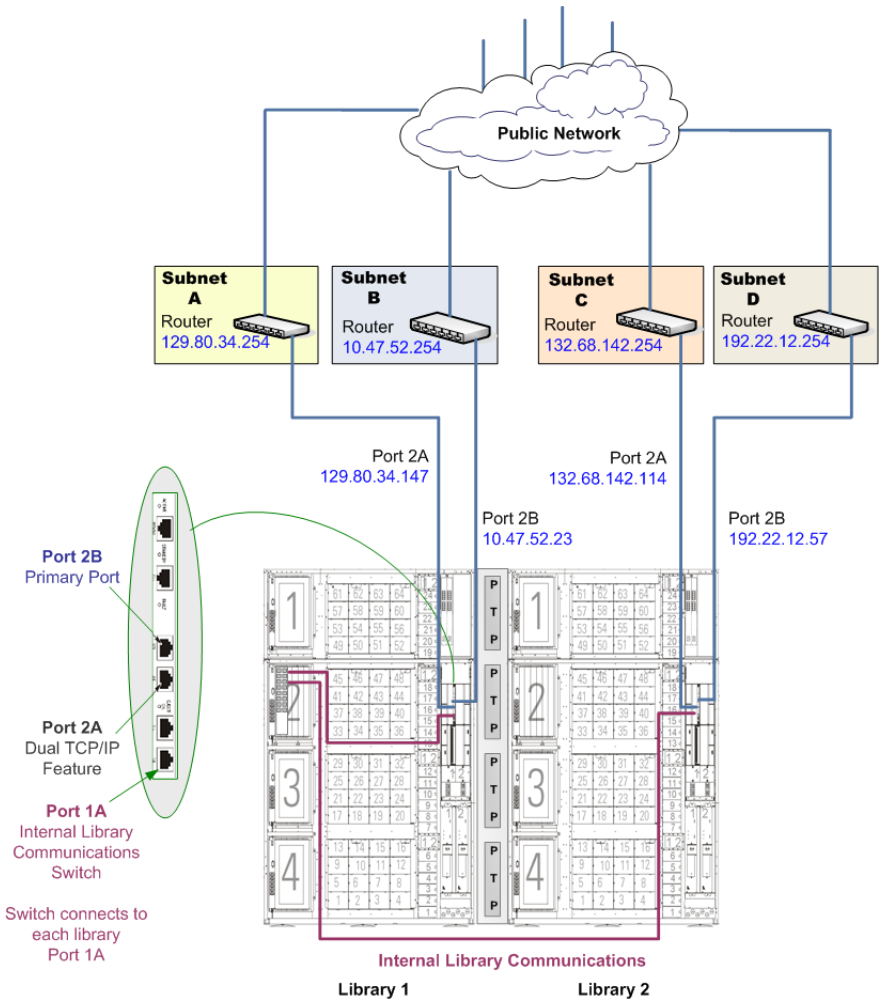
Configuration Examples

FIGURE 5-1 Multi-Host Configuration—Four Libraries with Four Host Connections



Components	Library 1	Library 2	Library 3	Library 4
Expansion Modules	One	Two	Three	Three
Library Firmware	FRS_3.96	FRS_3.96	FRS_3.96	FRS_3.96
Library Console	3.38	3.38	3.38	3.38
Software	ACSLS 7.1 or HSC 6.1	ACSLS 7.1 or HSC 6.1	ACSLS 7.1 or HSC 6.1	ACSLS 7.1 or HSC 6.1
IP Address	129.80.34.147	10.47.52.23	132.68.142.114	192.22.12.57
LSMs	0, 1, 2, 3	4, 5, 6, 7	8, 9, 10, 11	12, 13, 14, 15
Features:				
Pass-thru Port	Yes	Yes	Yes	—
Dual TCP/IP	No — The Multi-Host feature provides this connectivity.			
Partitioning	Not supported	Not supported	Not supported	Not supported
Multi-Host	Yes — Optional feature that supports up to four host connections to a library complex.			

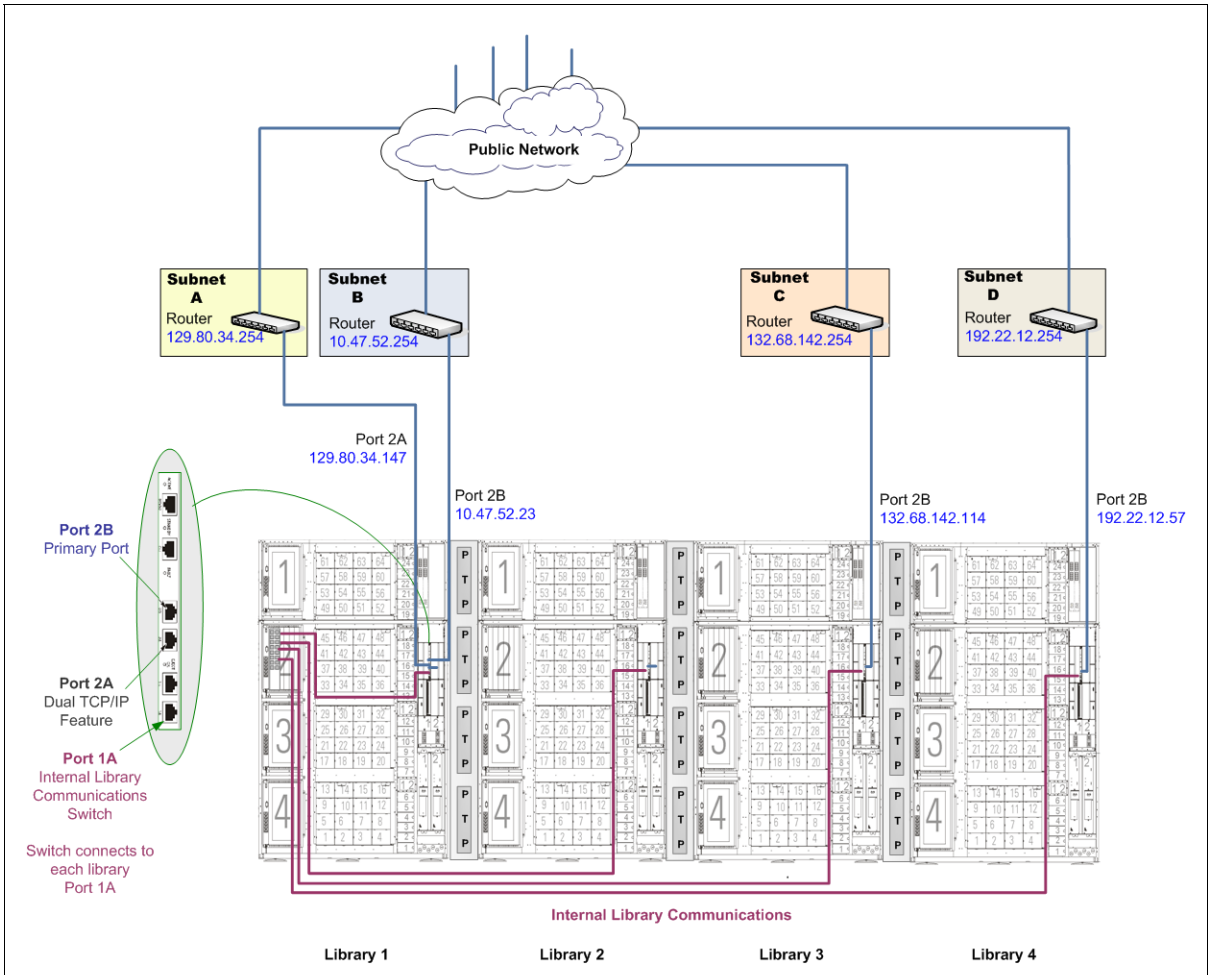
FIGURE 5-2 Multi-Host Configuration—Two Libraries with Four Host Connections



Components	Library 1		Library 2	
Expansion Modules	One		Two	
Library Firmware	FRS_3.96		FRS_3.96	
Software	ACSLS 7.1 or HSC 6.1		ACSLS 7.1 or HSC 6.1	
Port: IP Address	**2A:** 129.80.34.147	**2B:** 10.47.52.23	**2A:** 132.68.142.114	**2B:** 192.22.12.57
LSMs	0, 1, 2, 3		4, 5, 6, 7	
Features:				
Pass-thru Port	Yes		—	
Dual TCP/IP	No — The Multi-Host feature provides this connectivity.			
Partitioning	Not supported		Not supported	
Multi-Host	Yes — Optional feature that supports up to four host connections to a library complex.			

- Note: Because both Library 1 and Library 2 have a connection to Port 2A, a service representative must configure routing tables and possibly assign policies for those ports using the command line interface.

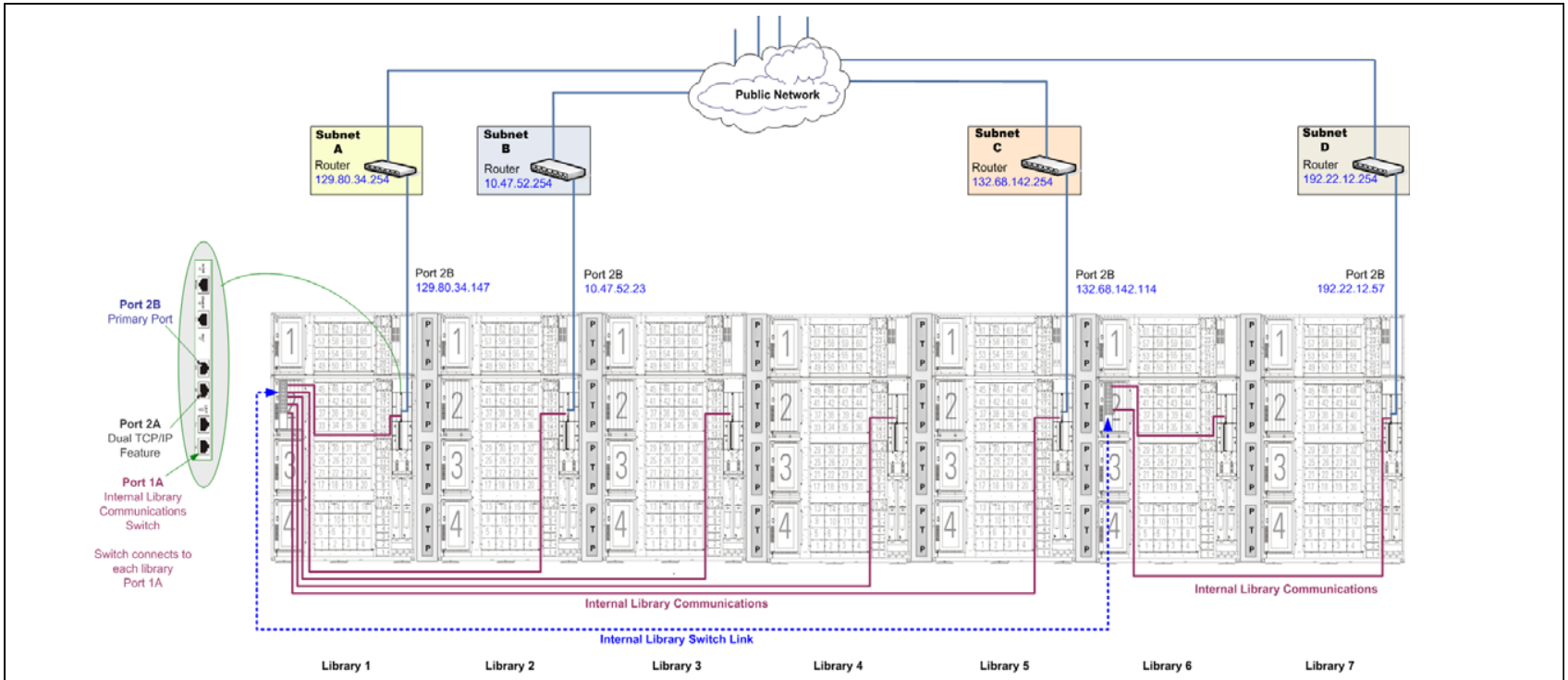
FIGURE 5-3 Multi-Host Configuration—Four Libraries with Two Plus Two Host Connections



Components	Library 1	Library 2	Library 3	Library 4
Expansion Modules	One	Two	Three	Three
Library Firmware	FRS_3.96	FRS_3.96	FRS_3.96	FRS_3.96
Library Console	3.38	3.38	3.38	3.38
Software	ACSLS 7.1 or HSC 6.1	ACSLS 7.1 or HSC 6.1	ACSLS 7.1 or HSC 6.1	ACSLS 7.1 or HSC 6.1
IP Address	129.80.34.147	10.47.52.23	132.68.142.114	192.22.12.57
LSMs	0, 1, 2, 3	4, 5, 6, 7	8, 9, 10, 11	12, 13, 14, 15
Features:				
Pass-thru Port	Yes	Yes	Yes	—
Dual TCP/IP	No — The Multi-Host feature provides this connectivity.			
Partitioning	Not supported	Not supported	Not supported	Not supported
Multi-Host	Yes — Optional feature that supports up to four host connections to a library complex.			

- Note: Because Library 1 has a connection to Port 2A, a service representative must configure routing and possibly assign policies for that port using the command line interface.

FIGURE 5-4 Multi-Host Configuration—Seven Libraries with Four Host Connections



Components	Library 1	Library 2	Library 3	Library 4	Library 5	Library 6	Library 7
Expansion Modules	One	Two	Three	Three	Four	Three	None
Library Firmware	FRS_3.96	FRS_3.96	FRS_3.96	FRS_3.96	FRS_3.96	FRS_3.96	FRS_3.96
Library Console	3.38	3.38	3.38	3.38	3.38	3.38	3.38
Software	ACSLS or HSC	ACSLS or HSC			ACSLS or HSC		ACSLS or HSC
IP Address	129.80.34.147	10.47.52.23	none	none	132.68.142.114	none	192.22.12.57
LSMs	0, 1, 2, 3	4, 5, 6, 7	8, 9, 10, 11	12, 13, 14, 15	16, 17, 18, 19	20, 21, 22, 23,	24, 25, 26, 27
Features:							
Pass-thru Ports	Yes	Yes	Yes	Yes	Yes	Yes	—
Dual TCP/IP	No — The Multi-Host feature provides this connectivity.						
Partitioning	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported
Multi-Host	Yes — Optional feature that supports up to four host connections to a library complex.						

CHAPTER 6

Potential Problems

While the SL8500's processor can auto-negotiate between 10 and 100 Mbps traffic, floods of address resolution protocol broadcasts (ARP is a network layer protocol that converts IP addresses into physical addresses) can overwhelm the library.

If the SL8500 is connected to shared networks, broadcast messages may be sent to all network nodes. While the library is receiving these irrelevant broadcasts, it cannot receive or reply to requests for library activity to the point that, to its host, it appears that the library's TCP/IP connection has been lost.

Similarly, heavy network traffic can overwhelm the Ethernet controller on the HBC card.

Shared Networks

The following are some examples of issues that can arise when you connect the SL8500 library to a shared network.

- A TCP/IP-connected library can handle standard host traffic, but it cannot handle floods of *Address Resolution Protocol* (ARP) broadcasts.

  For this reason, it is best to attach the library on a controlled network, such as behind a switch or router.

- Newer generation networks, such as 1000Base-T and Gig-E, support earlier communication modes—such as 10BaseT and 100BaseT. However, devices that are communicating with the library may transmit data at bandwidths that could overwhelm it.

  Again, for this reason, is best to **attach the library on a controlled network**, such as, with a switch that can isolate the library from network broadcasts.

- When you connect the library on shared networks, and broadcasts are sent to all network nodes, they may also be directed to the library (even though it does not need them). During the time the library is receiving these irrelevant broadcasts, it cannot receive requests or reply to others in a timely fashion. This heavy broadcast traffic on the network can saturate the library to the point that, to the host, it may appear that the TCP/IP connection has been lost.
- Heavy network traffic can also overwhelm the Ethernet controller causing the processor to continuously reset and re-initialize the controller, then recover the host-to-library communications.

Diagnosing TCP/IP Problems

If communication problems arise, problems can be diagnosed by using the following methods:

1. Use a “sniffer” (a device or program that traces the network traffic for the library).
2. Display the port statistics on the switch or hub to which the library is connected. Search for any errors that were encountered.
3. Run a trace with the library management software that displays host-to-library packets and transmissions.

Solutions

If possible, use a dedicated private network for host management software-to-library communication. If, however, a shared network is required, possible solutions are:

1. Directly connect the library to a switch that filters out undirected (broadcast) traffic
2. Place the library on its own subnet—this may protect the library from receiving broadcast messages.
3. Use a managed switch—this can:
   a. Set priorities on ports to supply the host and library with higher priority
   b. Provide dedicated bandwidth between the host and library
   c. Create a virtual local area network (VLAN) between the host and library
4. A virtual private network (VPN) can also insulate host-to-library traffic from other interference, such as irrelevant broadcasts.

Gigabit Ethernet Connections

The SL8500 library does not support native Gigabit Ethernet (Gig-E) connections.

Remember, the SL8500 network is only between the ACSLS server or HSC host and Gig-E communications and speed is not necessary.

When connecting to Gig-E networks, choose a switch or router that can convert to 100 Mbps for the library.

There is not an issue of what the customer puts on the other side of the server, host, or library to their clients.

APPENDIX **A**

Service and Support

This appendix is intended to support service representatives with configuring the SL8500 library host connections. It contains:

See Appendix B "Work Sheets" on page 75 for works sheets to help configure the SL8500 and host connectivity.

Network Entry Configuration

The following procedure assumes you are a trained SL8500 service representative familiar with hyperterminal sessions and using the command line interface (CLI). If not, refer to the *SL8500 Installation Manual–Chapter 10 "Configuration and Testing"* for more information.

To set the library network entries:

1. Consult with the customer's systems and/or network administrator for information about the network, routers, and IP addresses.

TABLE A-1 Network Entries

Description		IP Address / Description
Connection 1	HBC Card Port: 2A ❑ 2B ❑	
	Host name	
	Gateway	
	Netmask	
Connection 2	HBC Card Port: 2A ❑ 2B ❑	
	Host name	
	Gateway	
	Netmask	
Connection 3	HBC Card Port: 2A ❑ 2B ❑	
	Host name	
	Gateway	
	Netmask	
Connection 4	HBC Card Port: 2A ❑ 2B ❑	
	Host name	
	Gateway	
	Netmask	

2. Obtain or make a drawing of the configuration. This will help with the configuration and fault isolation if necessary.
3. Attach a laptop (PC) with serial cable, part 24100134, to the connector marked `CLI` on the HBC card at the rear of the library.
4. Open a Hyperterminal session. Once configured, click OK and press Enter.

   The command line interface prompt appears. If it does not, disconnect then reconnect from the Call tab for new settings to become effective.
5. Login and enter the password.
6. Type `help network` or just `network` to list the CLI commands. See TABLE A-2 on page 61 for an example.

Command Line Interface

The command line interface (CLI) is a user interface in which **service representatives only** can configure and diagnose the SL8500 library.

Customers are not allowed to access the CLI interface. Only trained and qualified Sun Microsystems representatives can access the CLI.

There are two ways to access and use the CLI:

- Serial Port Connection on the HBC card (RS-232) and a **HyperTerminal** connection to enter the commands.
- Ethernet Port Connection (ports 1A, 2A, or 2B) on the HBC card and use a secure shell (**PuTTY**) to enter the commands.
- You must have the latest appropriate library and SLC firmware for the selected configuration.

Serial Port Connection

To use the serial port with HyperTermnial:

1. Connect a PC to the CLI port on the HBC card using a serial cable, part number 24100134 or equivalent.
2. Start a HyperTerminal session.
   (Start ➪ Programs ➪ Accessories ➪ Communications ➪ HyperTerminal)
3. Select COM1 from the “Connect Using…” pull down menu.
4. Enter the appropriate port settings:

Baud rate	38,400
Data bits	8
Parity bit	None
Stop bit	1
Flow control	none

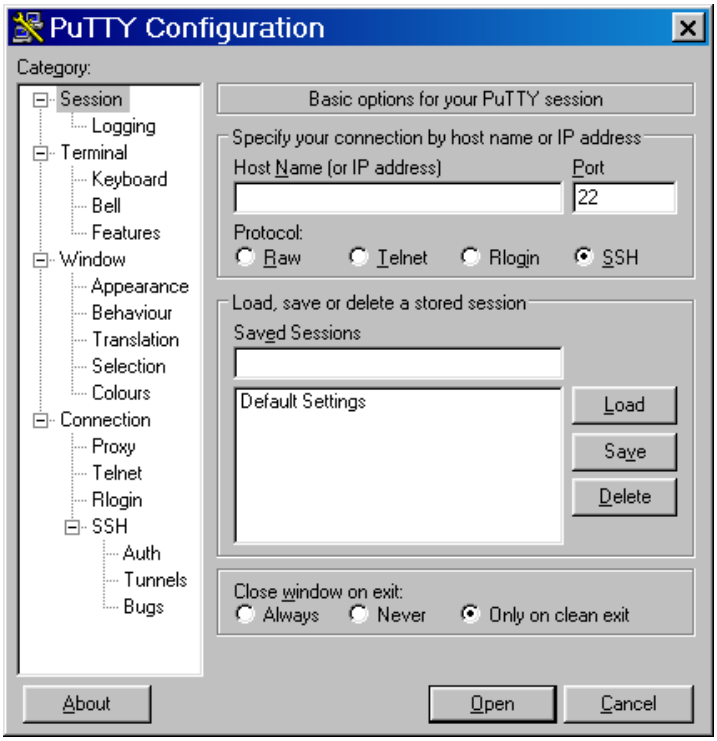
5. Click OK and press Enter.
   The command line prompt appears. **SL8500>**
6. At the logon prompt, enter: **service**.
7. The next prompt asks: Are you sure you want to continue?
   Answer: **Yes**
8. Enter the service password: *xxxxxxxx*
   The cursor does not move when entering the password.
9. To list the CLI commands enter: **SL8500> help**

Ethernet Port Connection

PuTTY is a free secure shell (SSH) software client for Windows and UNIX platforms. This application allows you to configure the SL8500 library using an Ethernet connection remote connection. If you need to download putty:

1. Go to http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html (Copy and paste this link into the address line of your web browser.)
2. Select and download *putty* and *pscp* versions 0.55 or higher.

FIGURE A-1 PuTTY—Secure Shell Configuration



3. Start the PuTTY application.

   Before starting PuTTY, you need to know the IP address of the library Ethernet port you are going to use.

Port	Description	IP Address
Port 2B	Primary host connection to the SL8500 library	
Port 2A	Dual TCP/IP port (or enabled to use for service)	
Port 1A	Service Delivery Platform (SDP) if applicable	

Once you have entered in the IP address and established a remote connection using PuTTY, use the same list of CLI commands.

CLI Network Commands

TABLE A-2 CLI Network Commands

```
SL8500> help network

network gateway <IP_address>
  NOTE: The IP_address cannot be on internal networks
        For use with a single port configuration
network gateway clear
   For use with a single port configuration
network ip <IP_address>
   For use with a single port configuration

NOTE:
   The following commands include an optional netmask value.
   network ip address add <IP_address[/netmask]> dev <device>
   network ip address del <IP_address[/netmask]> dev <device>
   network ip route <add|del> <IP_address[/netmask]> dev <device>
   network ip route <add|del> <IP_address[/netmask]> via <Gateway IP_address>
   The <netmask> value must be between 1 and 32 inclusive. A default
   netmask value of 32 is used if the netmask parameter is omitted.
EXAMPLE:
   If the <IP_address/netmask> parameter is <192.168.12.200>
   The default netmask value of 32 (255.255.255.255) is used.

network ip address add <IP_address[/netmask]> dev <device>
   Add an IP_address for device 2A or 2B
network ip address del <IP_address[/netmask]> dev <device>
   Delete an IP_address for device 2A or 2B
network ip address show [dev <device>]
   Displays IP_address information for device 2A or 2B

network ip link set dev <device> <up|down>
   Interface control command <up|down> for device 2A or 2B

network ip route add default via <IP_address>
   Add Default gateway
network ip route del default
   Delete Default gateway
network ip route <add|del> <IP_address[/netmask]> dev <device>
   Add or Delete static route to specific host or a network
   for device 2A or 2B
network ip route <add|del> <IP_address[/netmask]> via <Gateway IP_address>
   Add or Delete static route to destination network via gateway
network ip route show [dev <device>]
   Displays route table information for device 2A and or 2B

network ip policy route <add|del> <IP_address> dev <device>
   Add or Delete static route to policy for device 2A or 2B
network ip policy route <add|del> <IP_address> via <Gateway IP_address> dev <device>
   Add or Delete static route to policy for device 2A or 2B
   via gateway
network ip policy route show dev <device>
   Displays policy route information for device 2A or 2B
network ip policy <enable|disable> dev <device>
   Enable or Disable policy routing for device 2A or 2B
network ip policy status
   Display policy routing status for devices 2A and 2B

network netmask <netmask in xxx.xxx.xxx.xxx form>
   For use with a single port configuration
network name <host name string>
   For use with a single port configuration
network print
   For use with a single port configuration
   to display network port properties.

COMPLETED
```

Command Syntax

The original CLI **network** command does not support the functionality required to configure *both* interfaces (ports 2A and 2B).

Therefore, a new CLI **network ip** command is included with the updated library firmware to support Dual TCP/IP connections.

The command syntax is:

```
network ip <object> {option} <device> {option}
```

Objects include:
- *address* - IP address of an interface or device
- *link* - network interface or device
- *policy* - rules for routing implementation
- *route* - table entry as defined by a its IP address and netmask

The first option identifies a function:
- *add* - adds items such as an address or default
- *del* - deletes items such as an address or default
- *set* - sets a device online or offline
- *enable* - enables policies
- *disable* - disables policies
- *show* - displays a configuration

When specifying a device, the following are supported:
- *dev 2A* - secondary port on the HBC card
- *dev 2B* - primary port on the HBC card

The second option further defines the function for the object, for example:
- *up* - bring online
- *down* - place offline

Port Configurations

The following commands are necessary to configure a Dual TCP/IP connection to the SL8500.

Address Commands

The **network ip address** command supports multiple port configurations and are represented by a dotted decimal notation of four numbers from 0 to 255.

The command syntax is:

network ip address <*add*|*del*> <IPaddress[/netmask]> dev <device>

- For example, to add or delete an IP address type:

```
network ip address del 192.124.16.8/24 dev 2A
network ip address add 129.80.141.72/23 dev 2A
```

- To **show** an address type:

```
SLSL8500> network ip address show
  2A:
  Interface Status:   UP
  IP Address/Netmask: 129.80.141.72/23
  MAC Address:        00:10:4f:06:f8:33

  2B:
  Interface Status:   DOWN
  IP Address/Netmask: 192.27.2.5/23
  MAC Address:        00:10:4f:06:f8:32
```

Link Commands

The **network ip link** command provides interface control for the ports. This command allows you to place the port either up (online) or down (offline). You need to do this when adding or deleting an IP address.

The command syntax is:

network ip link set dev <device> <*up*|*down*>

- For example, to place a port online or offline type:

```
network ip link set dev 2A up
network ip link set dev 2A down
```

Route Commands

The **network ip route** commands provide routing table management. These tables keep information about paths to the other network nodes. Routes are typically specified by a prefix—IP address and netmask (*nm*).

Important:
Large networks with multiple switches and routers can be confusing;

"Which router and IP address do I use?"

When configuring the routing for the SL8500—use the router closest to the SL8500—within its own subnet.

The command syntax for route commands is:

network ip route <*add*|*del*> <host.IP.addr/nm> dev <device>

network ip route add default via <host.IP.addr/nm>

network ip route del default

network ip route <add|del> <host.IP.addr/nm> via `<router.IP.addr>`

network ip route show

- *No router* example: To add or delete a route.
  Note: The IP address must end in *0* for the following example (because of the netmask length).

```
network ip route add 129.80.71.0/24 dev 2B
network ip route del 129.80.71.0/24 dev 2B
```

- *Outside network* example: To add or delete a default route or gateway.
  Note: When configuring connections to an SL8500 through an outside network, you need to include a default gateway.

```
network ip route add default via 129.80.71.254
network ip route del default
```

- *With router* example: To add or delete a route using the host IP and router.
  Note: The host IP address must end in *0* and the router end in *254* for this example.

```
network ip route add 129.80.70.0/23 via 172.80.25.254
network ip route del 192.168.24.0/23 via 129.80.81.254
```

- For example: To show the routing type:

```
SL8500> network ip route show
  172.27.2.0/23 dev 2A
  129.80.70.0/23 dev 2B
  224.0.0.0/8 dev 2B
  default via 129.80.71.254 dev 2B

COMPLETED
```

Policy Routing Commands

The **network ip policy route** command supports advanced routing technique.

Important:
This command is used for configurations from a host with a single IP address in to an SL8500 with Dual TCP/IP—or a 1 into 2 configuration.

In this case, multiple routing tables must be configured for the SL8500 to respond through the desired IP address, routing device, and host.

Note: A netmask value is not used with these commands.

The command syntax is:

network ip policy route <*add*|*del*> <*IP.addr*> dev <*device*>

network ip policy route <*add*|*del*> <*IP.addr*> via <*router*> dev <*dev*>

network ip policy route show dev <*device*>

network ip policy <*enable*|*disable*> dev <*device*>

network ip policy status

For example, to add or delete a policy type:

```
network ip policy route add 192.168.25.7 dev 2A
network ip policy route del 192.168.25.7 dev 2A
```

- For example, to add or delete a specific route through a router to a port type:

```
network ip policy route add 192.168.25.7 via 129.80.81.254 dev 2B
network ip policy route del 192.168.25.7 via 129.80.81.254 dev 2A
```

- For example, to **show** a policy route for a specific device type:

```
SLSL8500> network ip policy route show dev 2A
  129.80.16.244 via 172.27.3.254 dev 2A
  129.80.16.240 via 172.27.3.254 dev 2A
  129.80.16.243 via 172.27.3.254 dev 2A
  129.80.16.239 via 172.27.3.254 dev 2A
```

In this example, there are four hosts accessing Port 2A through the same router <*host.ip.addr*> via <*router.ip.addr*>

- For example, to enable or disable a policy route type:

```
network ip policy enable dev 2A
network ip policy disable dev 2A
```

Examples

Configure SL8500 ports:

```
SL8500> network ip link set dev 2A down
SL8500> network ip link set dev 2B down
SL8500> network ip address add 129.80.64.100/23 dev 2A
SL8500> network ip address add 192.168.10.111/24 dev 2B
SL8500> network ip link set dev 2A up
SL8500> network ip link set dev 2B up
```

Verify the SL8500 port configuration:

```
SL8500> network print
Host Name:           sl85001
Gateway:             192.168.10.254
Domain Name:
Primary Dns:
Secondary Dns:
eth0 IP Address:    192.168.10.111
eth0 Subnet Mask:   255.255.254.0
eth0 MAC Address:    00:10:4f:06:f8:32
```

Show a network IP address:

```
SL8500> network ip address show dev 2A
2A:
Interface Status:       UP
IP Address/Netmask:     129.80.64.100/23
MAC Address:               00:10:4f:06:f8:33
```

Configure library port routing:

```
SL8500> network ip route add 129.80.91.200 via 129.80.65.254
SL8500> network ip route add 129.80.81.199 via 129.80.65.254
SL8500> network ip route add default via 192.168.10.254
```

Verify library port routing:

```
SL8500> network ip route show
129.80.91.200 via 129.80.65.254 dev 2A
129.80.81.199 via 129.80.65.254 dev 2A
129.80.64/23 dev 2A
192.168.10/24 dev 2B
default via 192.168.10.254 dev 2B
```

System Network Commands

Below is a short list of network commands used in Windows, UNIX, and other operating system environments that you may find useful.

Note: If you are not at the root or administrator level of a computer, it is possible these commands are disabled, which means some of these commands may not work unless you have administrator or root privileges.

TABLE A-3 System Network Commands

Command	Description
ARP	Display or manipulate the Address Resolution Protocol (ARP) information on a network device.
FINGER	Allows you to find information about a user.
HOSTNAME	Displays the host name of the computer currently logged into.
IPCONFIG	A utility that displays the network settings currently assigned and given by a network. This command can be utilized to verify a network connection as well as to verify your network settings.
PATHPING	A utility to find network latency and network loss.
PING	Ping is one of the most commonly used and known commands. Ping allows a user to ping another network IP address. This can help determine if the device is able to communicate with the network.
ROUTE	Allows you to view and modify the computer's route table.
WHOIS	Helps allow a user to identify a domain name.
WINIPCFG	Allows a user to display network and network adapter information. Here, a user can find such information as an IP address, subnet mask, or gateway, Windows 2000, Windows XP and above should use ipconfig.

Network Addresses

To communicate on a network, each device must have a unique number or "address."

An Internet Protocol or IP address is a unique number that identifies a device and allows it to communicate on a network. All other IP network devices—including computers, routers, and libraries—must have its own unique address. IP addresses are usually represented by a dotted decimal notation of four numbers from 0 to 255.

For example: 128.80.142.23 is an IP address.

An IP address has two components, the network address and the host address.

Assuming this is a Class B network, the first two numbers (128.80) represent the network address, and the second two numbers (142.23) identify a particular host or device on this network.

There are five classes of IP ranges: Class A, Class B, Class C, Class D, and Class E. while only A, B and C are commonly used. Each class allows for a range of valid IP addresses. Below is a listing of these addresses.

TABLE A-4 Network IP Classes and Address Ranges

Class	Address Range	Supports
Class A	1.0.0.1 to 126.255.255.254	Supports 16 million hosts on each of 127 networks.
Class B	128.1.0.1 to 191.255.255.254	Supports 65,000 hosts on each of 16,000 networks.
Class C	192.0.1.1 to 223.255.254.254	Supports 254 hosts on each of 2 million networks.
Class D	224.0.0.0 to 239.255.255.255	Reserved for multicast groups.
Class E	240.0.0.0 to 254.255.255.254	Reserved.

Subnet Masks

Definitions:

- **Subnets** allow network administrators to further divide the host part of an IP address into further, smaller, networks—subnets.
- A **mask** is a filter that selectively includes or *excludes* certain values. Values that do not conform to the mask can not access the device.
- A **subnet mask**, or **netmask**, is a 32-bit mask that divides an IP address into subnets and specifies the available hosts on a network.

A subnet mask looks like an IP address and is often seen in 255.255.255.0 notation. It uses a “1” bit to filter, or “mask” allowable addresses in the network.

For example: 255.255.255.0 is a subnet mask.
Where:

- 255 values *mask* the access of an IP address range and
- 0 (or 000) values *allow* the access of an IP address range

When configuring the IP address, including the “slash” notation (for example /24) is known as Classless Inter-Domain Routing (CIDR[1]) format and indicates the subnet mask for that IP address. While the more conventional notation 255.255.255.0 provides the same information, the subnet mask is more concise using the CIDR notation.

Here is an example of a netmask, binary conversion, and the number of bits masked.

Netmask	**First Octet**	**Second Octet**	**Third Octet**	**Fourth Octet**
	255.	**255.**	**255.**	**255**
Conversion	11111111	11111111	11111111	11111111
Netmask length (CIDR notation)	/8	/16	/24	/32

The above example is a 32-bit address, which is a *broadcast* address and **does not allow any hosts, computers, or other network devices access**.

A commonly used netmask is a 24-bit mask.

Netmask	**First Octet**	**Second Octet**	**Third Octet**	**Fourth Octet**
	255.	**255.**	**255.**	**0**
Conversion	11111111	11111111	11111111	00000000
Netmask length (CIDR notation)	/8	/16	/24	—

Using a 24-bit netmask would be capable of 2,097,150 networks or 254 different hosts. Below is a breakdown of each of the commonly used network classes:

Class	**Netmask Length**	**Networks**	**Hosts**	**Netmask**
Class A	/8	126	16,777,214	255.0.0.0
Class B	/16	16,382	65,534	255.255.0.0
Class C	/24	2,097,150	254	255.255.255.0

See TABLE A-5 on page 70 for a complete list of netmask values.

1. CIDR is often pronounced as Cedar.

Netmask Quick Reference

TABLE A-5 Netmask Quick Reference

Bits	Number of Hosts	Netmask
/8	16777216	255.0.0.0—Class A network
/9	8388608	255.128.0.0
/10	4194304	255.192.0.0
/11	2097152	255.224.0.0
/12	1048576	255.240.0.0
/13	524288	255.248.0.0
/14	262144	255.252.0.0
/15	131072	255.254.0.0
/16	65536	255.255.0.0—Class B network
/17	32768	255.255.128.0
/18	16384	255.255.192.0
/19	8192	255.255.224.0
/20	4096	255.255.240.0
/21	2048	255.255.248.0
/22	1024	255.255.252.0
/23	512	255.255.254.0
/24	256	255.255.255.0—Class C network
/25	128	255.255.255.128
/26	64	255.255.255.192
/27	32	255.255.255.224
/28	16	255.255.255.240
/29	8	255.255.255.248
/30	4	255.255.255.252
/31	2	255.255.255.254
/32	1	255.255.255.255—Single IP address

Partitioning Tasks

One essential message mentioned throughout this document is planning.

TABLE A-6 Steps and Tasks for Partitioning

✓	Step	Task	Responsibility*
❑	**1. Team**	Create a Team. When planning for content and partitions, use a process similar to that of the system assurance process; which is the exchange of information among team members to ensure all aspects of the implementation are planned carefully and performed efficiently. Team members should include representatives from both the customer and Sun Microsystems.	■ Customer ■ Administrators ■ Operators ■ Sun SE, PS ■ Sun Svc Rep
❑	**2. Codes**	Review the software and firmware requirements. Update as required.	■ Customer ■ Sun SE, PS ■ Sun Svc Rep
❑	**3. Planning**	■ Create a planning team ■ Define the customer expectations ■ Complete the assessment ■ Identify the configurations ■ Complete the planning diagrams	■ Customer ■ Administrators ■ Sun SE, PS ■ Sun Svc Rep
❑	**4. Media**	■ Verify the distribution of cartridges and required tape drives are available and ready.	■ Customer ■ Operators
❑	**5. Library**	■ Install and configure a library (if necessary).	■ Sun Svc Rep
❑	**6. License**	■ License the partitioning feature.	■ Sun Svc Rep
❑	**7. Partitions**	■ Create partitions.	■ Customer ■ Administrators ■ Operators
❑	**8. Hosts**	■ Momentarily stop all host activity if currently connected.	■ Customer
❑	**9. Use**	Instruct the customer how to: ■ Partition and re-partition the library ■ Override a CAP reservation	■ Customer ■ Sun SE, PS ■ Sun Svc Rep
❑	**10. Reference**	Make sure the customer has access to the appropriate documents.	■ Customer ■ Sun SE, PS ■ Sun Svc Rep

■ SE = Systems engineer
■ PS = Professional services representative
■ Service = Sun Service representative (Svc Rep)
■ Customer = System administrators, network administrators, system programmers, operators

Maintenance Considerations

Having a knowledge and understanding of the SL8500 library configuration is very important and can have a major impact on customer operations. For example:

- What can you safely power off without effecting operations?
- Which libraries have host connections?
- Which libraries have safety doors?
- Are there routing tables and policies to consider?

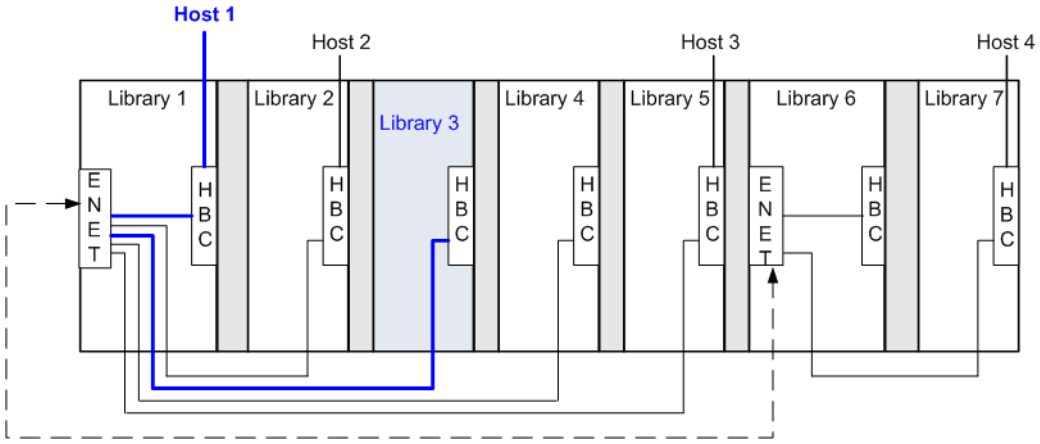
Having a drawing can help you visualize the customers configuration for fault isolation.

Some considerations include:

TABLE A-7 Maintenance Considerations

Consideration	Description
Components: At the operating system level	Vary or modify any SL8500 components offline (such as ACSs, LSMs, CAPs, and drives) *before* they are powered off and before you open the front access door. ■ This notifies ACSLS and HSC that these components are unavailable. ■ This allows outstanding requests to complete and prevents new requests from starting. If the customer has: ■ A single standalone SL8500, vary or modify the ACS offline. If the library is partitioned, make sure all hosts accessing this library are notified. ■ A library complex connected with PTPs, vary or modify all four LSMs offline in the library where the access door will be opened.
Front access door	Opening either front access doors without engaging the Service Safety Door causes the robotics to stop and requires an audit to confirm and/or update the inventory.
Service Safety Doors	Determine if the library has a service safety door. When the SL8500 Service Safety Door is engaged to provide a service bay separate from the rest of the library, the service representative can open the front access door on that side of the library without taking the LSM or ACS offline. It is advisable to keep the safety door engaged for a minimum amount of time. This is because the safety door blocks other hardware components (such as the elevators, CAPs, and cells).
Pass-thru ports (PTPs)	If the customer has a library complex connected with PTPs, vary or modify all four LSMs offline in the library where the access door will be opened. Note: PTPS are not supported on partitioned libraries.

TABLE A-7 Maintenance Considerations (Continued)

StorageTek Library Console Use the SLC to:	Disabling components at the SLC informs the library controller (HBC card) that component or device is unavailable. **Elevators** Disable the elevator on the left or right side before engaging the Service Safety Door and opening the front access door. **CAPs** Disable the CAPs on the right access door before opening.
Cartridge access ports (CAPs)	CAPS are located on the right front access door. Whenever opening the right access door, make sure you disable to CAPs at the operating system, and the right side elevators and CAPs at the SLC.
Removing Power  **For example:** If you power-off Library 1 to replace a HandBot in LSM 3, you remove power from the HBC card and the Ethernet switch in Rack 2. This removes Host 1 access to the entire complex, plus it also removes Host 2, 3, and 4 access to the entire complex. However, Host 2 can still access Library 2, Host 3 can access Library 5, and Host 4 can access Libraries 6 & 7. A better approach to this would be to use the Service Safety Door and power-off that specific rail at the HBS card on the rear of the library.	

APPENDIX **B**

Work Sheets

This appendix provides work sheets to help plan the host connections, content and partition planning for the SL8500 and includes:

Host Selection Checklist

TABLE B-1 Host Selection Checklist and Requirements

Configuration	Port	Library Firmware	Comments
Single	Port 2B only	All versions	This is the simplest type of host connection to the library. Supports: Single host/library management software (ACSLS or HSC).
Library Complex	Port 2B only	FRS_2.00	*Optional Feature.* Connects two or more libraries together using pass-thru ports. Can connect up to 10 libraries together for the complex. Supports: Single host/library management software (ACSLS or HSC).
Dual TCP/IP	Port 2B primary Port 2A optional	FRS_3.08	*Optional Feature.* Provides *two* separate paths for host connections to the library or library complex. Separate, not redundant. Redundancy is provided in the network design. Supports: Single host/library management software (ACSLS or HSC).
Partitioned	Port 2B primary Port 2A optional	FRS_3.7x	*Optional Feature.* Supports Dual TCP/IP feature. Supports: Dual host/library management software (ACSLS and/or HSC).
Multi-Host	Port 2B primary Port 2A optional	FRS_3.95	*Optional Feature.* Provides up to *four* separate paths for host connections to a library complex. Separate, not redundant. Redundancy is provided in the network design. Supports: Single host/library management software (ACSLS or HSC).
Note: The SL8500 library uses a TCP/IP protocol over an Ethernet physical interface to manage and communicate with the host and library management applications. This interface enables either: ■ Open system platforms with ACSLS or ■ Enterprise-level mainframes with HSC to connect to and communicate with the SL8500.			

Network Entries Work Sheet

When preparing the network and connections—as a best practice—complete a network entries worksheet for each port of the SL8500 library.

Description		IP Address
Port 2B	Host name to Port 2B	
	HBC Card Port 2B	
	Gateway Port 2B	
	Netmask	
Port 2A	Host name to Port 2A	
	HBC Card Port 2A	
	Gateway Port 2A	
	Netmask	

Important:

- When connecting more than one interface to an SL8500 library, the connections should be through different subnets for redundancy.

  If one subnet fails, communications between the hosts and the libraries continue over the other subnets.

- When connecting an interface to Port 2A, a service representative must configure routing and possibly assign policies for that port using the command line interface.

  Port 2B is the preferred port for host attachments to the library, no routing tables are required when connecting to that port.

- **The ports need to be on different Layer 2 broadcast domains**.

Multi-Host Network Entries Work Sheet

When preparing the network and connections—as a best practice—complete a network entries worksheet for each port of the SL8500 library.

Description		IP Address / Name
Connection 1	HBC Card Port: 2A ❑ 2B ❑	
	Host name	
	Gateway	
	Netmask	
Connection 2	HBC Card Port: 2A ❑ 2B ❑	
	Host name	
	Gateway	
	Netmask	
Connection 3	HBC Card Port: 2A ❑ 2B ❑	
	Host name	
	Gateway	
	Netmask	
Connection 4	HBC Card Port: 2A ❑ 2B ❑	
	Host name	
	Gateway	
	Netmask	

Important:

- When connecting more than one interface to an SL8500 library or library complex, the connections should be at least two different subnets for redundancy.

  If one subnet fails, communications between the hosts and the libraries continue over the other subnets.

- When connecting an interface to Port 2A, a service representative must configure routing and possibly assign policies for that port using the command line interface.

  Port 2B is the preferred port for host attachments to the library, no routing tables are required when connecting to that port.

- **The ports need to be on different Layer 2 broadcast domains**.

FIGURE B-1 Content Management Work Sheet

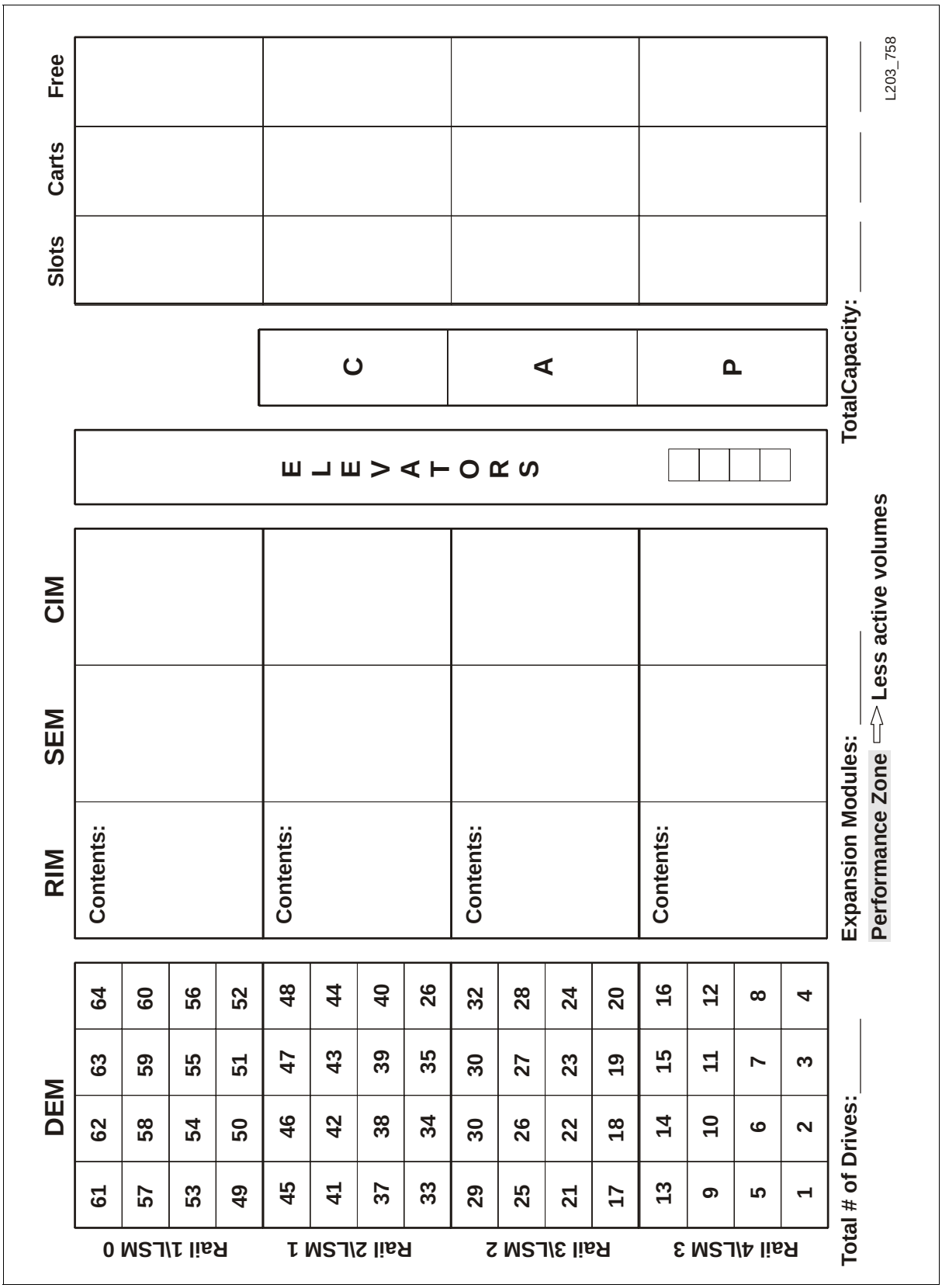
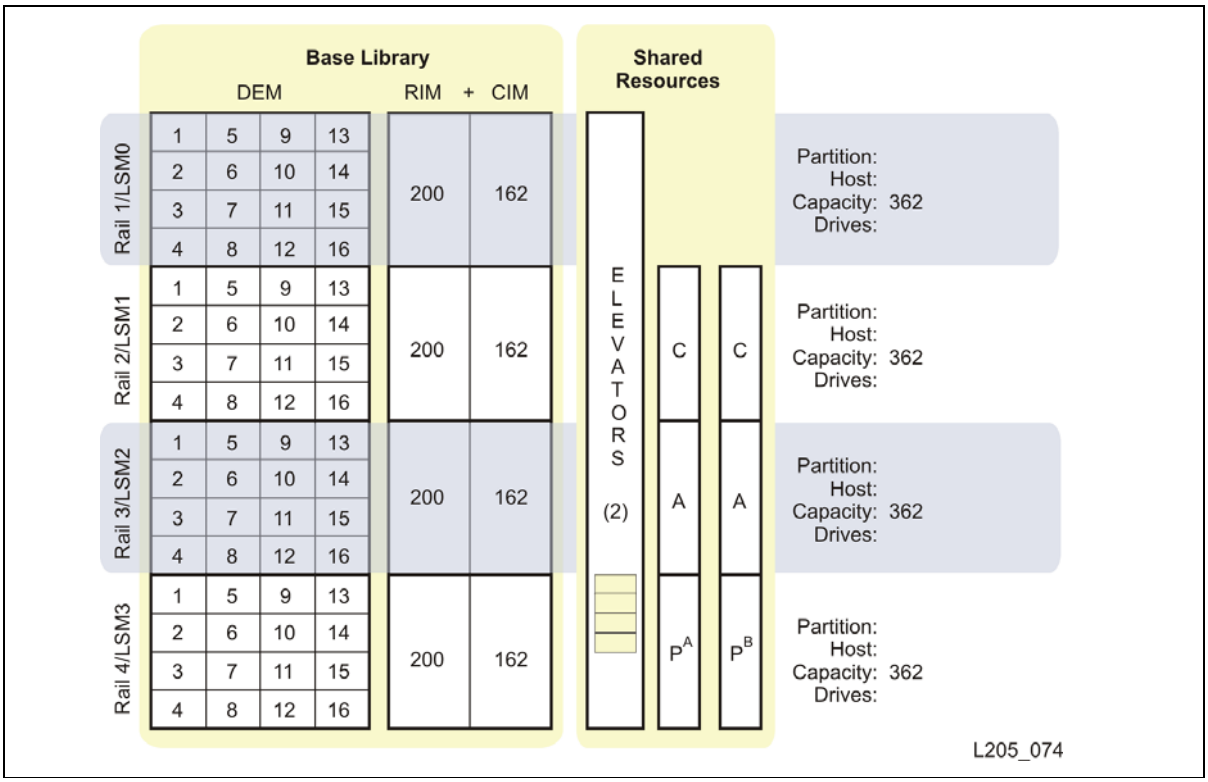


FIGURE B-2 Partition Planning—Base Library



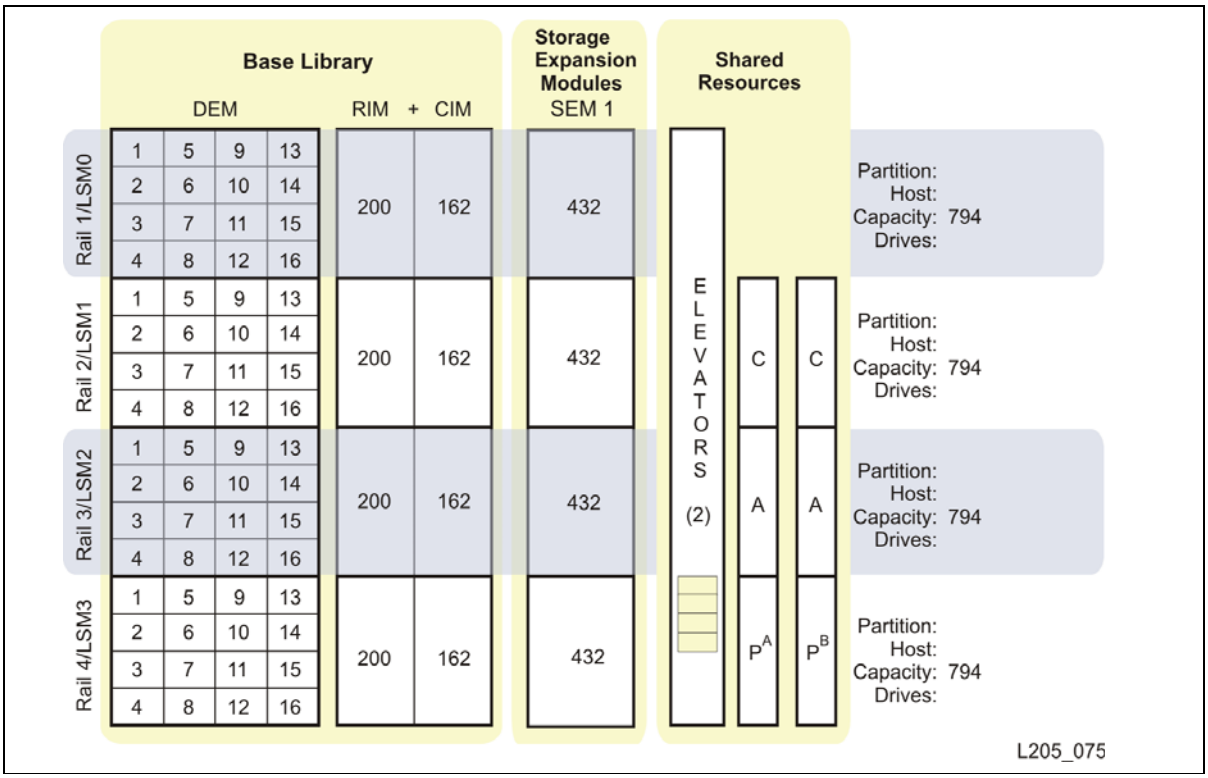
Rail 1
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 2
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 3
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 4
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

FIGURE B-3 Partition Planning—One Expansion Module



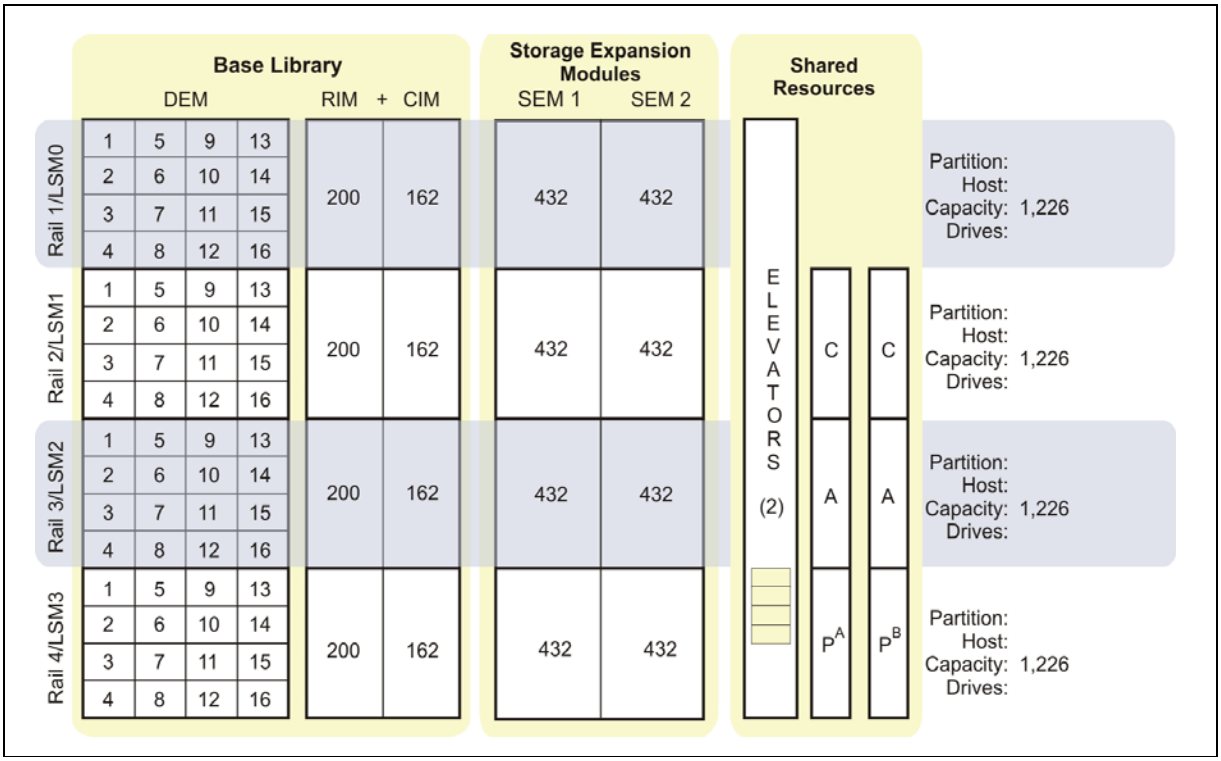
Rail 1
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 2
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 3
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 4
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

FIGURE B-4 Partition Planning—Two Expansion Modules



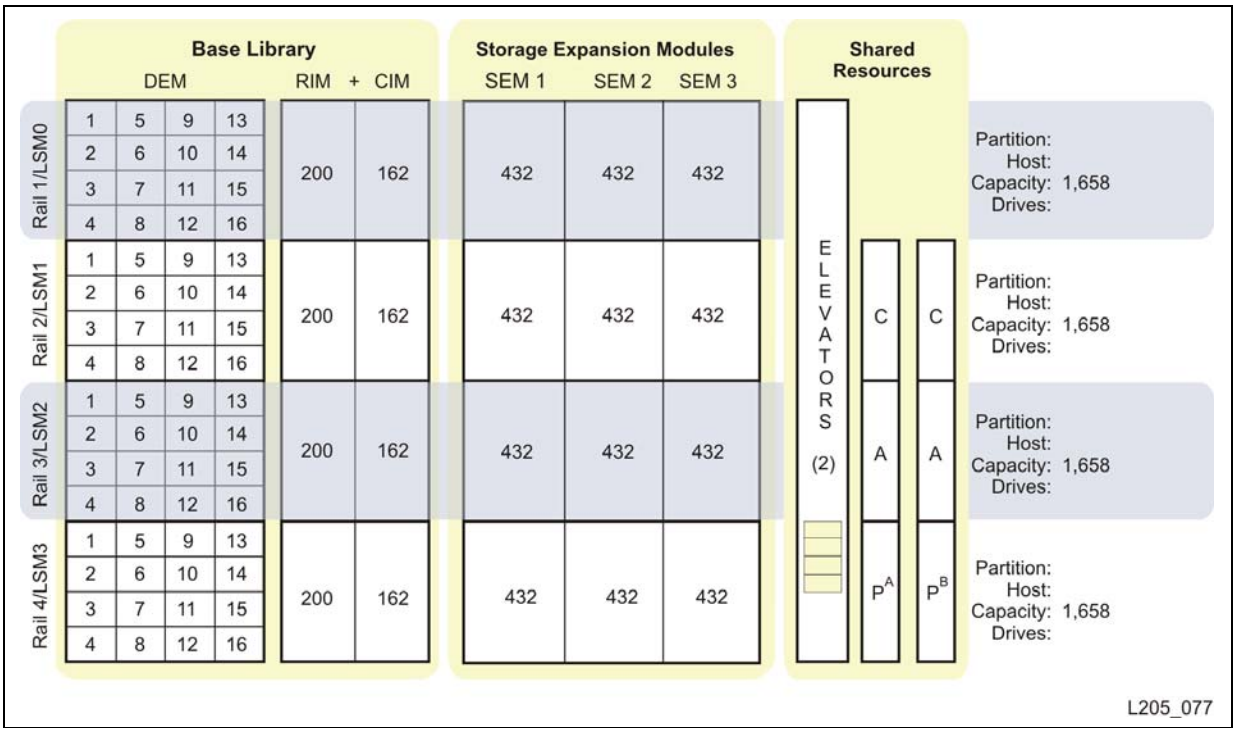
Rail 1
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 2
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 3
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 4
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

FIGURE B-5 Partition Planning—Three Expansion Modules



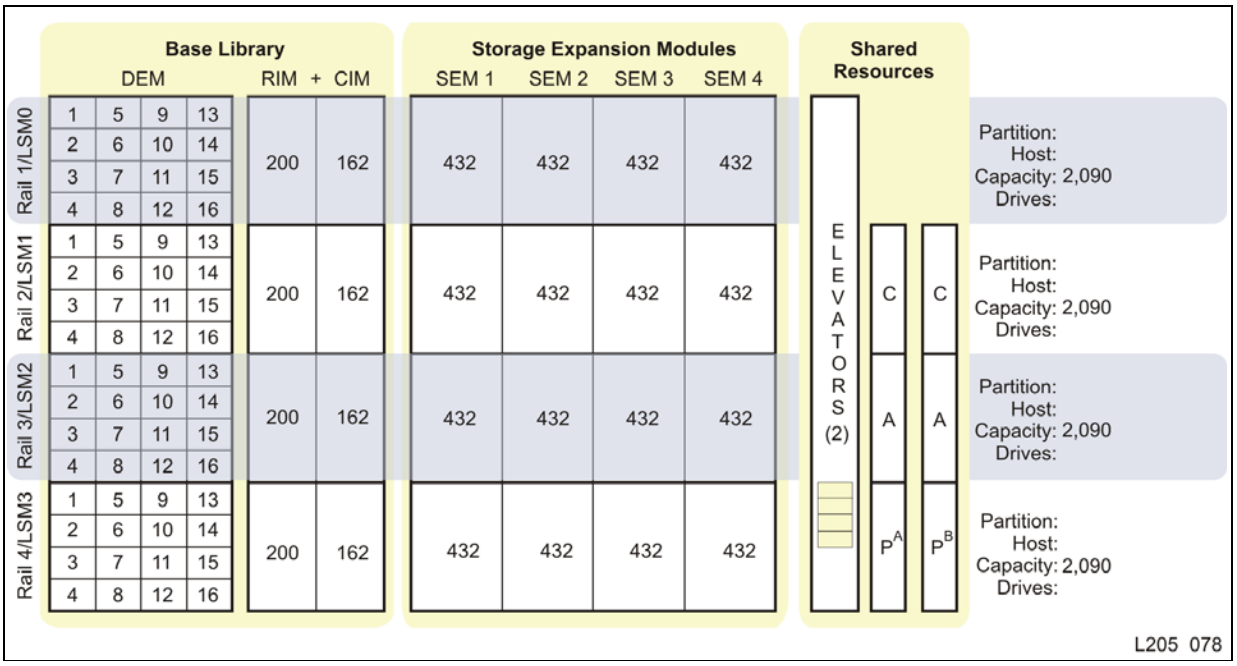
Rail 1
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 2
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 3
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 4
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

FIGURE B-6 Partition Planning—Four Expansion Modules



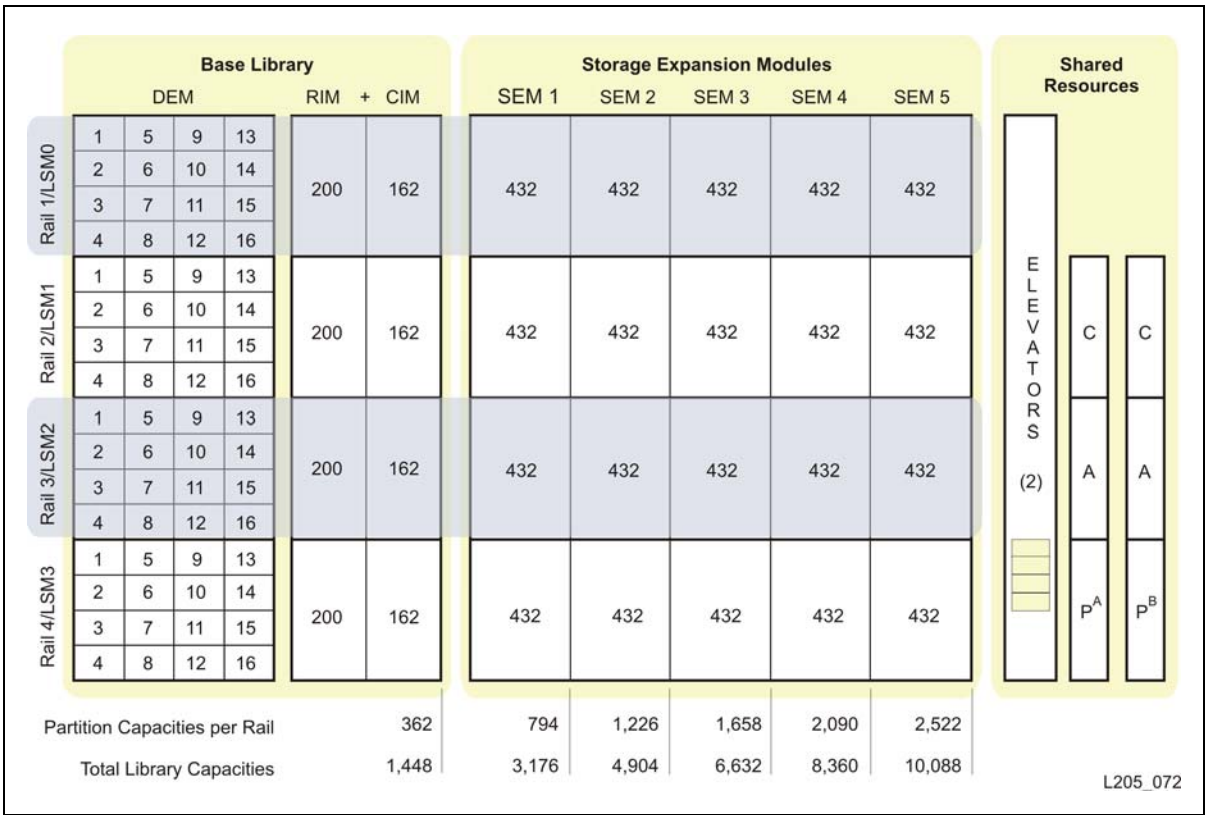
Rail 1
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 2
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 3
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 4
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

FIGURE B-7 Partition Planning—Five Expansion Modules



Rail 1
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 2
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 3
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Rail 4
Partition ID
Hosts
ACSLS or HSC
ACS, LSM Address
Applications
Cartridge capacity
Free slots
Tape Drive types

Glossary

This glossary defines terms and abbreviations used in this publication.

A

Address Resolution Protocol (ARP) A network layer protocol that converts IP address into physical addresses, like Ethernet addresses. Address Resolution Protocol (ARP) Takeover allows traffic to be redirected from a failing OSA-Express connection to another OSA-Express connection.

Away library The library that is always located on the *left* side of a Home library, as viewed from the front.

D

Destination The drive or slot location in the adjacent library where the cartridge will be mounted or stored.

Dual path/Dual TCP/IP Two distinct physical paths within a network architecture that interconnect two host systems.

E

Ethernet A local-area network (LAN) architecture that serves as the basis for the IEEE 802.3 standard. Ethernet is one of the most widely implemented LAN standards.

- 10Base-T: 10 Mbps baseband Ethernet over twisted pair cables with a maximum length of 100 meters.
- 100Base-T: 100 Mbps baseband Ethernet over twisted pair cable.

G

Gateway A node on a network that serves as an *entrance* to another network. A gateway is a device that *routes* traffic from one network to another network.

H

Home library The library that provides power, signal, and control lines to the PTP mechanisms. This is the library on the *right* as viewed from the front.

Host Software Component (HSC) Resides on mainframe operating systems and controls the library. HSC receives requests from the programmatic interface and translates them into commands for the library.

I

Internet Protocol (IP) A protocol used to route data from its source to its destination in an Internet environment.

IP address A four-byte value that identifies a device and makes it accessible through a network. The format of an IP address is a 32-bit numeric address written as four numbers separated by periods. Each number can be from 0 to 255. For example, 129.80.145.23 could be an IP address. Also known as TCP/IP address.

M

MAC address Short for media access control.

Mbps Spelled this way it is short for mega*bits* per second, a unit of measure for data transfer speed (a megabit is equal to one million bits). Newer versions of Ethernet, called Gig-E or 1000Base-T support data transfers of 1 gigabit (1,000 Mbps).

MBps: Spelled this way it is short for mega*bytes* per second.

Multi-homed More than one network interface; for example, the two SL8500 TCP/IP ports. This configuration does *not* imply redundancy.

N

Netmask This entry makes the library accessible through a subnet on a larger network, using a number from 0 to 32;
for example, 126.80.70.121/**23**.

The number 23 in this example is the netmask.

Network masks—also known as a subnet mask or netmask—use bits to identify the subnetwork, and how many host addresses may access it. These masks are usually represented by a dotted decimal notation of four numbers from 0 to 255 separated by periods. For example 255.255.254.0 is a subnet mask.

A shorter form of notation—known as Classless Inter-Domain Routing (CIDR)—gives the network number followed by a slash ("/") and the number of bits in the netmask.

network An arrangement of nodes and branches that connects data processing devices to one another through software and hardware links to facilitate information interchange.

NIST National Institute of Standards and Technology.

R

Redundant TCP/IP Relates to dynamic routing or switching from a primary interface to a secondary interface in the event of a failure on one interface. *This configuration is not supported*.

Routing The process of moving a packet of data from a source to a destination. Routing is a key feature in networking because it enables messages to pass from one device to another device, eventually reach its target.

S

Source The home slot location containing the cartridge that will be passed through to an adjacent library.

Static Routing Routing information in the host system is manually configured by the system administrator. *This is the only routing method supported by the SL8500 library.*

Storage Management Component (SMC) Resides on mainframe operating systems along with the HSC. SMC intercepts mount and dismount messages, translates them into move requests, and routes them to the library

T

TCP/IP—Transmission Control Protocol/ Internet Protocol

- **TCP** is one of the main protocols in networks that enable two hosts to establish a connection and exchange streams of data. TCP guarantees delivery of data and also guarantees that packets are delivered in the order they were sent.
- **IP** specifies the format of packets and the addressing scheme.

Index

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