

Getting Started Guide

hp StorageWorks SR2122-2 IP Storage Router

Fourth Edition (February 2004)

Part Number: AA-RTE1D-TE

This document describes the integration of IP-based Storage Networks using the iSCSI and FCIP protocols to HP StorageWorks Fibre Channel SANs and HP Storage arrays.

For the latest version of this document, access the HP storage website at:
<http://www.hp.com/country/us/eng/prodserv/storage.html>.



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SR2122-2 IP Storage Router: Getting Started Guide
Fourth Edition (February 2004)
Part Number: AA-RTE1D-TE

About this Document

This section describes the content reflected in this document, including:

- [Getting Started Guide Information](#), page 3
- [Intended Audience](#), page 3
- [Other IP SR2122-2 Storage Router Documentation](#), page 3

Getting Started Guide Information

This Getting Started Guide covers the following major topics:

- [Section 1: Using the SR2122-2 as an iSCSI Storage Router](#)
- [iSCSI in a Heterogeneous SAN](#), page 6
- [SR2122-2 Hardware and Software Support for iSCSI](#), page 9
- [SR2122-2 Configuration Rules](#), page 11
- [Configuring the SR2122-2 IP Storage Router in a SAN using iSCSI](#), page 14
- [Serving Fibre Channel Storage to the SR2122-2](#), page 18
- [Serving Storage to the iSCSI Initiators from the SR2122-2 over IP](#), page 25
- [Configuring hp StorageWorks Secure Path for Windows with the SR2122-2 Storage Router](#), page 47
- [Windows MSCS Cluster Support](#), page 54
- [Section 2: Using the SR2122-2 with FCIP](#)
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- [Sample Configurations](#), page 73

Intended Audience

This document is intended for customers who purchased the IP SR2122-2 Storage Router.

Other IP SR2122-2 Storage Router Documentation

The IP SR2122-2 Storage Router kit also includes:

- HP StorageWorks IP Storage Router SR2122-2 Command Line Interface Reference Guide:
Part Number 306001-002
- HP StorageWorks IP Storage Router SR2122-2 User Guide:
Part Number 304835-002

Additional documentation, including white papers and best practices documents, are available via the HP website at: <http://www.hp.com/support/iprouter>.

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Introduction

This document describes the basic setup and configuration of the SR2122-2 IP Storage Router within an HP supported heterogeneous SAN environment using either the iSCSI and/or FCIP protocol.

Section 1: Using the SR2122-2 as an iSCSI Storage Router

iSCSI Protocol

The SCSI transport protocol iSCSI maps block-oriented (CDB) storage data over TCP/IP networks (through iSCSI PDUs). The iSCSI protocol enables universal access to storage devices and storage-area networks (SANs) over standard Ethernet-based TCP/IP networks. These networks may be dedicated networks or may be shared with traditional Ethernet applications. IP LAN/WAN routers and switches can be used to extend the IP storage network to the wide area of applications such as synchronous and asynchronous remote disk copy or tape backup and restore.

Note: Although the iSCSI protocol is written as a complete data transport from host to storage this section will only discuss the current HP supported topology of iSCSI hosts to Fibre Channel storage.

Assumptions

The reader should have a thorough understanding of HP's Fibre Channel Storage networking products including Fibre Channel switches and storage as well as a basic understanding of TCP/IP networking.

iSCSI in a Heterogeneous SAN

Although the iSCSI protocol is written as a complete data transport from host to storage this chapter will only discuss the current HP supported topology of iSCSI hosts to Fibre Channel storage using the HP SR2122-2 iSCSI Router.

For further details please read “*HP StorageWorks IP Storage Router SR2122-2 User Guide* PN: 304835-003” Chapter 4 -SCSI Routing Overview.

Typical Network Structure

The addition of iSCSI to the SAN means that two data protocols need to be configured/ managed – TCP/IP and Fibre Channel. IP hosts with iSCSI drivers access the SR2122-2 through an IP network connected to the Gigabit Ethernet interface of each SR2122-2. The SR2122-2 accesses Fibre Channel storage devices connected to the Fibre Channel interfaces of each SR2122-2.

A typical IP/Fibre Channel network example:

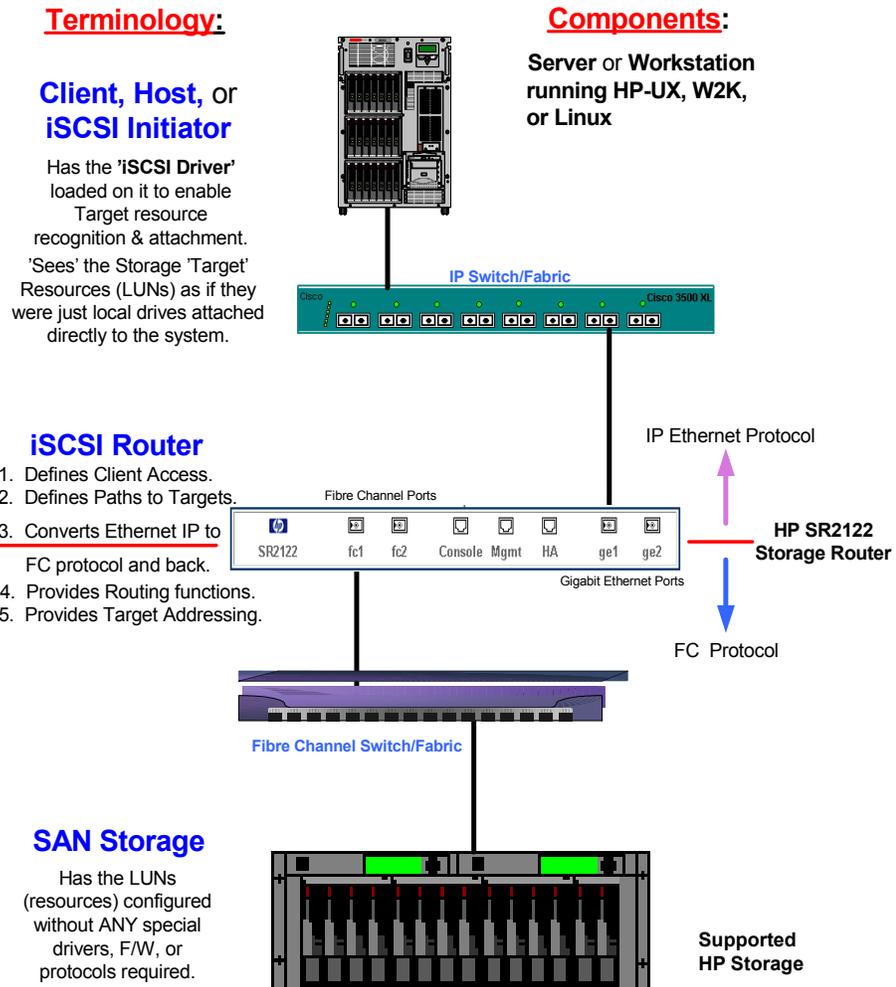


Figure 1: IP/Fibre Channel Network Example

iSCSI Initiator

The IP host, or iSCSI Initiator uses the iSCSI Driver to enable target resource recognition and attachment to the SR2122-2 over IP. The iSCSI driver is configured with the Gigabit Ethernet IP address of each SCSI routing instance running on the SR2122-2 with which the host is to transport SCSI requests and responses. The iSCSI initiator sees the storage resources (LUNs) as if they were just local drives attached directly to the server.

On the SR2122-2, IP host access is controlled through an access list and optional VLAN identifier (VID).

The iSCSI Initiator may use multiple NIC cards with teaming for failover. The term “team” refers to the concept of multiple network adapters working together as a single network adapter, commonly referred to as a Virtual Network Adapter.

Note: The HP-UX iSCSI Software Initiator does not provide for teaming as described here.

IP Network

The IP network is the infrastructure used to transfer data between the iSCSI initiator and the SR2122-2.

SR2122-2 iSCSI router

When configured in SCSI routing mode, the SR2122-2 IP Router is the bridge between the iSCSI Initiators and the SAN storage that converts IP to Fibre Channel protocol and provides iSCSI Initiator access to Fibre Channel storage.

SCSI routing provides IP hosts with access to Fibre Channel storage devices as if the storage devices were directly attached to the hosts, with access to devices being managed primarily in the Storage Router. An iSCSI target (also called logical target) is an arbitrary name for a group of physical storage devices. The iSCSI targets are created and mapped to physical storage devices attached to the Storage Router. The Storage Router presents the iSCSI targets to IP hosts (iSCSI initiators) as if the physical storage devices were directly attached to the hosts.

With SCSI routing, storage devices are not aware of each IP host; the storage devices are aware of the Storage Router and respond to it as if it were one Fibre Channel host.

You can configure storage routers in a cluster to allow the storage routers to back each other up in case of failure.

A storage router cluster consists of two to four storage routers connected as follows:

- Connected to the same hosts
- Connected to the same storage systems
- Connected to each other through their management and high availability (HA) interfaces

Note: Clustering, as defined above, is not supported with HP-UX. See HP-UX documentation for further information.

In a cluster, storage routers continually exchange HA information to propagate configuration data to each other and to detect failures in the cluster. The storage routers exchange HA information through two separate networks: one connected to the management interface of each Storage Router and the other connected to the HA interface of each Storage Router. To

make sure that HA information is exchanged reliably between storage routers, the storage routers balance the transmission of HA information between the management and the HA interfaces.

SR2122-2 access is controlled through an access list and a VLAN identifier (VID) number of the hosts. An access list enables access to storage devices attached to the Storage Router with any combination of host IP address(es), CHAP user name(s), or iSCSI name(s). An access list contains these combinations. Host VID enables access to storage devices according to the VID of each host. You can use a combination of access lists and VIDs to configure access in the Storage Router; that is, you can specify that certain hosts according to IP address in a VLAN can access storage devices attached to the Storage Router.

Fibre Channel SAN

A Storage Area Network is a dedicated, centrally managed, secure information infrastructure, which enables any-to-any interconnection of servers and storage. SANs are built to incorporate the best of both storage and networking interfaces: fast and efficient communications optimized for movement of large amounts of data, but with access to a wide range of other servers and storage devices on the network.

The SR2122-2 iSCSI Router is supported on any currently supported HP B-Series, C-Series, or M-Series switch fabric. For the latest HP switch topologies and fabric rules, please read the “*HP StorageWorks SAN Design Reference Guide*” available at:

<http://h18000.www1.hp.com/products/storageworks/san/documentation.html>

SAN Storage

The SR2122-2 supports the RA/MA8000, ESA/EMA12000, MSA1000, EVA, VA and XP storage arrays. See the section “[Storage Array Hardware Support](#)” for specific storage array versus OS support.

Please read “*HP StorageWorks SAN Design Reference Guide*” (link above) for the latest HP storage configurations and rules.

SR2122-2 Hardware and Software Support for iSCSI

This section lists the hardware, devices, and operating systems that are compatible with this SR2122-2 Storage Router.

Storage Array Hardware Support

The following HP Storage Array products are supported with Windows and Linux with Fibre Channel connectivity:

- MSA1000
- RA/MA8000
- ESA/EMA12000
- EMA16000
- Enterprise Virtual Array (EVA)
- VA7100
- VA7400/7410
- XP128/1024

The following HP Storage Array products are supported with HP-UX:

- XP
- EVA
- VA

Fibre Channel Switch Hardware Support for iSCSI

The SR2122-2 Storage Router is supported with the HP B-Series, C-Series, and M-Series Product Line switches listed in the *SR2122-2 IP Storage Router Product Support Tables*. View the Tables at:

<http://h18000.www1.hp.com/products/storageworks/san/documentation.html>

Network Interface Controller (NIC) Hardware Support

The following Proliant Server Network Interface Controllers are supported:

- NC6136 Gigabit Server Adapter
- NC7131 Gigabit Server Adapter
- NC7770 PCI-X Gigabit Server Adapter

The following Blade Server Network Interface Controller is supported:

- NC7781 Gigabit Server Adapter

The HP-UX iSCSI Software Initiator works with all NICs supported by HP-UX 11i v1 and 11i v2. For optimal performance, it is recommended that Gigabit Ethernet NICs be used.

Operating System Software Support

- HP-UX 11i v1 (64-bit only) and HP-UX 11i v2
See Release Notes at: www.docs.hp.com
- Microsoft Windows 2000 SP2 with either Microsoft hotfix Q302895 or Q248720 and Microsoft hotfix Q318271, SP3
- Microsoft Windows 2003
- MSCS (HP iSCSI initiator only)
- Red Hat Linux Red Hat Advanced Server 2.1
- Secure Path (Windows 2000 and Windows 2003 with HP iSCSI initiator only)

HP-UX iSCSI Software Initiator Support

The following versions of the HP-UX iSCSI Software Initiator are supported with HP-UX:

- B.11.11.03 with HP-UX 11i v1
- B.11.23.03 with HP-UX 11i v2

HP Windows Initiator Support

- Microsoft Windows 2000 SP2 with either Microsoft hotfix Q302895 or Q248720 and Microsoft hotfix Q318271, SP3
- Microsoft Windows 2003
- MSCS is supported
- Secure Path is supported
- HP Auto Path for VA/XP with Windows is not supported
- IA64 is not supported

Microsoft Initiator Support

- Windows 2000 server only with SP3
- Microsoft Windows 2003
- MSCS not supported
- Secure Path & Auto Path not supported
- IA64 not supported
- iSNS server not supported
- HP Auto Path for XP/VA for Windows is not supported

Linux Initiator Support

- Red Hat Linux Red Hat Advanced Server 2.1
- Linux Clustering is not supported
- HP Auto Path for VA/XP with Linux is not supported.

Compaq Network Teaming Software Support

- Compaq Network Teaming (Windows 2000 and Windows 2003 only)

SR2122-2 Management Software Support

The following HP management software is supported with Windows only:

- Compaq Insight Manager 7
- HP OpenView Storage Area Manager (SAM)

SR2122-2 Configuration Rules

SR2122-2 Router Rules

Table 1: SR2122-2 Router Rules

Maximum scsirouter instances per SR2122-2 Router (and per SR2122-2 Router Cluster)	12
Maximum iSCSI host connections per SR2122-2 SCSI Router instance	32
Maximum active targets per SR2122-2 Router	30
Maximum total active LUNs per SR2122-2 Router	30

- The SR2122-2's 2nd Fibre Channel port (FC2) is not supported as a redundant SAN port for FC1.
- Direct connect of the SR2122-2 Fibre Channel ports to any HP storage array is not supported.
- The SR2122-2 Management port must be in a different subnet than the SCSI Router Instances.

iSCSI Host Rules

Table 2: iSCSI Host Rules

Supported maximum targets accessed per iSCSI host	Windows 2000, 2003	30
	HP-UX, Red Hat Linux	4
Recommended maximum active LUNs per router	HP-UX, Linux, Windows 2000, 2003	30

Operating System Rules

- Linux Clustering is not supported.
- HP Secure Path for the MSA1000, RA/MA8000, EMA/ESA12000 and Enterprise Virtual Arrays for either HP-UX or Linux are not supported.
- HP Auto Path for VA/XP for HP-UX, Windows 2000, Windows 2003, and Linux are not supported.
- HP Secure Manager on XP and VA is not supported.
- The MSA1000 is not supported with Secure Path for Windows.

iSCSI Initiator Rules

HP Windows Initiator Rules

- Microsoft Windows 2000 SP2 with either Microsoft hotfix Q302895 or Q248720 and Microsoft hotfix Q318271, SP3
- Microsoft Windows 2003
- MSCS is supported
- Secure Path is supported
- HP Auto Path for VA/XP with Windows is not supported.
- IA 64 is not supported

Microsoft Initiator Rules

- Windows 2000 server only with SP3
- Microsoft Windows 2003
- MSCS not supported
- Secure Path & Auto Path not supported
- IA64 not supported
- iSNS server not supported
- iSCSI CRC is not supported

Linux Initiator Rules

- Red Hat Linux Red Hat Advanced Server 2.1
- Linux Clustering is not supported
- SR2122-2 is supported only in Stand Alone mode and Cluster mode is not supported
- HP Auto Path for VA/XP with Linux is not supported
- Linux supports only XP128/1024, VA7100 and VA7400/7410 arrays
- IA 64 is not supported
- Blade servers are not supported
- iSCSI CRC is not supported

Storage Array Rules

- The HSG80 is supported in both SCSI-3 Transparent Failover Mode and Multibus Failover Mode.
- Without HP Secure Path the Enterprise Virtual Array is supported with the SR2122-2 accessing only one EVA controller port. This will disable controller failover protection.
- The MSA1000 is supported with the SR2122-2 accessing only one MSA controller port. This will disable controller failover protection.
- The SR2122-2 fibre channel ports appear as host bus adapters to the Fibre Channel switches and to all storage arrays.
- Secure Manager is not supported for XP/VA.
- Read “*HP StorageWorks SAN Design Reference Guide*” for the latest HP storage rules.

Fibre Channel Switch/Fabric Rules

- The SR2122-2 is supported on the B-Series SAN switches, M-Series SAN switches, and C-Series SAN switches. Read “HP StorageWorks SAN Design Reference Guide ” for the latest switch topologies and fabric rules.
- The SR2122-2 should only be zoned with the storage devices that it will access. Zoning the SR2122-2 with other servers is not supported.

Management Software Rules

- HP OpenView Storage Area Manager (SAM) support is limited to property support only. It will identify the device, and by clicking on it, one can launch the device embedded web server interface or telnet. A device specific plug-in for the SR2122-2 is available on the SAM Website.
- CIM 7 Supports the SR2122-2's SNMP management capabilities.
- Management of the storage arrays through the SR2122-2 is not supported. Please use the recommended application/element manager to configure the storage array.
- Though Service Location Protocol (SLP) is not supported, the code for SLP is in the Router firmware 3.4.2-K9, and is enabled by default. Due to inappropriate handling of some SLP requests, the router's SLP code causes a memory leak and eventually hangs the router. Since there is no way to disable the SLP in this firmware, the SR2122-2 should not be configured in networks with SLP presence. A separate network, avoiding SLP agents, is recommended for the SR2122-2's management port .

Configuring the SR2122-2 IP Storage Router in a SAN using iSCSI

Configuring the SR2122-2 in a SAN takes on five distinct steps or sections:

- Setup/configuration of the SR2122-2 itself
- Adding the SR2122-2 to a SAN – standalone or clustered
- Serving storage to the SR2122-2 from the storage arrays over Fibre Channel
- Serving storage to the iSCSI Initiators from the SR2122-2 over IP.
- Setup/configuration of the iSCSI Initiators

SR2122-2 Setup

The SR2122-2 can be configured either as a standalone or clustered device. In Standalone Mode, as the name implies, the SR2122-2 does not have failover capabilities to other SR2122-2s. In Clustered Mode up to four SR2122-2s can be used as failover when presenting storage to iSCSI Initiators.

Note: A Standalone SR2122-2 can be added to a SR2122-2 Cluster without re-initializing the standalone router to preserve its configuration.

Note: SR2122-2 clustering is not supported with HP-UX.

For further SR2122-2 configuration details, please read “*HP StorageWorks IP Storage Router SR2122-2 User Guide* PN: 304835-003” Chapter 5 – Configuring the Storage Router.

Whether adding SR2122-2’s in Standalone or Cluster modes its important to know the WWPN of the fibre channel ports as they are needed for configuring both SAN zoning and Selective Storage Presentation (SSP).

To find the WWPN of a Fibre Channel ports using the SR2122-2’s CLI enter:

```
SR2122> show interface "fc1" stats
loop:          LOOP READY
connection:    F Port
Data Rate:    2 Gb/s
port id:      0xb0700
ALPA:        0x0
firmware:    READY
SCSI stats:
    35 status IOCB
    0 type 1 IOCB
    5 marker IOCB
    0 unhandled IOCB
WWPN: 28 00 00 02 3d 07 1b c0
.
```

To find the WWPN of a Fibre Channel ports using the SR2122-2's GUI, click on the Fibre Channel port in the Monitor window:

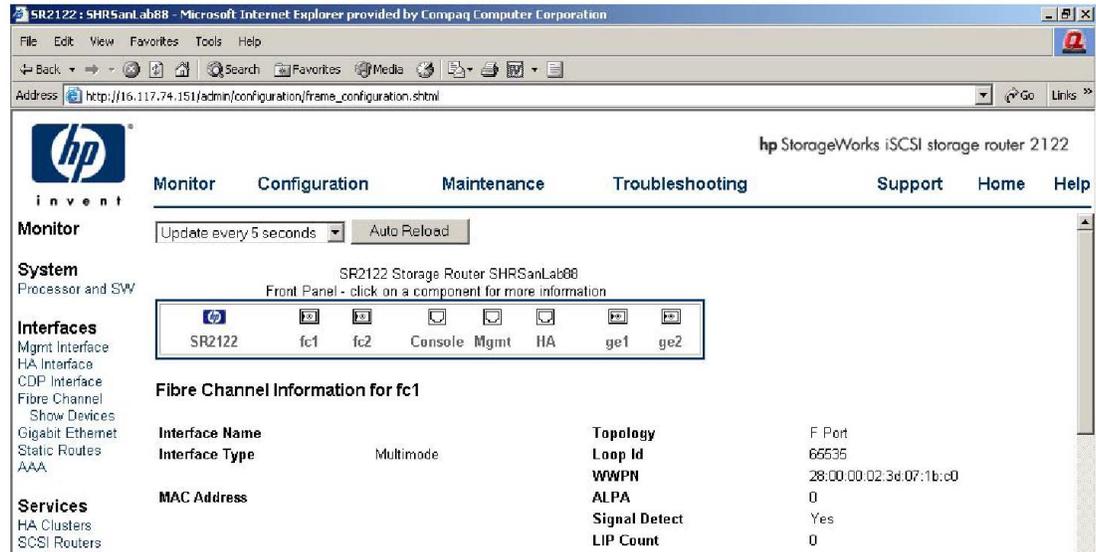


Figure 2: GUI Display of the Fibre Channel port WWPN

Adding a Standalone SR2122-2 to a SAN

The two SR2122-2 Fibre Channel ports are recognized as F-Ports by the Fibre Channel switch and as Fibre Channel HBAs by the Storage Arrays. Ports FC1 and FC2 may be used but they cannot be served the same LUN from the same storage array.

After physically connecting the Fibre Channel port(s), and if zoning is enabled, it is recommended to create a new zone that includes the Fibre Channel Port WWPNs and the WWPNs of the storage arrays that will be serving storage to the SR2122-2.

Standalone SR2122-2 examples:

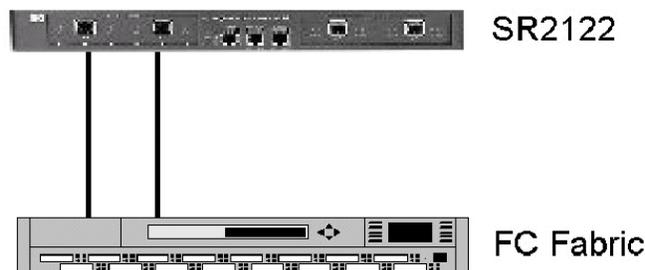


Figure 3: Standalone SR2122-2; Single SAN

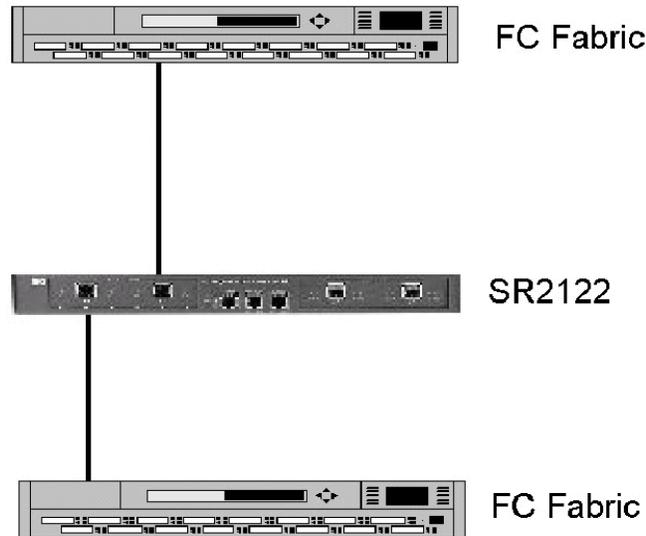


Figure 4: Standalone SR2122-2; Dual SANs

Adding a Clustered SR2122-2 to a SAN

The two SR2122-2 Fibre Channel ports on all the clustered SR2122-2's are recognized as F-Ports by the Fibre Channel switch and as Fibre Channel HBAs by the Storage Arrays.

After physically connecting the Fibre Channel port(s), and if zoning is enabled, it is recommended to create a new zone that includes the Fibre Channel Port WWPNs and the WWPNs of the storage arrays that will be serving storage to the SR2122-2.

Note: Important: Although Multi/Auto Pathing is not supported in a SR2122-2 clustered environment, a certain level of failover is available at the SR2122-2 when configured in a cluster.

Note: Clustered SR2122 configuration is not supported with HP-UX.

Normally, only one SR2122-2 within the cluster is responsible for the active I/O path between the iSCSI Initiator and the Storage Array, as an iSCSI Initiator's I/O cannot be split between SR2122-2 Cluster members. If this active Cluster member fails the I/O can switch to another cluster member. To insure proper failover each cluster member needs one of its Fibre Channel ports in the same zone.

Clustered SR2122-2 Example:

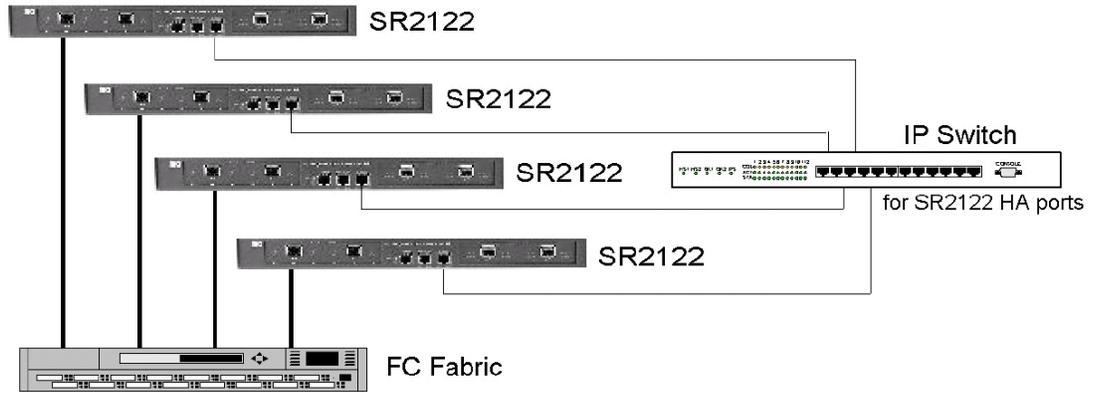


Figure 5: Clustered SR2122-2

Serving Fibre Channel Storage to the SR2122-2

Once the SR2122-2 is properly configured, connected and zoned within the SAN, the next step is to present storage to the router.

Where normally the storage is presented to a server, we must first get the Fibre Channel storage to the SR2122-2, then we have to present that storage to the iSCSI Initiators over IP.

As previously mentioned, the SR2122-2 Fibre Channel ports look like a typical Fibre Channel Host Bus Adapter to the storage array. Depending on the storage array it's now a matter of creating LUNs and presenting them to the SR2122-2's Fibre Channel port. This section describes how to serve storage from each supported storage array – MSA1000, RA/MA8000, ESA/EMA12000, Enterprise Storage Array, VA and XP – to the SR2122-2.

The assumption is the reader is not only experienced in the initial setup of these storage arrays but also in the creation of storage volumes or LUNs. This section describes the presentation of these LUNs to the SR2122-2. If not, it is suggested to read the configuration/user/reference guides for the storage array in question.

Please read “*HP StorageWorks SAN Design Reference Guide* – February 2004 Part Number: AA-RMPNL-TE” for the latest HP storage configurations and rules.

Presenting MSA1000 LUNs to the SR2122-2

MSA1000 storage volumes must be pre-configured before the LUN(s) can be detected and recognized by the SR2122-2. The MSA1000 can be configured either through its serial port or through the Array Configuration Utility.

Whatever method is chosen we must now use the MSA1000's selective storage presentation (SSP) commands to restrict access to volumes that are to be served to the SR2122-2.

Without HP Secure Path, the MSA1000 is only supported with the SR2122-2 accessing only one MSA controller port. This restriction disables controller failover protection.

First, using CLI commands through the MSA1000 serial port, the Show Connection command will determine if the MSA1000 storage array is aware of the SR2122-2 Fibre Channel port(s).

```
MSA1000> show connection
Connection Name: ""
Host WWNN = 10000002-3d071bc0
Host WWPN = 28000002-3d071bc0
Profile Name = Default Profile
Unit Offset = 0
Controller 1 Port 1 Status = Online
```

Next, to enable an ACL, the MSA1000 Volume Unit must be assigned to the SR2122-2's Fibre Channel port WWPN. For example, a Show Unit command may display:

```
MSA1000> sho units
Unit 1:
In PDLA mode, Unit 1 is Lun 2; In VSA mode, Unit 1 is Lun 1.
Unit Identifier:
Volume Status: VOLUME OK
5 Disk(s) used by lun 1:
```

```
Box 1, Bay 6, (SCSI bus 0, SCSI id 5)
```

```
Box 1, Bay 7, (SCSI bus 0, SCSI id 8)
```

```
Box 1, Bay 8, (SCSI bus 1, SCSI id 0)
```

```
Box 1, Bay 9, (SCSI bus 1, SCSI id 1)
```

```
Box 1, Bay 11, (SCSI bus 1, SCSI id 3)
```

```
Logical Volume Raid Level: PARITY FAULT TOLERANCE (Raid 4)
                        stripe_size=32kB
```

```
Logical Volume Capacity: 138,927MB
```

To present Unit 1 to the SR2122-2, the command would be:

```
MSA1000> add acl wwpn=28000002-3d071bc0 unit=1
```

```
Allowing 28000002-3d071bc0 access to unit 1.
```

Whether the MSA 1000 is running in PDLA or VSA Mode will determine how the LUN number is presented. In PDLA, the SR2122-2 will see Unit 1 as LUN 2 whereas in VSA Mode the SR2122-2 will see the unit as LUN 1.

Note: If using SR2122-2 Cluster mode, the WWPN for a Fibre Channel port on each SR2122-2 cluster member must be added to the MSA1000 Unit.

The SR2122-2 should now be able to present Unit 1 as storage to iSCSI Initiators.

Note: The MSA 1000 storage array is not supported with HP-UX.

Presenting RA/MA8000, ESA/EMA12000, and EMA16000 LUNs to the SR2122-2

RA/MA8000, ESA/EMA12000, and EMA16000 (HSG80) storage volumes must be pre-configured before the LUN(s) can be detected and recognized by the SR2122-2. The HSG80 controllers can be configured either through its serial port or through the HSG Element Manager application found on the SAN Management appliance.

Whatever method is chosen we must now use the HSG80's selective storage presentation (SSP) commands to restrict access to volumes that are to be served to the SR2122-2.

First, the Show Connection command will determine if the HSG80 is aware of the SR2122-2 Fibre Channel port(s).

```
HSG80> Show Connections
```

```
!NEWCON09      WINNT          OTHER          1      0D0F00  OL other      80
                HOST_ID=1000-0002-3D07-1E60      ADAPTER_ID=2800-0002-3D07-1E60

!NEWCON10      WINNT          THIS           2      0D0F00  OL this      180
                HOST_ID=1000-0002-3D07-1E60      ADAPTER_ID=2800-0002-3D07-1E60
```

On initial discovery the SR2122-2 Fibre Channel ports are assigned names that begin with !NEWCON# in the HSG80 connection table.

These entries may be renamed to a more user-friendly naming convention with the Rename command.

```
HSG80> rename !newcon09 isrfc1-p1
HSG80> rename !newcon10 isrfc1-p2
```

The Show Connections command will now display:

```
HSG80> show connections
ISRFC1-P1          WINNT          OTHER          1          0D0F00  OL other      80
  HOST_ID=1000-0002-3D07-1E60      ADAPTER_ID=2800-0002-3D07-1E60

ISRFC1-P2          WINNT          THIS           2          0D0F00  OL this      180
  HOST_ID=1000-0002-3D07-1E60      ADAPTER_ID=2800-0002-3D07-1E60
```

Next, an HSG80 Volume Unit can be assigned to the SR2122-2's Fibre Channel port WWPN using the connection name.

For example, a Show Unit command may display:

```
HSG80> Show Units
```

LUN	Uses	Used by
D1	DISK10000	
D2	DISK10100	
D3	DISK30000	
D4	DISK30100	
D81	DISK40300	
D107	DISK20000	
D108	DISK20100	
D181	DISK40400	

To present Unit 81 to the SR2122-2 the command would be:

```
HSG80> set D81 enable=isrfc1-p1
```

Note: When using Secure Path on Windows iSCSI Initiators all SR2122 connections must be enabled for each Unit.

Note: If Secure Path is not configured on the iSCSI initiators, then only one HSG port is supported to connect to the SR2122. Make sure only one of the four ports is included in the same SAN zone as the SR2122-2 Fibre Channel port.

To verify D81 is enabled only for the SR2122-2 type the command:

```
HSG80> Show D81
```

LUN	Uses	Used by
D81	DISK40300	
LUN ID:	6000-1FE1-0007-BB40-0009-9500-4670-004F	

```

NOIDENTIFIER
Switches:
  RUN                               NOWRITE_PROTECT          READ_CACHE
  READAHEAD_CACHE                   WRITEBACK_CACHE
  MAX_READ_CACHED_TRANSFER_SIZE = 32
  MAX_WRITE_CACHED_TRANSFER_SIZE = 32
Access:
  ISRFC1-P1
State:
  ONLINE to the other controller
Size:                               35556389 blocks
Geometry (C/H/S): ( 7000 / 20 / 254 )

```

Note: If using SR2122-2 Cluster mode the WWPN for a Fibre Channel port on each SR2122-2 cluster member must be added to the HSG80 Unit.

The SR2122-2 should now be able to present D81 as storage to iSCSI Initiators.

Note: The RA/MA8000, ESA/EMA12000, and EMA16000 storage arrays are not supported with HP-UX.

Presenting Enterprise Storage Array (EVA) LUNs to the SR2122-2

Enterprise Virtual Array (HSV110) storage volumes must be pre-configured before the LUN(s) can be detected and recognized by the SR2122-2. The HSV110 controllers can only be configured through the HSV Element Manager application found on the SAN Management appliance.

Note: If Secure Path is not configured on the iSCSI initiators, then only one HSV port is supported to connect to the SR2122-2. Make sure only one of the four ports is included in the same SAN zone as the SR2122-2 Fibre Channel port. **Caution:** This will prohibit controller failover. This note applies to Windows and Linux only.

The user must now use the HSV110's selective storage presentation (SSP) commands to restrict access to volumes that are to be served to the SR2122-2.

First, a host entry for the SR2122-2 must be added to the EVA and assign its WWPN to it using the HSV Element Manager application.

Open the Storage Array icon and click on hosts. Click the  button that appears on the content screen.

STEP 1: Enter/Add the Host Name
Enter your host's LAN node name.



STEP 2: Enter the IP address (optional)

If your host uses a static LAN IP address, enter the address. Skip this step if your host uses dynamic IP addresses.

Dynamic IP

STEP 3: Enter an adapter port World Wide Name: Enter the SR2122-2's Fibre Channel port WWN.

2800-0002-3d07-1e60 —OR— 2800-0002-3d07-

STEP 4: Select an operating system – Leave as Microsoft Windows.

Microsoft Windows

STEP 5: Add comments for this entry (optional)

SR2122 iSCSI Storage Router

Click **Finish** button to save host information.

Your host entry should now look like this:

Host Properties	
Node name:	SR2122 iSCSI Router
IP Address (if static):	Dynamic IP Assignment
Operational state:	Initialized - Good
Operating System:	Microsoft Windows
Fibre Channel adapter ports WWN:	2800-0002-3d07-1e60
UID:	6005-08b4-0001-45d7-0000-f000-00a1-0000
Presentations:	
Virtual disk/LUN:	
Active HSV connections:	2
Comments:	
SR2122 iSCSI Storage Router	

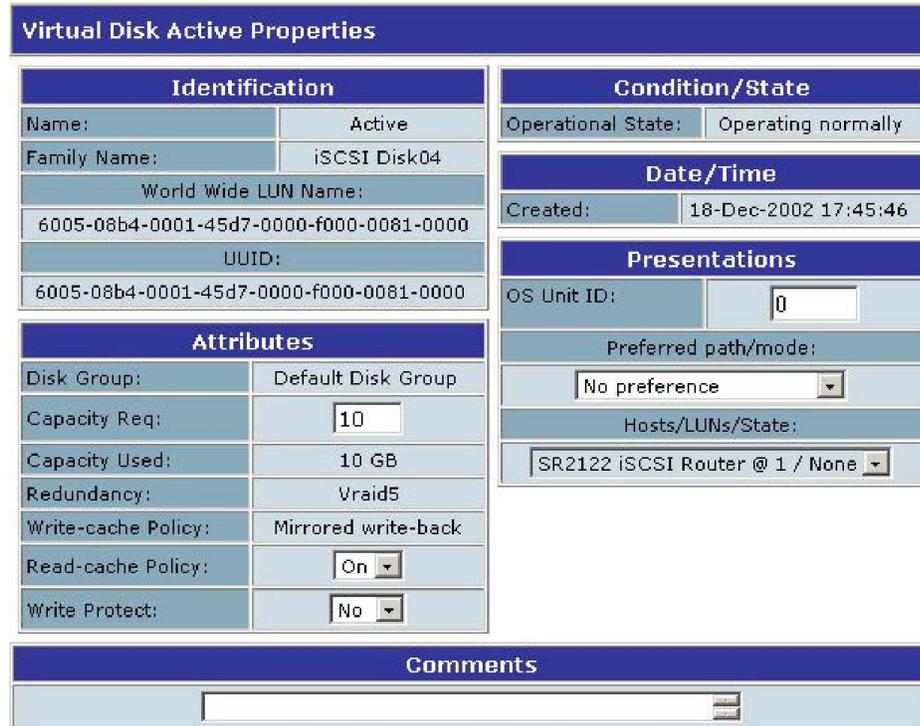
Figure 6: Host Properties

After the Host entry is created it must be assigned to a LUN. To assign the Host entry to a LUN, click on the Active icon under the LUN name in the Virtual Disk folder. In the Content frame click on the **Present..** button:

STEP 1: Select a host:


A screenshot of a web interface showing a dropdown menu with the text 'SR2122 iSCSI Router' selected. To the right of the dropdown is a small yellow question mark icon.

Click  to save the entry. The virtual disk entry will appear as:



A screenshot of the 'Virtual Disk Active Properties' window. The window is divided into several sections:

- Identification:** Name: Active; Family Name: iSCSI Disk04; World Wide LUN Name: 6005-08b4-0001-45d7-0000-f000-0081-0000; UUID: 6005-08b4-0001-45d7-0000-f000-0081-0000.
- Condition/State:** Operational State: Operating normally.
- Date/Time:** Created: 18-Dec-2002 17:45:46.
- Attributes:** Disk Group: Default Disk Group; Capacity Req: 10; Capacity Used: 10 GB; Redundancy: Vraid5; Write-cache Policy: Mirrored write-back; Read-cache Policy: On; Write Protect: No.
- Presentations:** OS Unit ID: 0; Preferred path/mode: No preference; Hosts/LUNs/State: SR2122 iSCSI Router @ 1 / None.
- Comments:** A text input field with a scroll bar.

Figure 7: Virtual Disk Properties Entry

Note: If using SR2122-2 Cluster mode the WWPN for a Fibre Channel port on each SR2122-2 cluster member must be added to the HSV110 Unit.

The SR2122-2 should now present 'iSCSI DISK04' as storage to iSCSI Initiators.

Presenting VA LUNs to the SR2122-2

VA storage volume must be pre-configured before the LUN(s) can be detected and recognized by the SR2122-2. A VA can be configured either through Virtual Front Panel (VFP) via RS232 or HP SureStore Command View Storage Device Manager (SDM).

Note: Although XP's HP Storage Works Secure Manager VA can configure VA LUNs to be selectively presented for SR2122-2's Fibre Channel port, it is not supported at this time. Currently, the entire set of LUNs configured on the VA's Fibre channel port is presented to the SR2122-2. It is required to have this port dedicated to the SR2122-2 fabric zone.

Additional required configurations are:

1. Set the Fibre Channel HOST MODE: HP-UX, Linux, or Win2k (to reflect HP-UX, Linux OS or Win2K)
2. Select the FIBRE TOPOLOGY (depends on configuration)

No additional configuration is required for running an SR2122-2 in cluster mode, since the other SR2122-2's Fibre Channel port is also on the same fabric zone and has the same access to the LUNs on the VA array's Fibre channel port.

The SR2122-2 should now present the LUNs as storage to the iSCSI initiator.

Presenting XP LUNs to the SR2122-2

XP storage volume must be pre-configured before the LUN(s) can be detected and recognized by the SR2122-2. The XP can be configured either through the XP console (SVP) or Command View XP.

Note: Although XP's HP Storage Works Secure Manager XP can configure XP LUNs to be selectively presented for SR2122-2's Fibre Channel port, it is not supported at this time. Hence, the entire LUNs configured on the XP's Fibre channel port is presented to the SR2122-2. It is required to have this port dedicated to the SR2122-2 fabric zone.

1. Set the Fibre Channel HOST MODE: 08 (for HP-UX), 00 (for Linux or Windows OS)
2. Select the FIBRE TOPOLOGY (depends on the configuration)

Note: No additional configuration is required for running SR2122-2 in cluster mode, since the other SR2122-2's Fibre Channel port is also on the same fabric zone and has the same access to the LUNs on the XP array's Fibre channel port.

The SR2122-2 should now present the LUNs as storage to iSCSI initiator.

Serving Storage to the iSCSI Initiators from the SR2122-2 over IP

Up to this point, this chapter has described the SR2122-2 and its impact on the fibre channel SAN. It's now time to turn our attention to the IP side of the router.

SR2122-2 Devices

Regardless of the SR2122-2 being in a Standalone or Cluster configuration once storage is presented to a SR2122-2, the SR2122-2 node should recognize these new devices. If not, the SR2122-2 can be forced to rescan for devices either through its management GUI within the Monitor Window or through the CLI command "Show Devices Rediscover".

To verify that each SR2122-2 can see the storage LUNs use the Show Devices command.

```
SR2122> Show Devices
Lun Description Table
Interface      WWPN          LUN  Capacity Vendor Product      Serial
-----
1) fc1         50001fe150002f78  0    0KB    COMPAQ  HSV110  P4889B49ILW05R
2) fc1         50001fe150002f78  1    10GB   COMPAQ  HSV110  P4889B49ILW05R
3) fc1         50001fe150002f78  2    10GB   COMPAQ  HSV110  P4889B49ILW05R
4) fc1         50001fe10007bb41  1    0KB    DEC     HSG80   ZG95004670
5) fc1         50001fe10007bb41  0    0KB    DEC     HSG80CCL ZG95004670
6) fc1         50001fe10007bb42  1    0KB    DEC     HSG80   ZG95004652
7) fc1         50001fe10007bb42  0    0KB    DEC     HSG80CCL ZG95004652
```

In this example the SR2122-2 is presented storage from one HSG80 and one HSV110. The line items are described as:

1. This is the CCL from the HSV110 served from storage port 50001fe150002f78.
2. This is iSCSI_DISK03 from an HSV110 served from storage port 50001fe150002f78.
3. This is iSCSI_DISK04 from an HSV110 served from storage port 50001fe150002f78.
4. This is unit D81 from an HSG80 served from storage port 50001fe10007bb41.
5. This is the CCL from the HSG80 served from storage port 50001fe10007bb41.
6. This is unit D181 from an HSG80 served from storage port 50001fe10007bb42.

If the devices do not appear, the SR2122-2 can be forced to rescan its Fibre Channel ports. This is done with the Show Devices Rediscover command:

```
SR2122> Show Devices Rediscover
Fibre channel discovery kicked off!
```

SR2122-2 Access Lists

Prior to creating a SCSI Router Instance it is necessary to create an Access List entry for each iSCSI Initiator. This Access List is used when creating the SCSI Router Instance to selectively route the SR2122-2 storage to a specific iSCSI initiator. Much like selective storage presentation on the storage controllers, the SR2122-2 has the ability to present storage to a specific iSCSI initiator using its Access List. The Access List, in this case, assigns or cross-references the iSCSI initiator's IP address to a host name.

Note: The host name assigned to the IP address does not necessarily have to be the IP address's DNS name.

For example:

Table 3: SR2122-2 Access List

Host Name	IP address
iSCSI03	16.117.74.66
Prod_Server15	16.222.21.44
Lab203_Server	16.120.232.32

Each SR2122-2 router must have an access list entry for each iSCSI initiator

Access List entries may be created through the SR2122-2 GUI or using CLI commands.

For example, to create an Access List entry via the CLI the command would be:

```
SR2122> accesslist iSCSI03
```

To add an IP address to this entry:

```
SR2122> accesslist iSCSI03 16.117.74.66/32
```

Note: The IP mask /32 is not an IP subnet mask but rather an IP address mask for the Access List entry. The /32 mask in this case means to only allow access for iSCSI Initiator 16.117.74.66 (subnet mask set to 255.255.255.255, all 32 bits of the IP address must match). If the mask /24 was used, it would mean to allow any iSCSI Initiators with an IP address that begins with 16.117.74.x. The mask /16 would mean any iSCSI Initiators that begin with 16.117.x.x.

To display all entries in the Access List, use the command:

```
SR2122> show accesslist all  
  
accesslist iSCSI03  
accesslist iSCSI03 16.117.74.66/255.255.255.255  
accesslist Prod_Server15  
accesslist Prod_Server15 16.222.21.44/255.255.255.255  
accesslist Lab203_Server  
accesslist Lab203_Server 16.120.232.32/255.255.255.255
```

To create an Access List entry via the GUI click on Add Access List on the Configuration page:

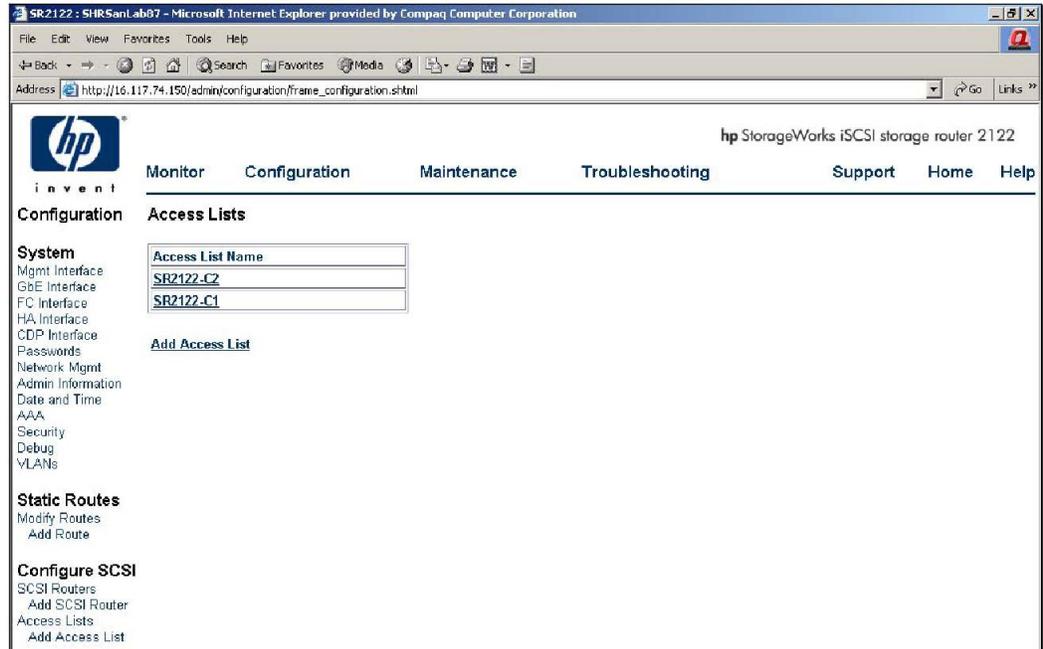


Figure 8: Access List Entry

Enter the iSCSI Initiator name and click ADD.



Figure 9: iSCSI Initiator Name

Enter the iSCSI Initiator IP address and IP mask and click ADD.

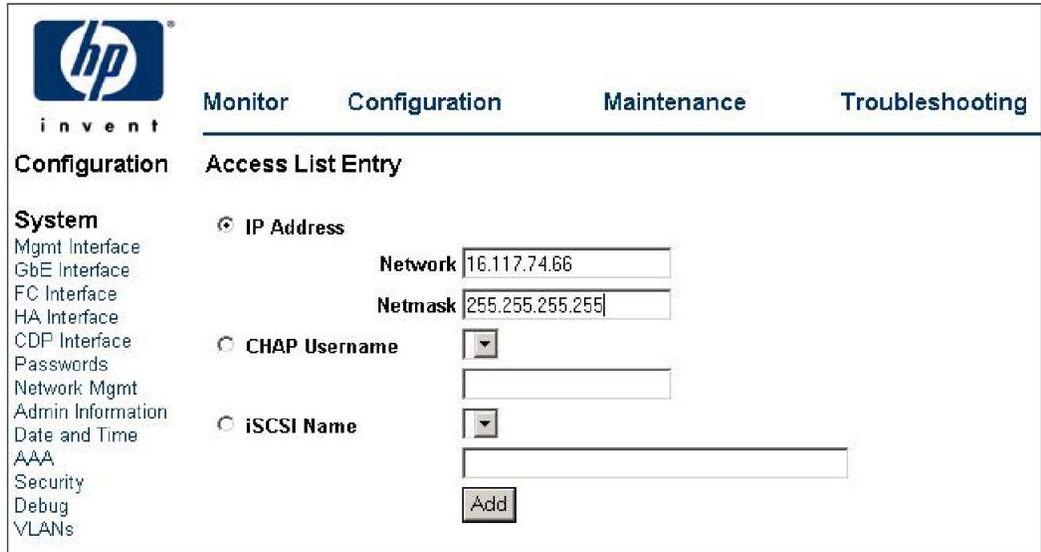


Figure 10: iSCSI Initiator IP Address

The Access List entry will now display.



Figure 11: Completed Access List Entry

SR2122-2 SCSI Router Instances

Presenting SAN storage over IP to the iSCSI Initiators from the SR2122-2 is done by creating a SCSI Router Instance within the SR2122-2. The SCSI Router Instance could be thought as a process or daemon running on the Router that includes, among other things, an IP address, SCSI targets, Storage devices and an Access List entry.

It is the SCSI Router Instance that the iSCSI Initiator communicates with to access its storage from the SR2122-2.

The basic structure of a SCSI Router Instance is as follows:

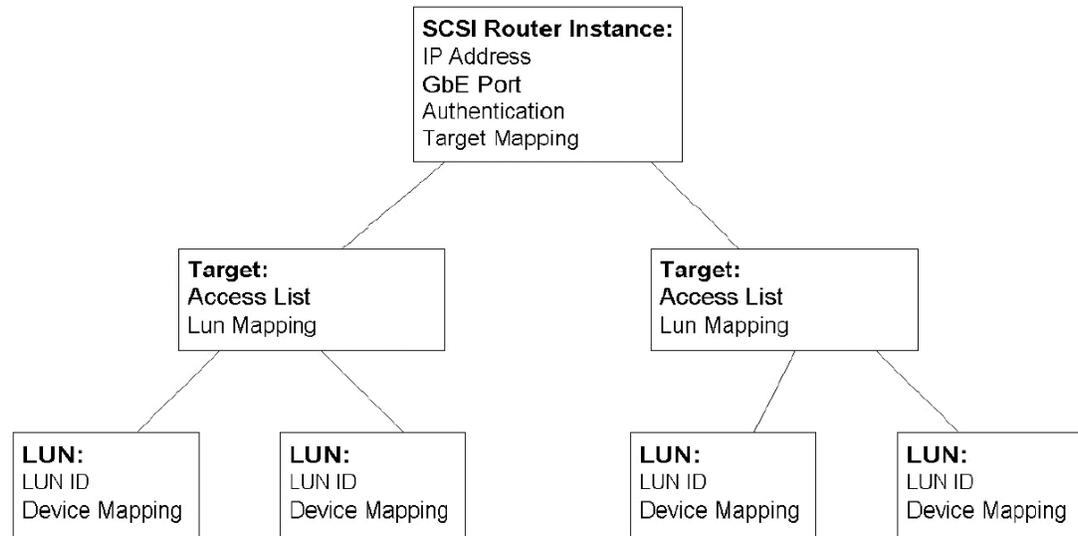


Figure 12: SCSI Router Instance Structure

SCSI Router Instance – Contains the IP address used by the iSCSI Initiator, the SR2122-2 GbE interface port to use, authentication information, and Target Mapping. A SCSI Router Instance may have more than one Target assigned to it.

Target – Contains the Access List Entry and LUN Mapping. A Target may have more than one LUN assigned to it.

LUN – Contains the LUN ID to serve to the iSCSI Initiator and the SR2122-2 Device associated with the LUN.

Creating a SCSI Router Instance

The SCSI Router Instance may be created using the SR2122-2 Management GUI or by CLI commands.

In this example, we will serve two LUNs from EVA storage to node iSCSI03 using the following information:

Table 4: SCSI Router Instance Example

SCSI Router Name / IP address	Target Name	Target LUN #	WWID	Controller LUN #
iSCSI03_Disks 33.33.33.101/24	HSV23_T1	1	50001fe150002f78	1
		2	50001fe150002f78	2

Note: A SCSI Router Instance is only active on one SR21212 regardless if the SR2122 is setup in Standalone or Cluster Mode.

Using the SR2122-2 CLI the commands would be:

```

SR2122> scsirouter iSCSI03_Disks
SR2122> scsirouter iSCSI03_Disks description "Router Instance of all
storage for iSCSI03"
SR2122> scsirouter iSCSI03_Disks authentication "none"
SR2122> scsirouter iSCSI03_Disks username "none"
  
```

```
SR2122> scsirouter iSCSI03_Disks password "none"
SR2122> scsirouter iSCSI03_Disks primary "none"
SR2122> scsirouter iSCSI03_Disks reserveproxy disable
SR2122> scsirouter iSCSI03_Disks failover secondary none
SR2122> scsirouter iSCSI03_Disks lun reset no
SR2122> scsirouter iSCSI03_Disks serverIf gel
33.33.33.101/255.255.255.0 secondary ge2
SR2122> scsirouter iSCSI03_Disks target HSV23_T1 lun 1 wwpn
"50001fe150002f78" lun "1"
SR2122> scsirouter iSCSI03_Disks target HSV23_T1 lun 2 wwpn
"50001fe150002f78" lun "2"
SR2122> scsirouter iSCSI03_Disks target HSV23_T1 enabled
SR2122> scsirouter iSCSI03_Disks target HSV23_T1 accesslist "iSCSI03"
```

To display the SCSI router Instance information:

```
SR2122> show scsirouter "iSCSI03_Disks" all

Status Codes: A=active, I=inactive, C=create failed, D=not enabled, S=slave
          CDB  Proxy  Pass Lun
Router    Stat Retry Server  Thru Reset Description
-----
iSCSI03_Disks A    6    disabled no   no Router Instance of all storage
                                     for iSCSI03

SCSI Router Authentication Information
Router    Authentication Username      Password
-----
iSCSI03_Disks none                none          none

Router    ServerIf  Vlan Vid IP/Netmask      Secondary TCP Port
-----
iSCSI03_Disks gel                33.33.33.101/24      ge2          3260

Router    Target      Status  Accesslist Targetid  Description Profile
-----
iSCSI03_Disks HSV23_T1      enabled iSCSI03  none      (not set) High

Router    Target      WWPN Primary  I/F  WWPN Secondary  I/F  Alias
-----
iSCSI03_Disks HSV23_T1      none                none
iqn.1986-03.com.hp:
fcgw.sr2122.3b6128603a94e42a2f66acd8a2601971.HSV23_T1

Router    Target      Lun  WWPN          Lun  I/F  WWPN          Lun
I/F
-----
iSCSI03_Disks HSV23_T1      1    50001fe150002f78 1    fc1  none
iSCSI03_Disks HSV23_T1      2    50001fe150002f78 2    fc1  none
```

Notice at the end of the command output that there are two LUN columns for each controller WWPN entry. Because the SR2122-2 is issuing a target (HSV23_T1) over IP to the iSCSI initiator, the iSCSI initiator needs a LUN value from the target.

The second LUN column is based on the LUN number received from the storage controller. The two LUN numbers do not necessarily have to match.

Using the SR2122-2 GUI, a SCSI Router Instance is created from the Configuration screen clicking on Add a SCSI Router. Enter the Instance name and description and click Add.

Figure 13: SCSI Router Instance Name and Description

Enter the Target name, Access List entry, click the LUN Mapping radio button and click Add.

Figure 14: Add Target Name and Access List Entry

At the Configure LUNs screen click Add LUN.



Figure 15: Configure/Add LUN

At the Add New LUN screen enter the SCSI LUN number that will be presented to the iSCSI Initiator, click the WWPN radio button and select the appropriate storage controller WWPN with the LUN number from the primary pull down menu and click Add.

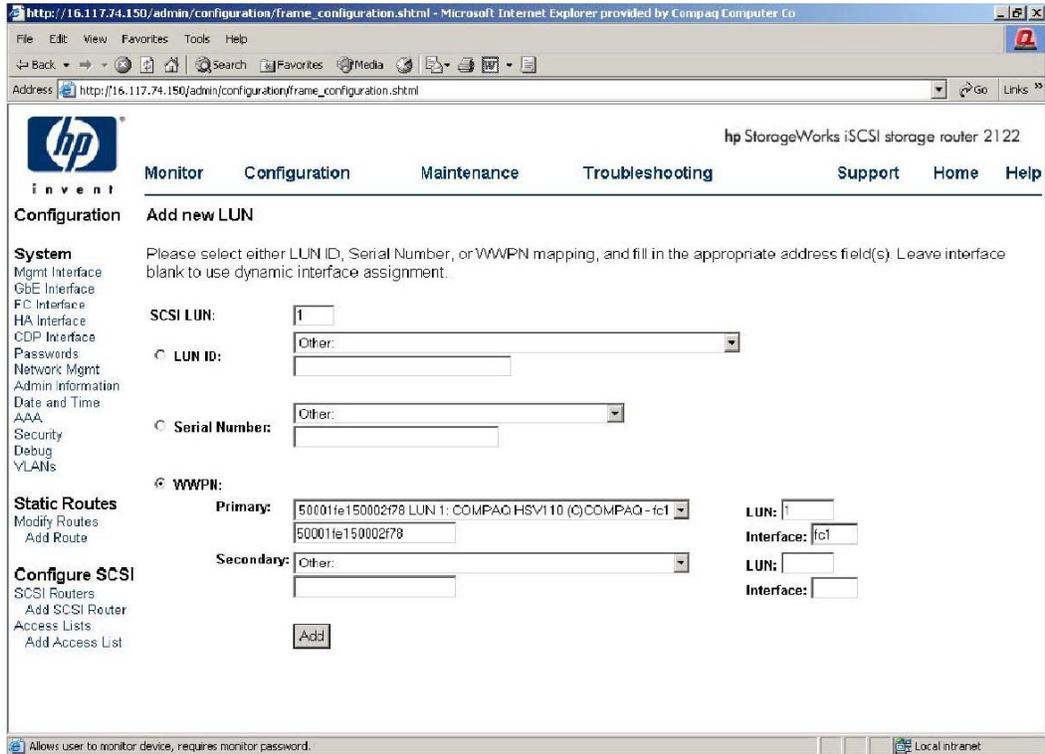


Figure 16: Add New Lun

The browser will return to the Configure LUNs screen. Click the Add button and add the 2nd LUN for this Target.

hp StorageWorks iSCSI storage router 2122

Monitor Configuration Maintenance Troubleshooting Support Home Help

Configuration Add new LUN

System
 Mgmt Interface
 GbE Interface
 FC Interface
 HA Interface
 CDP Interface
 Passwords
 Network Mgmt
 Admin Information
 Date and Time
 AAA
 Security
 Debug
 VLANs

Please select either LUN ID, Serial Number, or WWPN mapping, and fill in the appropriate address field(s). Leave interface blank to use dynamic interface assignment.

SCSI LUN:

LUN ID: Other:

Serial Number: Other:

WWPN:

Primary: LUN:
 Interface:

Secondary: Other: LUN:
 Interface:

Static Routes
 Modify Routes
 Add Route

Configure SCSI
 SCSI Routers
 Add SCSI Router
 Access Lists
 Add Access List

Figure 17: Add Second LUN

After Clicking Add the browser will return you to the Configure LUNs screen displaying the two newly created LUNs.

hp StorageWorks iSCSI storage router 2122

Monitor Configuration Maintenance Troubleshooting Support Home Help

Configuration Configure Luns

System
 Mgmt Interface
 GbE Interface
 FC Interface
 HA Interface
 CDP Interface
 Passwords
 Network Mgmt
 Admin Information
 Date and Time
 AAA
 Security
 Debug
 VLANs

SCSI Lun	Mapping	Device Type	Inquiry
2	WWPN	Storage Array	COMPAQ HSV110 (C)COMPAQ
1	WWPN	Storage Array	COMPAQ HSV110 (C)COMPAQ

[Add Lun](#)

Figure 18: New LUNs

Click on SCSI Routers to display all SCSI Router Instances.

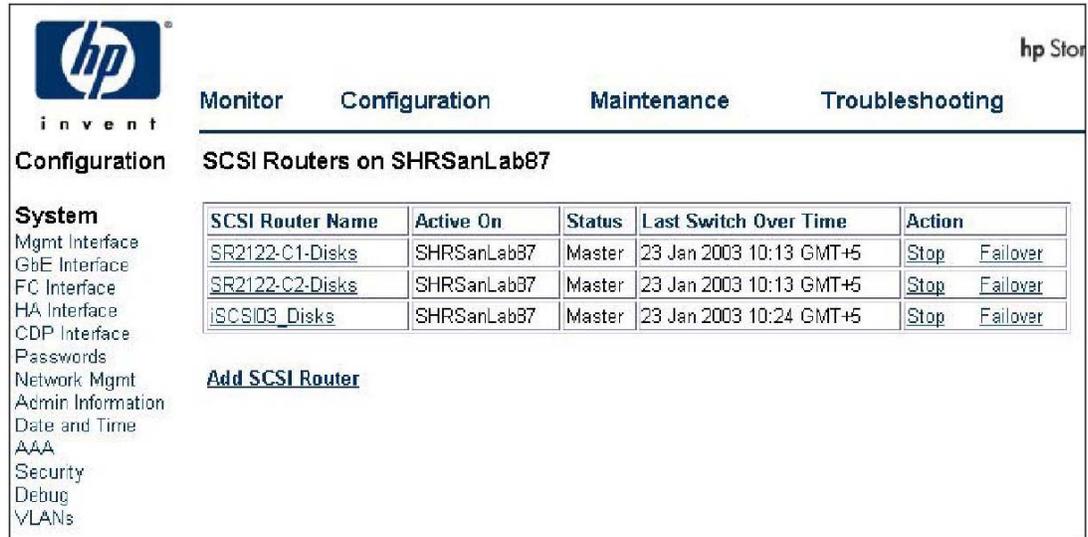


Figure 19: All SCSI Router Instances

Click on the newly created Instance, iSCSI03.

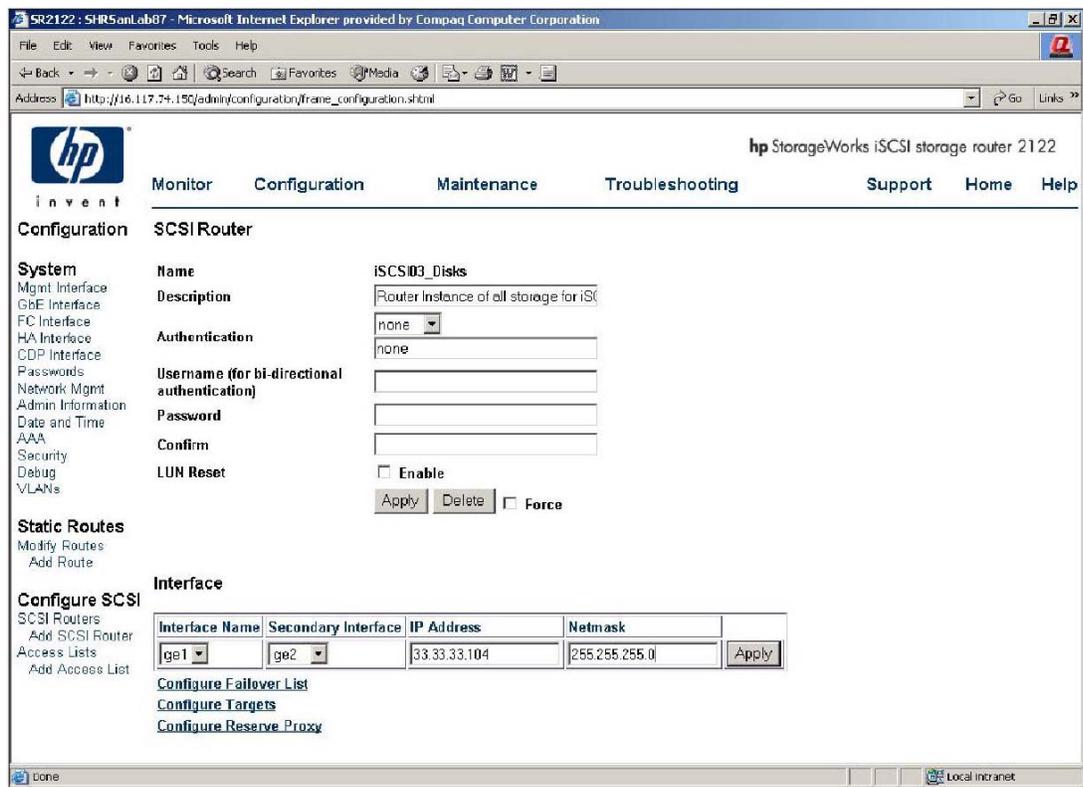


Figure 20: Instance iSCSI03

Add ge2 from the Secondary Interface pull down menu, add the SCSI Router Instance IP address and its Netmask, then click Apply.

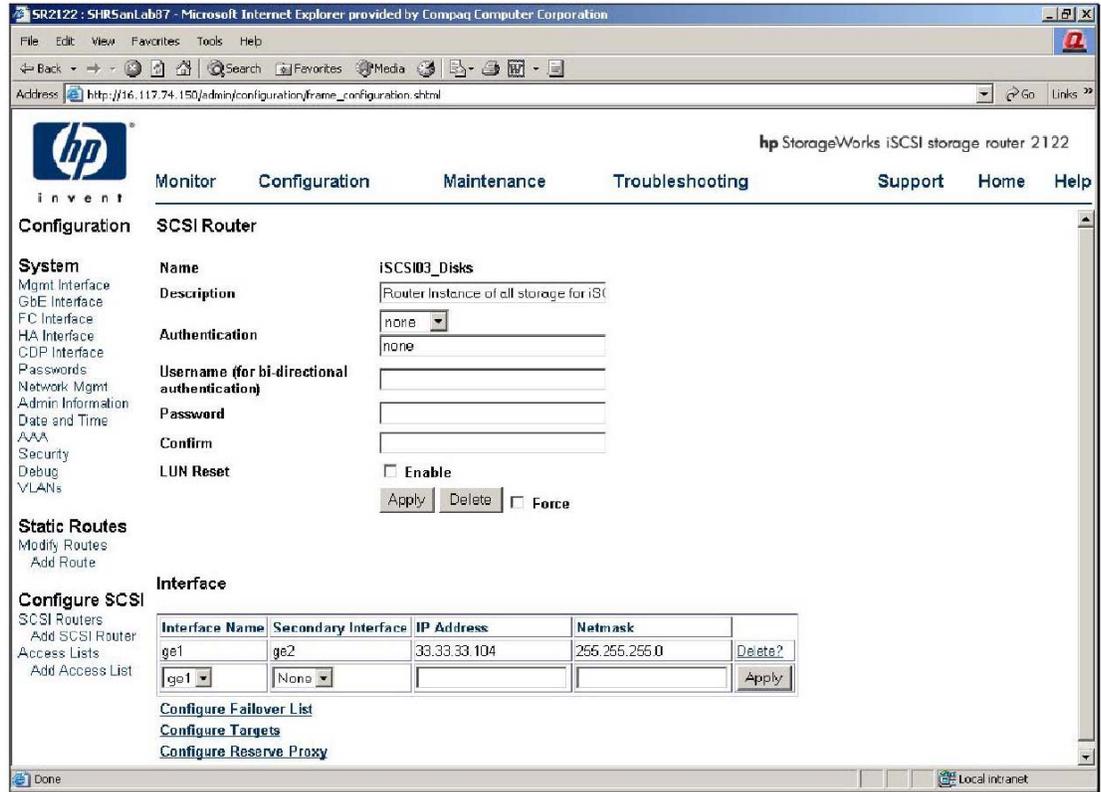


Figure 21: Secondary Interface

The SCSI Router Instance is now available on the IP network for iSCSI Initiator iSCSI03 to connect to once the iSCSI03 has its iSCSI driver loaded and configured.

iSCSI Initiator Setup

The IP host, or iSCSI Initiator uses the iSCSI Driver to enable target resource recognition & attachment to the SR2122-2 over IP. The iSCSI driver is configured with the Gigabit Ethernet IP address of each SCSI routing instance running on the SR2122-2 with which the host is to transport SCSI requests and responses.

The iSCSI initiator sees the storage resources (LUNs) as if they were local drives attached directly to the server.

HP-UX iSCSI Software Initiator Setup for HP-UX 11i v1 and HP-UX 11i v2

Please view the Installation and Configuration chapters of the *HP-UX iSCSI Software Initiator Support Guide for HP-UX 11i v1 & 11i v2*, available on <http://www.docs.hp.com> for instructions to download, install and configure the HP-UX iSCSI Software Initiator on HP-UX 11i v1 and HP-UX 11i v2. The Release Notes are also available at this URL.

The iSCSI driver software can be loaded from: www.software.hp.com

The part number for the HP-UX iSCSI Software Initiator is T1452A.

HP iSCSI Initiator Setup for Windows 2000 and Windows 2003

The iSCSI driver provides a transport for SCSI requests and responses for storage devices; however, instead of providing a transport for directly attached devices, the driver transports the SCSI requests and responses between the IP host and the SR2122-2 via an IP network. The SR2122-2, in turn, transports SCSI requests and responses between it and the storage devices attached to it.

The iSCSI driver for Windows 2000 is included on the SR2122-2 Solution CD as well as on the web. See <http://www.hp.com/support/iscsirouter>

To begin the installation the user can either insert the SR2122-2 Solution CD and choose Install iSCSI Driver from the install menu or by running Setup.exe from the SR2122-2 Solution CD directory: `iscsi_initiator\HP\Windows`

Follow the prompts on the screen and accept the license agreement and at the iSCSI Configuration screen, you may enter the SCSI Router Instance IP address that the iSCSI Initiator is to use for storage. An iSCSI Initiator may communicate with up to 32 SCSI Router Instances.

A reboot is necessary to finish the driver installation.

Note: By entering the SCSI Router Instance IP address during the driver installation the user will save another reboot as any changes to the driver configuration, add IP address – Remove IP address, will need a host reboot for the changes to take affect.

For this example we will use the SCSI Router Instance IP address we created earlier.

Enter the SCSI Router Instance IP address in the top frame and click Add.

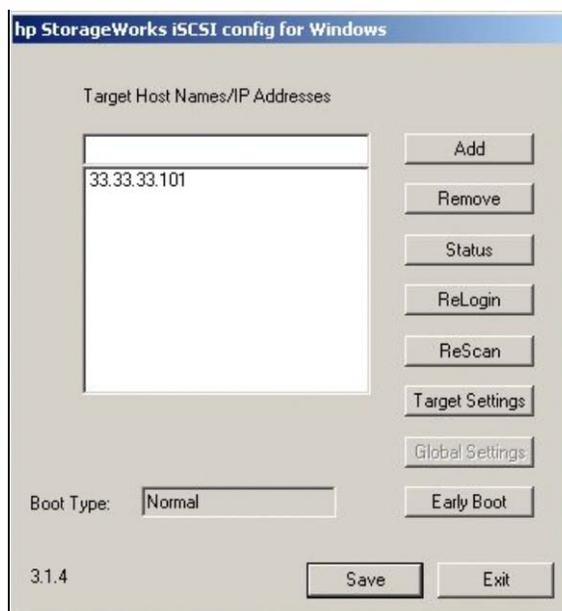


Figure 22: SCSI Router Instance IP Address

Once the IP address is added click Save then Exit to continue the driver installation.

After the iSCSI Initiator reboot the iSCSI Configuration application can be found in the Control Panel.



Figure 23: iSCSI Configuration Application

Click on the 'hp iSCSI Config' icon to return to the iSCSI Config screen.

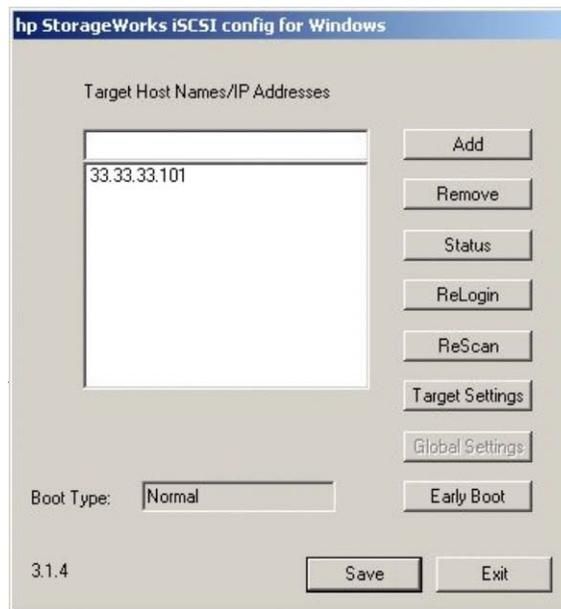


Figure 24: iSCSI Configuration Screen

The **Status** button is used to display iSCSI connection status to the SCSI Router Instance IP address and its associated Targets.

Note: This screen will not display the LUNs attached to the targets.



Figure 25: iSCSI Connection Status

The other button options:

Add: Used to define the IP addresses of iSCSI target nodes. Enter an IP address for each additional SCSI Router Instance and click Add. Click Save when you are done adding IP addresses. A Reboot is necessary for the new configuration to take affect.

Remove: Used to remove already defined target node IP addresses. Select the IP address to remove and click Remove. Click Save when you are done removing IP addresses. A Reboot is necessary for the new configuration to take affect.

Relogin: Used to cause reconnections to all of the target nodes without requiring a system reboot. This helps when the SCSI router Instance did not respond properly during login and the target devices were not seen correctly.

For example, if the access list on the Target is configured incorrectly, there would be no login response and no indication of what devices would be found. Once the access list is corrected, this button can be used to reinitiate the login sequences for discovering the correct target information.

Rescan: Used to rescan only the SCSI bus represented by the iSCSI driver similar to the Windows 2000 Disk Management's "Rescan Disks" command.

Target Settings: (HP 3.1.4 Driver Only) Used to set the access authentication username and password. If authentication were 'enabled' on the SCSI Router Instance for this configured connection, you would have to set the access authentication username and password by highlighting the IP address just created and clicking the Settings button.

Global Settings: (HP 3.1.4 Driver Only) Not enabled at the time. This is a future control for iSCSI Cyclical Redundancy Check (CRC).

Settings: (HP 3.1.3 Driver Only) If authentication were 'enabled' on the SCSI Router Instance for this configured connection, you would have to set the access authentication username and password by highlighting the IP address just created and clicking the Settings button.

A username and password must be set for each IP Address listed in the main config window that uses authentication.

Normal/Early Boot: Use Normal/Early Boot to set the Boot Type to either Early or Normal. This setting is immediate and does not need a separate Save step.

With Normal Boot configured, the computer may not discover all iSCSI targets before it completes booting. With Early Boot configured, the computer will discover all available iSCSI targets before it completes booting.

Because a driver configured for Normal Boot does not log in to the SR2122-2 until after most of the Windows 2000 OS has already been initialized, some services and components in the computer do not activate properly. Two files, actiscsi.vbs (a Visual Basic script file) and chkiscsi.exe (a utility), are copied onto the system's %SYSTEMROOT%\system32 directory

during driver installation to minimize that problem. The files can be used to automatically activate certain system features after the iSCSI devices are present. Please refer to the instructions at the beginning of the `actiscsi.vbs` file for detailed installation information and procedural steps.

Once the iSCSI driver is installed, the IP host will proceed with a discovery process for iSCSI storage devices as follows:

1. The iSCSI driver requests available iSCSI targets from the SR2122-2.
2. The SR2122-2 sends available iSCSI target names to the IP host.
3. The IP host logs in to the iSCSI targets.
4. The SR2122-2 accepts the IP host login and sends target identifiers.
5. The IP host queries targets for device information.
6. Targets respond with device information.
7. The IP host creates a table of internal devices.

The HP StorageWorks iSCSI Driver for Microsoft Windows 2000 and Windows 2003 uses Windows 2000 network services to connect to iSCSI remote target nodes that are defined using the iSCSI control panel applet.

Using the “Status” button of the iSCSI Configuration Control applet can retrieve status of the iSCSI connections to the remote target nodes and targets. Each responding remote target will show up with its IP address, connect state, and target name or alias.

The possible connect states are:

Table 5: Possible Connect States

NOTINIT	TCP connection CLOSED, iSCSI not initialized
UP	TCP connection ESTABLISHED, iSCSI not initialized
DOWN	TCP connection CLOSED, iSCSI down
LOGIN	TCP connection ESTABLISHED, proceeding with iSCSI login sequence
ACTIVE	TCP connection ESTABLISHED, iSCSI active
BREAK	TCP connection CLOSING, iSCSI going down
WAIT	TCP connection ESTABLISHED, iSCSI waiting for previous targets to complete login sequence
DISABLED	TCP connection permanently CLOSED until after a reboot. This state is entered if the user chooses to immediately disable all connections to an IP address being removed with the iSCSI control panel applet.
HELD	TCP connection CLOSED because of certain types of login failures. Login attempts will resume after receiving notification that new targets are present or by using the Relogin button on the iSCSI control panel applet.

Enter Window’s Disk Management application and it should now report new disks and ask to write a signature. At this point you would treat these drives as you would any locally attached disk (create partition, format, etc.).

Microsoft iSCSI initiator Setup for Windows 2000 and Windows 2003 Server

Please download the iSCSI driver from Microsoft's download page, and follow the install instructions to complete the installation. Once installed, you can refer to the user guide document in C:\Program Files\Microsoft iSCSI Initiator\uguide.doc to set up iSCSI targets presented by the SR2122-2.

During the initial use of the Microsoft iSCSI driver you must manually login to the Available Targets. Once Available Target logins are completed with the Restore Connection button enabled, the iSCSI driver will automatically login whenever the server powers up or reboots.

During setup the install procedure will place a Microsoft iSCSI Initiator icon out on the server desktop as well as in the Control Panel.



By clicking on the icon the Microsoft iSCSI driver GUI, the Microsoft iSCSI initiator properties will be displayed.

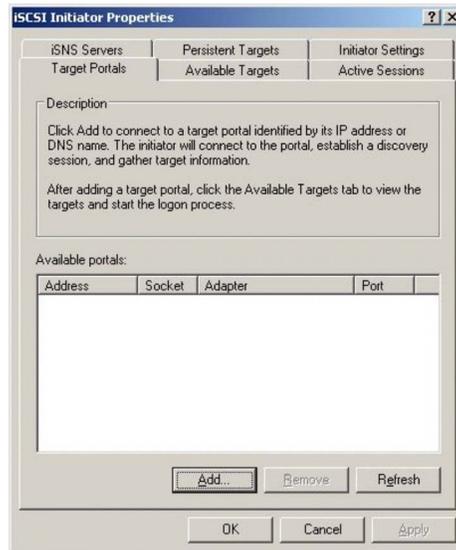


Figure 26: iSCSI Initiator Properties

First, the IP address(es) of the target(s) presented to this server from the SR2122-2 must be added to the Target Portal list .

In this example we will add a SR2122-2's target IP addresses 33.33.33.89 to the iSCSI driver.

Click on the Add button located on the Target Portal tab then type the IP address of the SR2122-2 target presented to this server and Click OK to add the IP address to the Available Portals list.

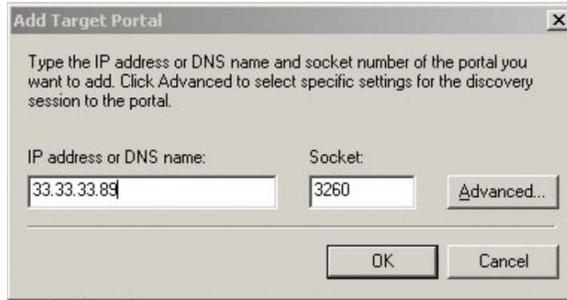


Figure 27: Add Target Portal

Next, click on the Available Targets tab to list the targets found through the Available Portals. The Status should be Inactive.

Next, log into the target to discover the SR2122-2 LUNs by selecting a Target and clicking on Log On.

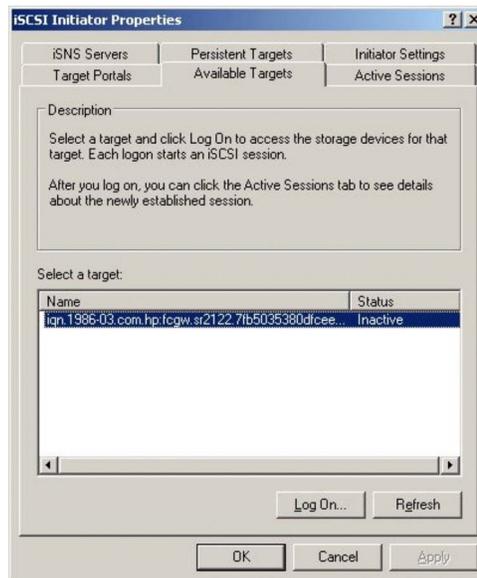
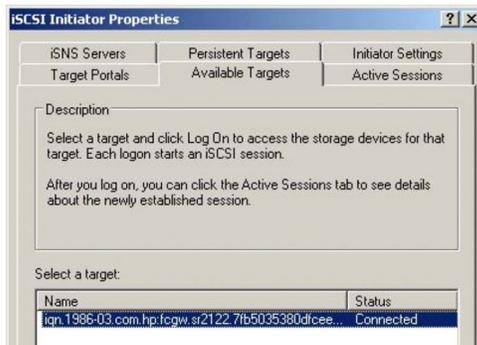


Figure 28: Log On to an Available Target

Note: It is important to enable Automatic Restore if the server is to automatically login to the SR2122-2 target when the server is powered up or rebooted. If not, then the Available Targets must be logged in manually.



The Target Status should change to connected.



To verify that the server is now connected to the SR2122-2 LUNs click on the Active Sessions tab, highlight the connected Session and click on the Details button.

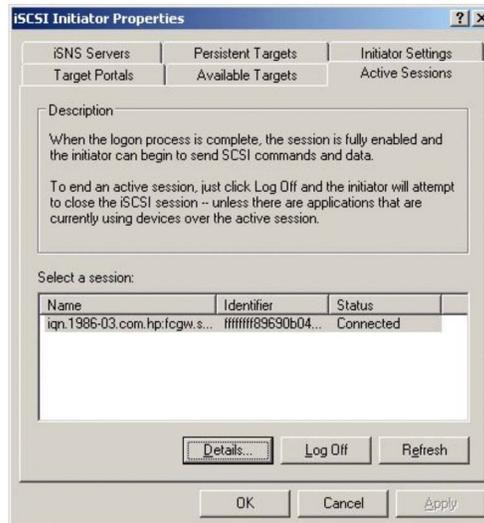


Figure 29: Verify Connection

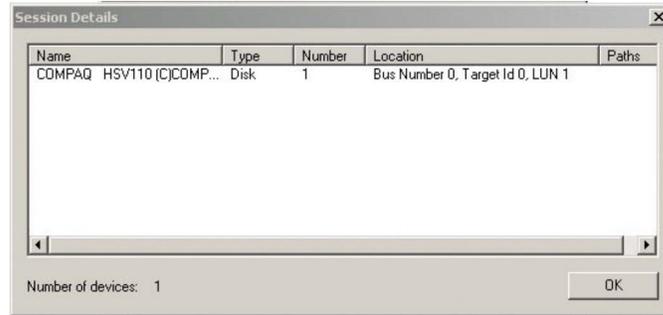


Figure 30: Session Details

The iSCSI driver should now display all luns that are presented from the SR2122-2 target.

Enter Window's Disk Management application and it should now report new disks and ask to write a signature. At this point you would treat these drives as you would any locally attached block-level disk (create partition, format, etc.).

Note: iSCSI CRC is not supported. Do not select iSCSI CRC.

iSCSI Initiator Setup for Red Hat Linux

The kernel source must be installed for the iSCSI driver to compile properly. If you are upgrading from a previous installation of the iSCSI driver, HP recommends that you remove the file `/etc/initiatorname.iscsi` before installing the new driver.

Please refer to the following web site for the latest sources for the linux driver for the HP SR2122-2 IP storage router:

<http://sourceforge.net/projects/linux-iscsi>

Loading the iSCSI Driver

In a newly installed Red Hat Linux kernel, sometimes an iSCSI instance may be running. Before installing the iSCSI driver, the running instance needs to be stopped. To stop the instance, run `setup`, deselect iSCSI, and then reboot the system. Please refer to the README file in the tar ball file for more information on configuring the iSCSI initiator.

1. Use `tar(1)` to decompress the source archive into a directory of your choice. The archive will contain a subdirectory corresponding to the archive name.

```
cd /usr/src
tar xvzf /path/to/linux-iscsi-<version>.tgz
cd linux-iscsi-<version>
```

2. Compile the iSCSI driver. If your kernel sources are not in the usual place, add `'TOPDIR=/path/to/kernel'` or edit the definition of `TOPDIR` in the Makefile.

```
Make
```

3. As root, install the driver. If you are currently using the iSCSI driver, first unmount all iSCSI devices and unload the old iSCSI driver. If your Linux distribution includes an iSCSI driver, it may be necessary to uninstall that package first.

4. Update `/etc/iscsi.conf` to include the IP addresses for your iSCSI targets. A sample configuration file might include entries like this:

```
DiscoveryAddress=33.33.33.101
```

The `iscsi.conf` man page has a more detailed description of the configuration file format. To read the man page, type:

```
man iscsi.conf
```

5. Manually start iSCSI services to test your configuration.

```
/etc/rc.d/init.d/iscsi start
```

If there are problems loading the iSCSI kernel module, diagnostic information will be placed in `/var/log/iscsi.log`.

The iSCSI initialization will report information on each detected device to the console or in `dmesg(8)` output. For example:

```
Vendor: SEAGATE    Model: ST39103FC      Rev: 0002
Type:   Direct-Access  ANSI SCSI revision: 02
Detected scsi disk sda at scsi0, channel 0, id 0, lun 0
SCSI device sda: hdwr sector= 512 bytes.
                               Sectors= 17783240 [8683 MB] [8.7 GB]
```

```
sda: sda1
scsi singledevice 0 0 0 1
```

Normal disk commands like `fdisk`, `mkfs`, and `fsck` will work on the iSCSI devices like a local drive.

`/proc/scsi/iscsi` will contain a file (the controller number) that contains information about the iSCSI devices.

To manually stop the iSCSI driver enter:

```
/etc/rc.d/init.d/iscsi stop
```

6. Modify your init scripts to manage iSCSI. You may also need to change the order of the boot script to ensure that iSCSI services are started after the network has been initialized.
7. List your iSCSI partitions in `/etc/fstab.iscsi`. It has the same format as `/etc/fstab`. The init scripts will mount and unmount these partitions automatically. See the next few sections for more details on how to do this correctly.

Device Names

Because Linux assigns SCSI device nodes dynamically whenever a SCSI logical unit is detected, the mapping from device nodes (e.g. `/dev/sda`, `/dev/sdb`) to iSCSI targets and logical units may vary.

Variations in process scheduling and network delay may result in iSCSI targets being mapped to different SCSI device nodes every time the driver is started. Because of this variability, configuring applications or operating system utilities to use the standard SCSI device nodes to access iSCSI devices may result in SCSI commands being sent to the wrong target or logical unit.

To provide a more reliable namespace, the iSCSI driver will scan the system to determine the mapping from SCSI device nodes to iSCSI targets, and then create a tree of directories and symbolic links under `/dev/iscsi` to make it easier to use a particular iSCSI target's logical units.

Under `/dev/iscsi`, there will be a directory tree containing subdirectories for each iSCSI bus number, each target id number on the bus, and each logical unit number for each target. For example, the whole disk device for bus 0, target id 0, LUN 0 would be `/dev/iscsi/bus0/target0/lun0/disk`

In each logical unit directory there will be a symbolic link for each SCSI device node that may be connected to that particular logical unit. These symbolic links are modeled after the Linux `devfs` naming convention.

The symbolic link 'disk' will map to the whole-disk SCSI device node (e.g. `/dev/sda`, `/dev/sdb`, etc).

The symbolic links 'part1' through 'part15' will map to each partition of that SCSI disk (e.g. `/dev/sda1`, `dev/sda15`, etc). Note that these links will exist regardless of the number of disk partitions. Opening the partition devices will result in an error if the partition does not actually exist on the disk.

The symbolic link 'mt' will map to the auto-rewind SCSI tape device node for this LUN (e.g. `/dev/st0`), if any. Additional links for 'mtl', 'mtm', and 'mta' will map to the other auto-rewind devices (e.g. `/dev/st0l`, `/dev/st0m`, `/dev/st0a`), regardless of whether these device nodes actually exist or could be opened.

The symbolic link 'mtn' will map to the no-rewind SCSI tape device node for this LUN (e.g. `/dev/nst0`), if any. Additional links for 'mtnl', 'mtmn', and 'mtan' will map to the other no-rewind devices (e.g. `/dev/nst0l`, `/dev/nst0m`, `/dev/nst0a`), regardless of whether those device nodes actually exist or could be opened.

The symbolic link 'cd' will map to the SCSI cdrom device node for this LUN (e.g. `/dev/scd0`), if any.

The symbolic link 'generic' will map to the SCSI generic device node for this LUN (e.g. `/dev/sg0`), if any.

Because the symlink creation process must open all of the SCSI device nodes in `/dev` in order to determine which nodes map to iSCSI devices, you may see many `modprobe` messages logged to `syslog` indicating that `modprobe` could not find a driver for a particular combination of major and minor numbers. This is harmless, and can be ignored. The messages occur when Linux is unable to find a driver to associate with a SCSI device node that the iSCSI daemon is opening as part of its symlink creation process. To prevent these messages, the SCSI device nodes with no associated high-level SCSI driver can be removed.

Target Bindings

The iSCSI driver automatically maintains a bindings file `/var/iscsi/bindings`. This file contains persistent bindings to ensure that the same iSCSI bus and target id number are used for every iSCSI session to a particular iSCSI TargetName, even when the driver is repeatedly restarted.

This feature ensures that the SCSI numbers in the device symlinks described above will always map to the same iSCSI target.

Note that because of the way Linux dynamically allocates SCSI device nodes as SCSI devices are found, the driver does not and cannot ensure that any particular SCSI device node (e.g. `/dev/sda`) will always map to the same iSCSI TargetName. The symlinks described in the section on Device Names are intended to provide a persistent device mapping for use by applications and `fstab` files, and should be used instead of direct references to particular SCSI device nodes.

If the bindings file grows too large, lines for targets that no longer exist may be manually removed by editing the file. Manual editing should not normally be needed, since the driver can maintain up to 65535 different bindings.

Mounting File systems

Because the Linux boot process normally mounts file systems listed in `/etc/fstab` before the network is configured, adding mount entries in iSCSI devices to `/etc/fstab` will not work. The script `iscsi-mountall` will manage the checking and mounting of devices listed in the file `/etc/fstab.iscsi` which has the same format as `/etc/fstab`. This script is automatically invoked by the iSCSI startup script. Note that the `iscsi-mountall` script may timeout and fail to mount one or more file systems if one or more iSCSI sessions are unable to login immediately due to network or authentication problems.

Because of the variability of the mapping between SCSI device nodes and iSCSI targets, instead of directly mounting SCSI device nodes, it is recommended to either mount the `/dev/iscsi` tree symlinks, mount file system UUIDs or labels (see man pages for `mke2fs`, `mount`, and `fstab`), or use logical volume management (see Linux LVM) to avoid mounting the wrong device due to device name changes resulting from iSCSI target configuration changes or network delays.

Unmounting File systems

It is very important to unmount all file systems on iSCSI devices before the iSCSI driver stops. If the iSCSI driver stops while iSCSI devices are mounted, buffered writes may not be committed to disk and file system corruption may occur.

Since Linux will not unmount file systems that are being used by a running process, before iSCSI devices can be unmounted, any processes using those devices must be stopped (see `fuser(1)`).

To avoid file system corruption, the iSCSI shutdown script will automatically kill all processes using devices in `/etc/fstab.iscsi`, first by sending them `SIGTERM`, and then by sending any remaining processes `SIGKILL`. It will then unmount all iSCSI file systems and kill the iSCSI daemon, terminating all connections to iSCSI devices.

Caution: File systems not listed in `/etc/fstab.iscsi` may not be automatically unmounted!

Dynamic LUN and Target Discovery

The driver can be told to rediscover iSCSI devices and probe for LUNs by running:

```
/etc/rc.d/init.d/iscsi reload
```

This will cause the iSCSI daemon to restart all iSCSI discovery processes and probe LUNs on all iSCSI targets.

In addition, when using iSCSI targets that support long-lived iSCSI discovery sessions, such as the Cisco 5400 Series, the driver will keep a discovery session open waiting for change notifications from the target. When a notification is received, the driver will rediscover targets, add any new targets, and reprobe LUNs on all targets that were discovered.

The `"/proc/scsi/iscsi"` directory

The directory `/proc/scsi/iscsi` will contain a special file that can be used to get status from your iSCSI HBA. The name of the file will be the iSCSI HBA's host number, which is assigned to the driver by Linux.

When the file is read, it will show the driver's version number, followed by a list all iSCSI targets and LUNs the driver has found and can use.

Each line will show the Linux host number, channel number, target id number, and logical unit number, as well as the IP address, TCP port, and iSCSI TargetName. If an iSCSI session exists, but no LUNs have yet been found for a target, the LUN number field will contain a question mark. If a TCP connection is not currently established, the IP address and port number will both appear as question marks.

Kernel Upgrades

Because the driver contains a Linux kernel module, the driver must be rebuilt and reinstalled if you make any changes to your Linux kernel. To remove, rebuild, and reinstall the driver, do the following while logged in as root:

```
make remove
make clean
make
make install
```

Note: iSCSI CRC is not supported. Do not select iSCSI CRC in the driver.

Configuring hp StorageWorks Secure Path for Windows with the SR2122-2 Storage Router

Note: HP Storageworks for Windows is supported with SR2122s in Standalone Mode only. SR2122-2 HA environments are not supported.

Note: Only the HSG80 (RA/MA) and HSV110 (EVA) controllers are supported with Secure Path.

Normally, with Secure Path configured on a server directly connected to a fibre channel SAN, a LUN is presented to the server's multiple fibre channel host bus adapters to insure failover capabilities. However, with Secure Path running on an iSCSI client the controllers do not detect the iSCSI client NIC card, but instead, only sees the Fibre Channel port of the SR2122-2 itself. With this in mind a pair of SR2122-2s are used with each SR2122-2 connected to a separate Fibre Channel fabric which in turn is connected to two out of the four controller ports. Storage is now presented to the two Fibre Channel ports of the SR2122-2 pair.

As mentioned earlier in this guide, normally the storage is presented to a server, but with iSCSI initiators we must first get the Fibre Channel storage to the SR2122-2 pair, then present that storage to the iSCSI client over IP.

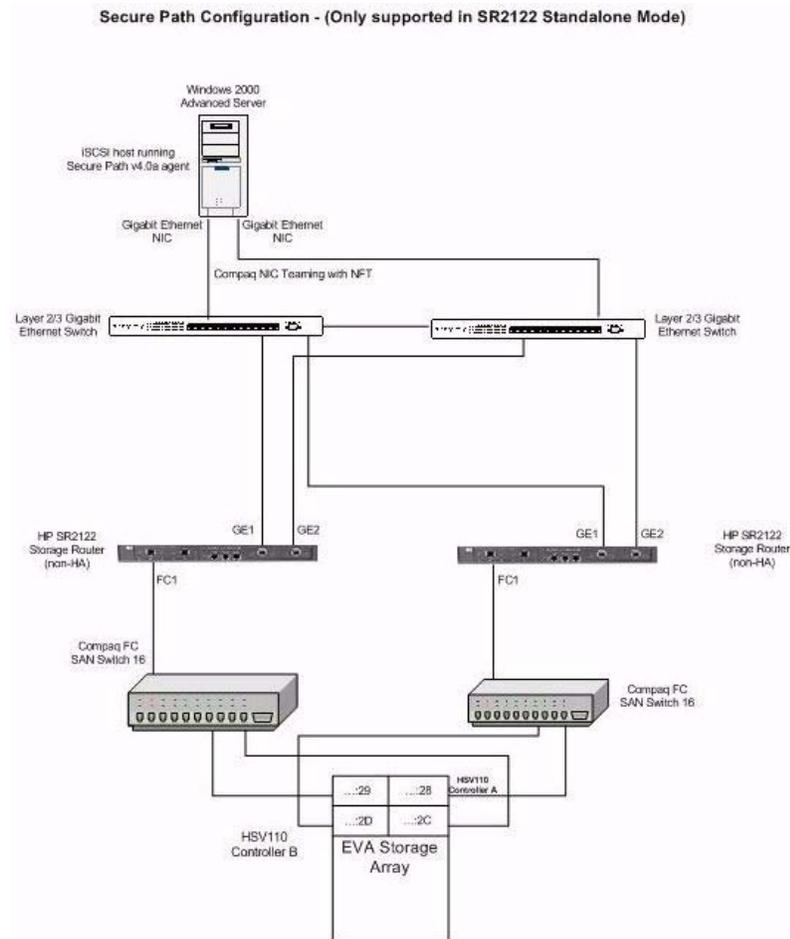


Figure 31: Secure Path configuration example

After configuring the SR2122-2 in Standalone, the following steps are necessary.

- SAN/Storage Setup
- SR2122-2 Setup
- Secure Path Setup
- iSCSI Initiator Setup

Note: For setup examples, the SR2122-2 members are Node A and Node B. The two SAN fabrics will be called the Ring and the Tree.

SAN/Storage Setup

In a High Availability SAN only Fibre Channel port FC1 from each SR2122-2 is connected to a different fabric.

SR2122-2 Name	FC1	FC2
Node A	Ring	Not Used
Node B	Tree	Not Used

The Fibre Channel ports emulate a Fibre Channel HBA on the SAN fabric. Create a zone on each fabric that includes the SR2122-2 Fibre Channel port and the storage controllers you want the SR2122-2 to access.

Setup for EMA/ESA12000, EMA16000, MA/RA8000, MA6000

If the ports of HSG80 controller-based storage are zoned with both Node A and Node B SR2122-2 routers, the storage will see two paths or connections per SR2122-2 Fibre Channel port for a total of 4 connections. These connections are treated much the same way as any host accessing EMA/ESA12000, EMA16000, MA/RA8000, MA6000 storage using the storage controller's selective storage presentation feature.

Rename these connections in the connection table for ease of identification. For example:

SR2122-2 Name	Connection Name
Node A	iNAFC1-P1 iNAFC1-P2
Node B	iNBFC1-P1 iNBFC1-P2

Note: If the HSG80-based storage array's connection table is implementing offsets, please set the same offset number for each SR2122-2 connection entry.

After creating LUNs, present them to both the Node A and the Node B connections - either using the HSG Element Manager GUI or through the HSG's CLI commands.

A rescan either through the SR2122-2 management GUI within the Monitor Window or through the CLI command "Show Devices Rediscover" will now show the newly presented HSG80 LUNs.

Note: The EMA/ESA12000, EMA16000, MA/RA8000, MA6000 storage arrays are not supported in a configuration with HP-UX servers and SR2122-2's.

Setup for EVA

If the EVA ports (HSV110, HSV100 controllers) are zoned with both Node A and Node B SR2122-2 routers, the EVA will see one WWID per SR2122-2 Fibre Channel port for a total of two WWIDs. These WWIDs are treated much the same way as any host accessing storage on the EVA using the EVA controller's selective storage presentation.

Using the Command View for EVA GUI, create a host name for each SR2122-2 node and assign its respective Fibre Channel port WWIDS to it. For example:

SR2122-2 Name	FC1 WWID	FC2
Node A	28:00...1C:6F	Not Used
Node B	28:00...2A:09	Not Used

Using the Command View for EVA GUI, create LUNs and present both SR2122-2 Host Names to each LUN.

A rescan either through the SR2122-2 management GUI within the Monitor Window or through the CLI command "Show Devices Rediscover" will now show the newly presented EVA LUNs.

SR2122-2 Setup

Once storage is presented to Node A and Node B, each SR2122-2 node should recognize these new devices. If not, the SR2122-2 can be forced to rescan for devices either through its management GUI within the Monitor Window or through the CLI command "Show Devices Rediscover".

With both the HSG80 and HSV110/100 controllers, a single LUN will appear twice in each of the SR2122-2's Device List. One SR2122-2 will see two out of the four controller ports and the other SR2122-2 will see the other two controller ports.

For example, LUN 2 from an HSV110/100 would have device entries on each SR2122-2 as:

SR2122-2 Name	Device List Entry (HSV Port WWID)	LUN presented by storage
Node A	50001fe150002f79	2
	50001fe150002f7c	2
Node B	50001fe150002f7d	2
	50001fe150002f78	2

Next, to present a LUN to an iSCSI initiator running Secure Path you must create a SCSI Router Instance on both SR2122-2 Node A and Node B to ensure all four ports or paths to the LUN are available to the host. The SCSI Router Instances can be created either through the management GUI or through the SR2122-2's CLI.

Creating the SCSI Router Instance

The SCSI Router Instance may be created using the SR2122-2 Management GUI or by CLI commands.

In this example, we will serve LUN 2 from the EVA storage presented to SR2122-2 Node A and Node B to iSCSI client iSCSI03.

Note: These commands assume the Access List Entry of iSCSI03 has been created.

SR2122-2 Name	Router Instance/ IP Address	Target Name	Target LUN#	WWID	Controller LUN#
Node A	iSCSI03_Disks 33.33.33.103	HSV23_T1	1	50001fe150002f79	2
			2	50001fe150002f7c	2
Node B	iSCSI03_Disks 33.33.33.104	HSV23_T2	1	50001fe150002f7d	2
			2	50001fe150002f78	2

The following SR2122-2 CLI commands will create a SCSI Router instance on each SR2122-2 and assign LUN 1 from each port of the HSV110 to be accessed by iSCSI Initiator iSCSI03.

On SR2122-2 Node A:

```

NodeA> scsirouter iSCSI03_Disks
NodeA> scsirouter iSCSI03_Disks description "Router Instance of all drives for iSCSI03"
NodeA> scsirouter iSCSI03_Disks authentication "none"
NodeA> scsirouter iSCSI03_Disks username "none"
NodeA> scsirouter iSCSI03_Disks password "none"
NodeA> scsirouter iSCSI03_Disks primary "none"
NodeA> scsirouter iSCSI03_Disks reserveproxy disable
NodeA> scsirouter iSCSI03_Disks failover secondary none
NodeA> scsirouter iSCSI03_Disks lun reset no
NodeA> scsirouter iSCSI03_Disks serverIf ge1 33.33.33.103/255.255.255.0 secondary ge2
NodeA> scsirouter iSCSI03_Disks target HSV23_T1 lun 1 wwpn "50001fe150002f79" lun "2"
NodeA> scsirouter iSCSI03_Disks target HSV23_T1 lun 2 wwpn "50001fe150002f7c" lun "2"
NodeA> scsirouter iSCSI03_Disks target HSV23_T1 enabled
NodeA> scsirouter iSCSI03_Disks target HSV23_T1 accesslist "iSCSI03"

```

On SR2122-2 Node B:

```

NodeB> scsirouter iSCSI03_Disks
NodeB> scsirouter iSCSI03_Disks description "Router Instance of all drives for iSCSI03"
NodeB> scsirouter iSCSI03_Disks authentication "none"
NodeB> scsirouter iSCSI03_Disks username "none"
NodeB> scsirouter iSCSI03_Disks password "none"
NodeB> scsirouter iSCSI03_Disks primary "none"
NodeB> scsirouter iSCSI03_Disks reserveproxy disable
NodeB> scsirouter iSCSI03_Disks failover secondary none
NodeB> scsirouter iSCSI03_Disks lun reset no
NodeB> scsirouter iSCSI03_Disks serverIf ge1 33.33.33.104/255.255.255.0 secondary ge2
NodeB> scsirouter iSCSI03_Disks target HSV23_T2 lun 1 wwpn "50001fe150002f7d" lun "2"
NodeB> scsirouter iSCSI03_Disks target HSV23_T2 lun 2 wwpn "50001fe150002f78" lun "2"
NodeB> scsirouter iSCSI03_Disks target HSV23_T2 enabled
NodeB> scsirouter iSCSI03_Disks target HSV23_T2 accesslist "iSCSI03"

```

To display Node A router information:

```
NodeA> show scsirouter "iSCSI03_Disks" all
```

```

Status Codes: A=active, I=inactive, C=create failed, D=not enabled, S=slave
          CDB   Proxy   Pass Lun
Router    Stat Retry Server  Thru Reset Description
-----
iSCSI03_Disks A    6    disabled no    no    Router Instance of all drives for iSCSI03

SCSI Router Authentication Information
Router    Authentication Username Password
-----
iSCSI03_Disks none          none      none

Router    ServerIf  Vlan Vid IP/Netmask          Secondary TCP Port
-----
iSCSI03_Disks ge1          33.33.33.103/24          ge2      3260

```

```

Router      Target      Status  Accesslist Targetid  Description Profile
-----
iSCSI03_Disks HSV23_T1      enabled iSCSI03  none      (not set) High

Router      Target      WWPN Primary  I/F  WWPN Secondary  I/F  Alias
-----
iSCSI03_Disks HSV23_T1      none                                none                                iqn.1986-03.com.hp:
fcgw.sr2122.3b6128603a94e42a2f66acd8a2601971.HSV23_T1
Router      Target      Lun  WWPN      Lun  I/F  WWPN      Lun  I/F
-----
iSCSI03_Disks HSV23_T1      1    50001fe150002f79  2    fc2  none
iSCSI03_Disks HSV23_T1      2    50001fe150002f7c  2    fc1  none
    
```

Notice at the end of the command output there are two LUN columns for each controller WWPN entry. Because SR2122-2 Node A is issuing a target (HSV23_T1) over IP to the iSCSI initiator, the iSCSI initiator needs a LUN value per controller port (left column LUNs 1 and 2) in order for Secure Path on the iscsi client to recognize different paths to the same SAN storage.

Note: The right LUN column is based on the LUN number received from the storage controller. In a Secure Path configuration, these LUN numbers in this column must match. Failure to do so may cause the SR2122-2 to allow I/O to another LUN on the storage controller.

The SCSI Router Instance iSCSI03_Disks on both Node A and Node B are now available on the IP network for iSCSI Initiator iSCSI03 to connect to once the iSCSI03 has its iSCSI driver loaded and configured.

Hp Storageworks Secure Path for Windows Setup

Prior to installing the iSCSI driver it is recommended to install Secure Path. Although there is no harm if the iSCSI driver is loaded before installing Secure Path, loading Secure Path first will alleviate the operating system from reporting multiple disk occurrences in Disk Management as well as multiple Write Signature pop-up messages for the same drive.

Installing Secure Path software is simply a matter of following the installation instructions for the product. There are no special Secure Path installation or configuration settings necessary for it to work with iSCSI LUNs presented by the SR2122-2.

iSCSI Initiator Setup

The iSCSI driver provides a transport for SCSI requests and responses for storage devices; however, instead of providing a transport for directly attached devices, the driver transports the SCSI requests and responses between the IP host and the SR2122-2 via an IP network. The SR2122-2, in turn, transports SCSI requests and responses between it and the Fibre Channel storage devices attached to it.

The iSCSI driver for Windows 2000 is included on the SR2122-2 Solution CD as well as on the web. See <http://www.hp.com/support/iprouter>

To begin the installation the user can either insert the SR2122-2 Solution CD and choose Install iSCSI Driver from the install menu or by running Setup.exe from the SR2122-2 Solution CD directory: `iscsi_initiator\HP\Windows`

Follow the prompts on the screen and accept the license agreement and at the iSCSI Configuration screen, you may enter the SCSI Router Instance IP addresses that the iSCSI Initiator is to use for storage. An iSCSI Initiator may communicate with up to eight SCSI Router Instances.

A system reboot is necessary after the driver installation.

When HP's Windows iSCSI driver is loaded on the iSCSI initiator, it also creates a *hp iSCSI Config icon* that is accessed through the Control Panel.



Open the *hp iSCSI Config* configuration screen and add the IP addresses of the newly created SCSI Router Instances from each SR2122-2 Node A and Node B, 33.33.33.103 and 33.33.33.104 respectively

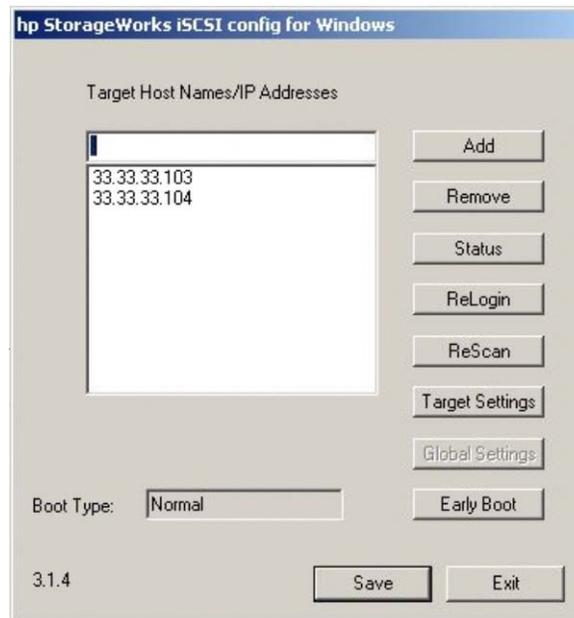


Figure 32: Iscsi03 HP Config Screen Example

Click SAVE and reboot the iSCSI Initiator to apply.

After the server reboots enter *hp iSCSI Config* again and check the Status of the driver to verify both the SR2122-2 targets are active.

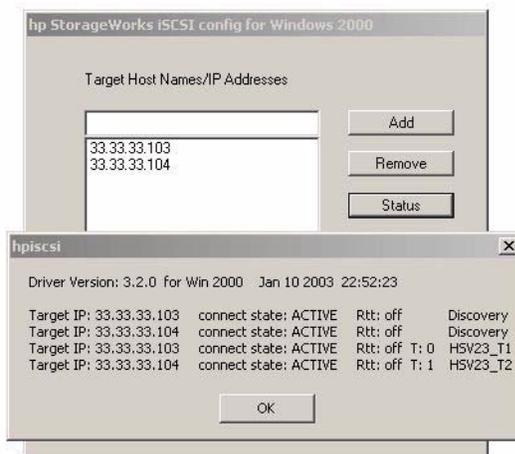


Figure 33: Checking that SR2122-2 Targets are Active

The system may also report a new disk found and ask to write a signature. At this point you would treat this drive as you would any locally attached disk (create partition, format, etc.). Verify the correct numbers of paths to this disk with Secure Path Manager.

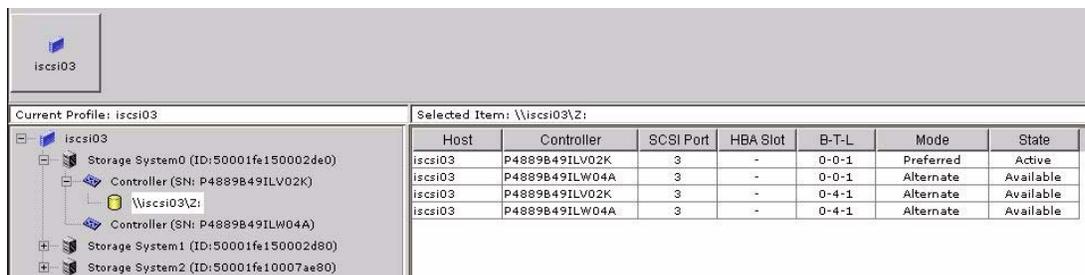


Figure 34: Secure Path Manager Example

Windows MSCS Cluster Support

Microsoft Clustering is supported with the SR2122-2 and can be easily configured with a few additional settings. Because the server's/cluster's point of view is that the iSCSI drive(s) are local, a change to the iSCSI target's Access List and to the iSCSI driver is all that is necessary.

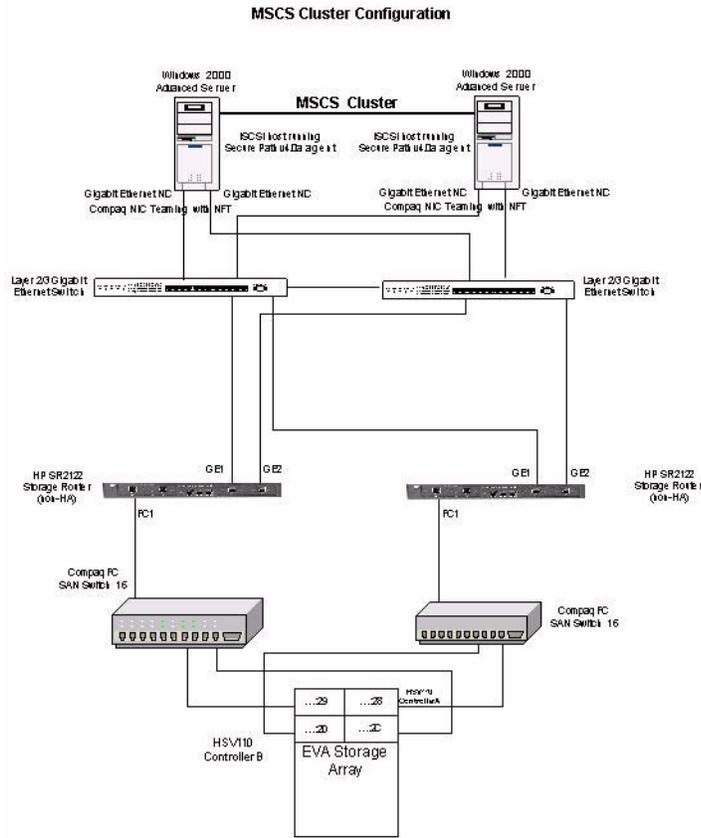


Figure 35: MSCS Cluster with SR2122-2 Routers Example

As a SR2122-2 Access List Entry may contain multiple IP addresses, the first step is to create an Access List Entry on the SR2122-2 that contains the IP address of all MSCS cluster members. These addresses can be either IP addresses assigned to a physical NIC card or an IP address assigned to a Virtual Network Adapter or "Teamed" adapters. The term "team" refers to the concept of multiple network adapters working together as a single network adapter. Also, the IP addresses entered into the Access List should only be those that will be used by the iSCSI driver to connect to the SR2122-2.

For example, a two node MSCS cluster contains members ARTICX0015 and ARTICX0031 each with two NIC cards teamed together connecting to SR2122-2 Node A and Node B as described in the previous section on Secure Path.

MSCS Cluster Member	Team IP Address
ARTICX0015	33.33.33.01
ARTICX0031	33.33.33.02

The Access List Entry on both SR2122 routers must contain the same MSCS Cluster IP addresses to ensure proper failover/failback of the iSCSI disk drives in the MSCS cluster.

The Access List entry must be created on both SR2122-2 Node A and Node B:

SR2122-2 Name	Access List Entry name	Access List Entries
Node A	ArticX-Cluster	33.33.33.01 33.33.33.02
Node B	ArticX-Cluster	33.33.33.01 33.33.33.02

Note: The Access List Name assigned to the IP address does not necessarily have to be the IP address's DNS name.

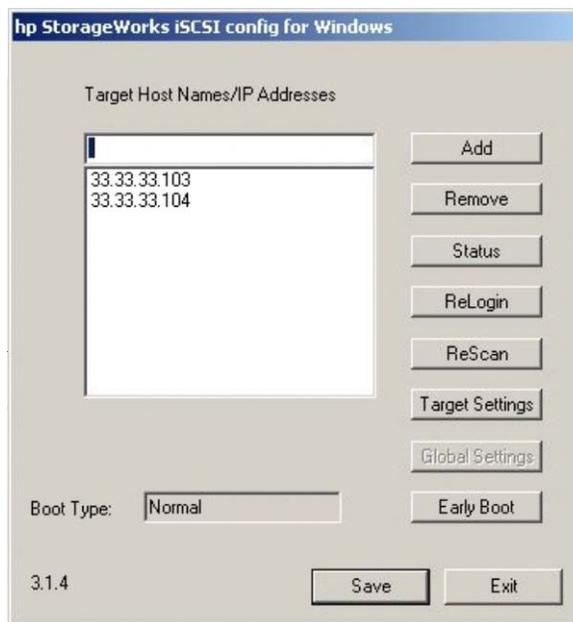
The iSCSI Target(s) on both SR212 routers must contain the same MSCS Cluster Access List Entry to ensure proper failover/failback of the iSCSI disk drives.

SR2122-2 Name	Router Instance/ IP Address	Target Name	Access List Entry Assigned to this Target
Node A	ISCSI03_Disks 33.33.33.103	HSV23_T1	ArticX-Cluster
Node B	ISCSI03_Disks 33.33.33.104	HSV23_T2	ArticX-Cluster

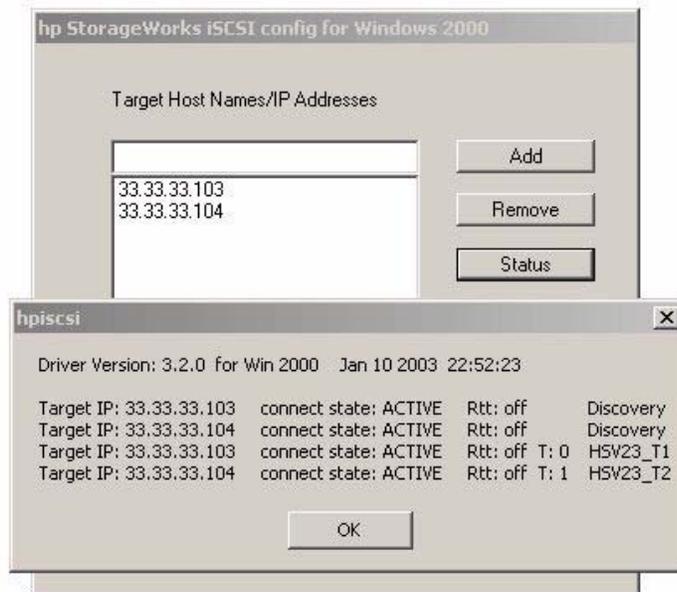
Next, add both Router Instance IP addresses to each MSCS Cluster member's iSCSI driver.

Open the *hp iSCSI Config* configuration screen and add the IP addresses of the SCSI Router Instances from each SR2122-2 Node A and Node B, 33.33.33.103 and 33.33.33.104, respectively

MSCS Cluster Member	Add Router Instance IP Addresses
ARTICX0015	33.33.33.103 33.33.33.104
ARTICX0031	33.33.33.103 33.33.33.104



A reboot of both MSCS Cluster members is necessary in order for these changes to take effect. After the MSCS cluster reboots enter *hp iSCSI Config* again on each cluster member and check the Status of the driver to verify both the SR2122-2 targets are active.



Verify the correct numbers of paths with Secure Path Manager to each cluster member.

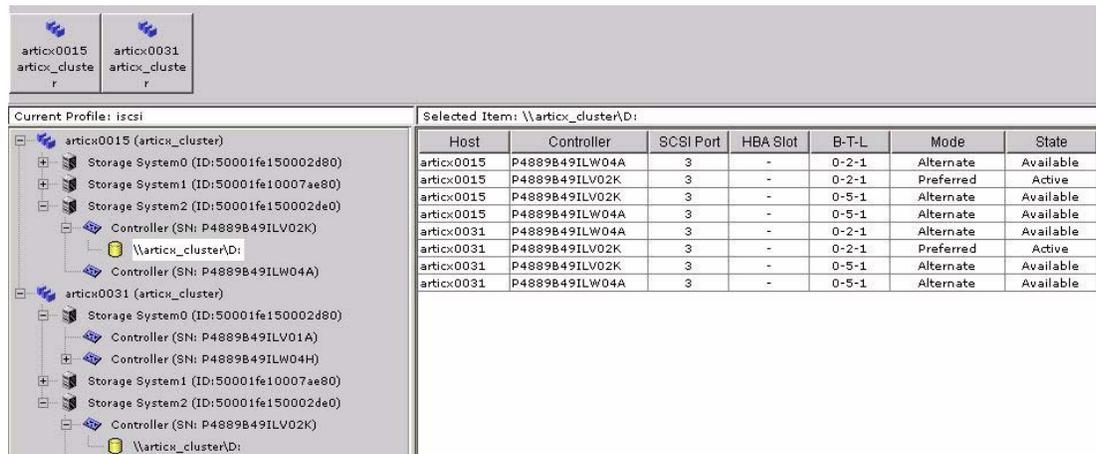


Figure 36: Secure Path Manager Example

Section 2: Using the SR2122-2 with FCIP

Storage Array Hardware Support

The following HP Storage Array products are supported with the SR2122-2 in FCIP mode:

- Enterprise Virtual Array
- XP128/1024
- RA/MA8000, ESA/EMA12000, EMA16000

Fibre Channel Switch Hardware Support for FCIP

Refer to the *hp StorageWorks SR2122-2 IP Storage Router Product Support Tables* for supported Fibre Channel switch models and firmware versions. This document is available at:

<http://h18000.www1.hp.com/products/storageworks/san/documentation.html>

Operating System Software Support

Refer to the *hp StorageWorks SR2122-2 IP Storage Router Product Support Tables* for specific operating system support. This document is available at:

<http://h18000.www1.hp.com/products/storageworks/san/documentation.html>

FCIP Protocol

Fibre Channel over IP (FCIP) enables SR2122-2 Storage Routers to provide connectivity between Fibre Channel hosts and Fibre Channel storage devices over an IP network. To deploy FCIP, two SR2122-2 Storage Routers are required. Each system is configured for FCIP and connected to a SAN (or to any Fibre Channel host or Fibre Channel device). The peer systems are connected to each other through an IP network.

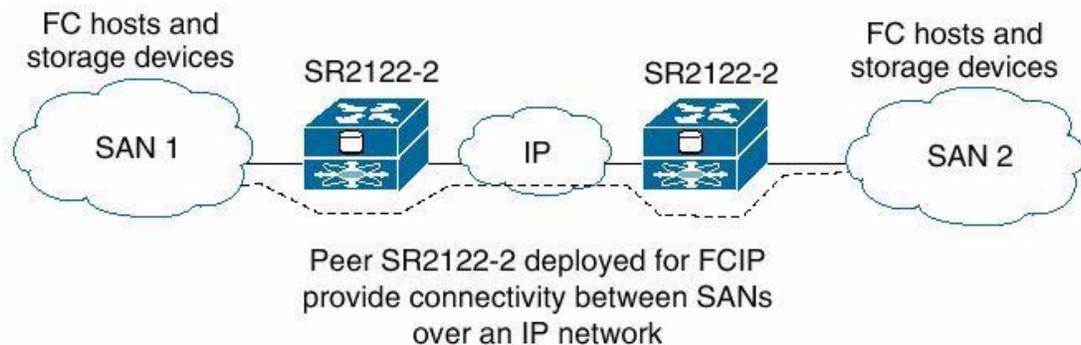


Figure 37: FCIP with Two SR2122-2's

A Fibre Channel host or Fibre Channel device needs no additional hardware or software to access storage devices via an SR2122-2 Storage Router deployed for FCIP.

Using FCIP to Route Fibre Channel Packets

With FCIP, peer systems transport Fibre Channel frames over an IP network. From the perspective of the SANs the storage devices accessed through the peer systems appear to be part of one unified SAN.

Once configured, FCIP instances on each system become active and establish their connectivity via the IP network. The storage devices in one SAN access the storage devices in the connected SAN using Fibre Channel frames, which are encapsulated in IP packets by the FCIP instance, and transmitted to the peer system. The peer FCIP instance strips the IP packet data and passes only the Fibre Channel frames over the Fibre Channel interfaces to the storage devices.

The peer systems deployed for FCIP must be configured to use the TCP protocol.

With the TCP protocol one FCIP instance must be configured as the TCP client; the other FCIP instance must be configured as the TCP server. The only difference between FCIP instances configured as TCP client and TCP server is which FCIP instance initiates the connection: the TCP client initiates the connection.

FCIP transports Fibre Channel frames between SANs by performing the following actions:

- Transporting Fibre Channel frames between a SAN and an SR2122-2 that is deployed for FCIP
- Encapsulating Fibre Channel frames in IP packets and transporting the IP packets to a peer SR2122-2 that is deployed for FCIP
- Receiving IP packets and transporting as Fibre Channel frames between the peer SR2122-2 and a connected SAN

Note that Fibre Channel traffic is carried over the IP network in such a way that the Fibre Channel fabric and all Fibre Channel devices on the fabric are unaware of the presence of the IP Network.

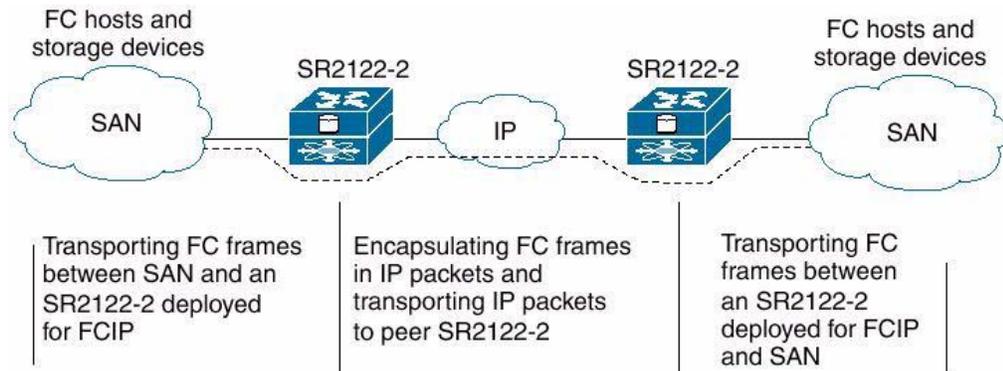


Figure 38: Encapsulating Fibre Channel Frames in IP Packets

Configuring the SR2122-2 IP Storage Router in a SAN using FCIP

Before performing FCIP configuration tasks on the SR2122-2, make sure you have configured all system parameters as described in Chapter 5, "Configuring the Storage Router," and Chapter 6, "Configuring System Parameters."

To configure an FCIP instance, you will need the IP address of the FCIP instance on the peer system (another SR2122-2 Storage Router configured for FCIP).

Configuring the SR2122-2 for FCIP in a SAN takes 5 distinct steps or sections:

1. Create an FCIP instance.
2. Assign an interface and IP address to the FCIP instance for use by the peer system (another SR2122-2 Storage Router configured for FCIP).
3. Assign FCIP peer IP address.

4. (Optional) Configure operational parameters as needed.
5. Verify and save configuration.

In this example we will configure two SR2122-2 Storage Routers in a FCIP configuration using the following information.

Table 6: FCIP Configuration Information for Two SR2122-2's

SR2122 Name	FCIP Instance Name	IP Address	TCP Protocol
Node A	fcip2	10.1.0.46/24	Client
Node B	fcip2	10.1.0.47/24	Server

Create an FCIP Instance

To create an FCIP instance using CLI commands on Node A:

Enter Administrator mode.

```
Node A$ enable
```

Create an FCIP instance by naming the new instance fcip2

```
Node A# fcip fcip2
```

Note: The FCIP instance named fcip1 uses the Gigabit Ethernet interface ge1; the instance named fcip2 uses ge2. See the IP Storage Router Command Line Interface Reference Guide for more information about the fcip command.

(Optional) Add a description of what the FCIP instance is for. For example, add the description "Access to SAN island 2" to the FCIP instance fcip2.

```
Node A# fcip fcip2 description "Access to SAN island 2"
```

To create an FCIP instance using CLI commands on Node B:

Enter Administrator mode.

```
Node B$ enable
```

Create an FCIP instance by naming the new instance fcip2

```
Node B# fcip fcip2
```

Note: The FCIP instance named fcip1 uses the Gigabit Ethernet interface ge1; the instance named fcip2 uses ge2. See the IP Storage Router Command Line Interface Reference Guide for more information about the fcip command.

(Optional) Add a description of what the FCIP instance is for. For example, add the description "Access to SAN island 1" to the FCIP instance fcip2.

```
Node B# fcip fcip2 description "Access to SAN island 1"
```

Assign an IP address

Assign an IP address to the FCIP instance on Node A:

```
Node A# fcip fcip2 networkif 10.1.0.46/24
```

Assign an IP address to the FCIP instance on Node B:

```
Node B# fcip fcip2 networkif 10.1.0.47/24
```

Assigning a Peer Name and Peer IP Address

Assigning a peer name and IP address to Node A fcip instance (TCP Client)

```
Node A# fcip fcip2 destination tcpclient 10.1.0.47
```

This configures the NODE A FCIP instance named fcip2 with a destination at IP address 10.1.0.47, using TCP/IP connection protocol. The FCIP instance is configured as a TCP client, and will initiate the TCP connection to the destination.

Assigning a peer name and IP address to Node B fcip instance (TCP Server)

```
Node A# fcip fcip2 destination tcpserver 10.1.0.46
```

This configures the NODE B FCIP instance named fcip2 with a destination at IP address 10.1.0.46, using TCP/IP connection protocol. The FCIP instance is configured as a TCP server, and listens for the TCP connection from the destination.

Configuring Operational Parameters

For FCIP deployment, a large maximum transfer unit (MTU) size is desirable. To set the size of the MTU, use the interface `ge? mtusize` command to set MTU to its highest level, 9000, if possible.

To configure FCIP operational parameters, use the `fcip destination config` command.

rxTcpWinSize	Max number of outstanding bytes that can be received on a TCP connection
txTcpWinSize	Max number of outstanding bytes that can be transmitted on a TCP connection
tcpPort	TCP port number where the server is listening to and the client is connected to.
idlePingDelay	Number of seconds before a keep-alive packet is sent across an idle connection.
pktTraceMask	Value of the packet trace mask. Packets are traced for debugging problems. Range is from 0x0000 to 0xffff. A value of zero will disable tracing.
frinHiWater	Maximum number of frames given to the Fibre Channel interface.
useBport	Use Fibre Channel (FC) B_port connectivity. This configuration option applies to all FCIP connection types.

batchTcp	Batch multiple Fibre Channel frames in one TCP segment.
compression	Compress the FCIP data stream.
pacinrate	Minimum expected and/orallotted bandwidth in Mbits/sec for this FCIP configuratio. Zero is off.

If modifications to these settings are necessary, see the *IP Storage Router 2122-2 Command Line Interface Reference Guide* for details about the `fcip destination config` command.

Verifying and Saving Configuration

Verify the FCIP configuration using the procedures that follow. You can save the configuration at any time by using the `save all bootconfig` command. You must save the running configuration to the bootable configuration for it to be retained in the storage router when it is rebooted.

Once you have saved the configuration, you can verify that the configuration to be used when the storage router is rebooted matches the currently running configuration.

To verify FCIP configuration:

```
Node A# show fcip fcip1 - Displays the operational and
connection information for FCIP instance fcip1.
```

```
Instance   Device I/F   Network I/F   Description
-----
fcip1      fc1          ge1 10.0.0.24 Access to SAN island 5
```

```
Destination LocalMode   IpAddress      IsConnected LinkState
-----
fcip         tcpserver    10.0.0.25     TRUE        UP
```

```
fcip1 Trace Status
-----
```

```
pktTracing      On, mask 0xffff
mboxTracing     On
mboxCmdCount    0
```

```
fcip1 Credit Information
-----
```

```
Receive Credits 61
Transmit Credits 16
```

```
fcip1 Connection Information
-----
```

```
idlePingDelay   60
Compression:    Off
```

```

tcpPort                3225
rxTcpWindowSize        262144
maxRxTcpWindowSize     262144
txTcpWindowSize        262144
txTcpCongestionWindowSize 524280
maxTxTcpWindowSize     262144
frIn                   0
frInHiWater            688

```

FCIP Setup Examples with the SR2122 GUI



Figure 39: Adding FCIP instance fcip1

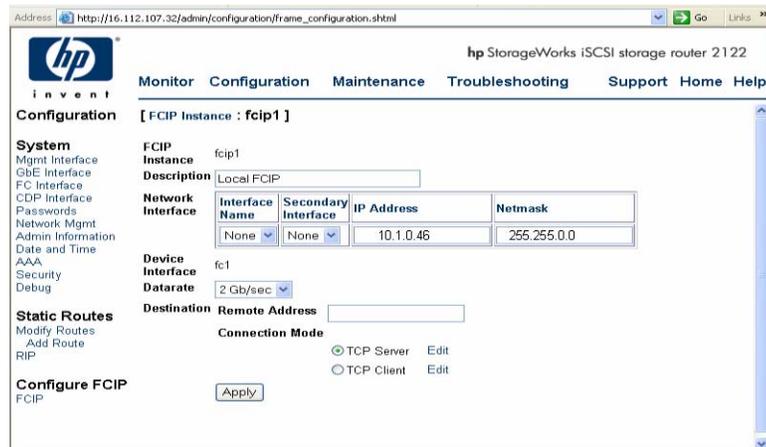


Figure 40: Configuring FCIP Instance fcip1

The screenshot shows the configuration page for an HP StorageWorks iSCSI storage router 2122. The browser address bar shows 'http://16.112.107.32/admin/configuration/frame_configuration.shtml'. The page title is 'hp StorageWorks iSCSI storage router 2122'. The navigation menu includes Monitor, Configuration, Maintenance, Troubleshooting, Support, Home, and Help. The current page is 'Configuration' for '[FCIP Instance : fcip1][Destination : fcip]'. The left sidebar lists various configuration categories: System, Static Routes, and Configure FCIP. The main content area shows a list of parameters for the FCIP instance, each with a text input field and a description. The parameters are: rxTcpWinSize (262144), txTcpWinSize (2097152), tcpPort (3225), idlePingDelay (15), pktTraceMask (65535), frInHiWater (688), useBport (checked), batchTcp (checked), compression (unchecked), and pacingrate (0). There are 'Set Defaults' and 'Apply' buttons.

Parameter	Value	Description
rxTcpWinSize	262144	TCP receive window size
txTcpWinSize	2097152	TCP transmit window size
tcpPort	3225	TCP port to listen on or connect to
idlePingDelay	15	Idle time (seconds) before sending keep alive packet
pktTraceMask	65535	Trace mask
frInHiWater	688	Maximum frames to FC
useBport	<input checked="" type="checkbox"/>	Use FC B-Port connectivity
batchTcp	<input checked="" type="checkbox"/>	Batch multiple FC frames in one TCP segment
compression	<input type="checkbox"/>	Compress data stream
pacingrate	0	Queue IP packets for remote (mBits/sec)

Figure 41: Setting Optional FCIP Instance Parameters

SR2122-2 / Insight Manager 7 Service Pack 2 Integration

The purpose of this section is to describe the integration of the HP SR2122-2 IP Storage Router and Insight Manager 7 (IM 7). To IM 7, it is simply a TCP/IP device, which is discovered, data collected, and status polled.

Integration Components

Insight Manager 7 SP 2

Insight Manager (IM) 7 is a software application running on the Windows NT platform that does encompass a more traditional IP attached device management role, primarily in the server space. It contains a number of standard IP discovery methods, which provide device identification, data collection, event handling and notification. It also includes a number of software revision controls and updates, as well secure remote task execution.

Service Pack 2 includes new features, which allow IM 7 to:

- Automatically discover, using an ICMP Ping Spray, SNMP Get Requests, and HTTP requests. Sets up an application launch to the management application of the HP SR2122-2.
- Uses SNMP MIB II for data collection of network statistics
- Periodically status polls and displays status changes within the IM 7 device status page.
- Receives SNMP Traps from the HP SR2122-2.

IM 7, Service Pack 2 requires the following hardware and software for the server:

Table 7: Management Server Hardware and Software Minimum Requirements

Management Server Feature	Minimum Requirements
Hardware	ProLiant Server, Deskpro Desktops or Professional Workstations, EVO Desktops or Workstations NetServer models LX Pro, LC3, LC4 and Vectra XA6/200 Management Servers require 400 MHz Pentium Processor II or faster
System Memory	192 MB of RAM with Microsoft SQL Server or MSDE on same server 256 MB of RAM with Version Control Repository Manager installed on same server with Microsoft SQL Server or MSDE
Disk Space	100 MB on the Microsoft Windows system drive 110 MB for Insight Manager 7 software 300 MB for the database server drive and database log 3 MB for Version Control Repository Manager

Table 7: Management Server Hardware and Software Minimum Requirements (Continued)

Management Server Feature	Minimum Requirements
Management Server Operating System	<p>Microsoft Windows NT Server 4.0 Retail with Service Pack 6a or later</p> <p>Microsoft Windows NT Server 4.0 Enterprise with Service Pack 6a or later</p> <p>Microsoft Windows NT Server 4.0 International with Service Pack 6a or later</p> <p>Microsoft Windows XP with Service Pack 1 or later</p> <p>Microsoft Windows 2000 Server with Service Pack 2 or later</p> <p>Microsoft Windows 2000 Advanced Server with Service Pack 2 or later</p> <p>Microsoft Windows 2000 Professional with Service Pack 2 or later</p> <p>Microsoft Windows 2000 International, International English, French, German, Spanish, and Japanese with latest Microsoft Service Pack applied</p> <p>Windows .NET Server 2003, Standard Edition</p> <p>Windows .NET Server 2003, Enterprise Edition</p> <p>To be sure you have the correct version of Microsoft Internet Explorer, open the browser and click Help from the menu bar. Select About Internet Explorer and an information box is displayed. This box lists the version you are currently running. You must have V5.50.4522.1800 or later.</p> <p>Microsoft Internet Explorer 5.5 or later is only required if you want to browse.</p>
Server Software	<p>TCP/IP installed</p> <p>SNMP services installed and active</p> <p>Microsoft Internet Explorer 5.5 with Service Pack 2 or later</p> <p>Microsoft Internet Explorer 6.0</p> <p>Microsoft Internet Explorer 5.5 or Microsoft Internet Explorer 6.0 is only required if you want to browse locally on the server.</p>

Table 7: Management Server Hardware and Software Minimum Requirements (Continued)

Management Server Feature	Minimum Requirements
Database Software for Server	<p>Microsoft SQL 7.0 MSDE, with Service Pack 4 or later (local upgrades only)</p> <p>Microsoft SQL Server 7.0 Standard, with Service Pack 4 or later</p> <p>Microsoft SQL Server 7.0 Enterprise, with Service Pack 4 or later</p> <p>Microsoft SQL 2000 Personal, with Service Pack 1 or later (local only)</p> <p>Microsoft SQL 2000 Standard, with Service Pack 1 or later</p> <p>Microsoft SQL 2000 Enterprise, with Service Pack 1 or later</p> <p>Microsoft SQL 2000/MSDE, with Service Pack 1 or later (local only)</p> <p>All database software for servers are requirements for local and remote unless otherwise noted.</p>

MSDE 2000 can be found on the Management CD and can be automatically installed for you if you do not already have a database available and running. You must have a database engine installed in order for the Insight Manager 7 installation to continue.

If you install SNMP services after installing Microsoft Windows Operating System Service Pack, reinstall the service pack.

The Insight Manager 7 server and the database server must be in the same time zone. In addition, you should employ best practices to ensure time synchronization among the set of management server and browser machines.

SR2122-2 Management Port

The SR2122-2 Management Port is a 10/100 Ethernet connection that must have LAN connectivity to the ProLiant running IM 7, in order to manage it. This implies that the SR2122-2 has a legitimate IP address, and is able to route its TCP/IP and SNMP traffic to the network devices working with it. It also assumes that the SR2122-2 has been enabled to be managed and is configured correctly for the level of SNMP and management support.

SR2122-2 SNMP V1 MIBs which effect IM 7 are:

- MIB II (RFC 1213, and RFC 1215)
- Fibre Alliance MIB V2.2
http://www.fibrealliance.org/fb/mib/mib2_2.htm

Configuring the SR2122-2 to integrate with IM 7 SP2

First, the SR2122-2 10/100 Management Port must be enabled. The Management port provides TCP/IP/ICMP/SNMP network connectivity to the Management Server running IM 7 SP2

There are a number of settings that have to be configured in order to make the SNMP V1 integration with IM 7 to work. Here is a valid SR2122-2 Management Port TCP/IP configuration:

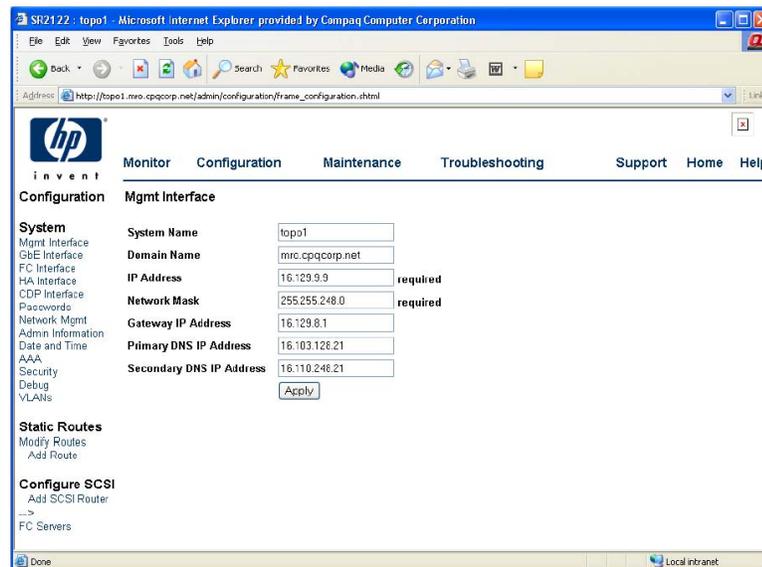


Figure 42: Valid SR2122-2 Management Port TCP/IP Configuration

Next, Network Management information must be configured:

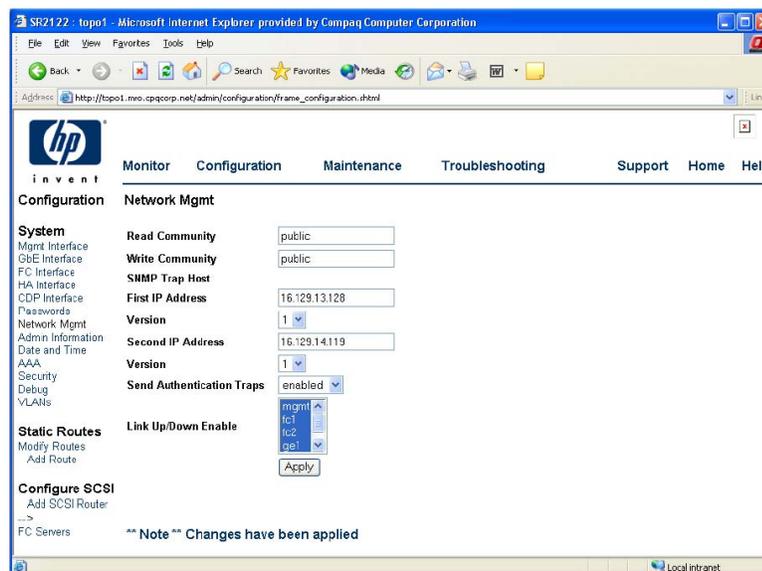


Figure 43: Network Management Configuration

Of particular note is the READ Community. This allows for the IM 7 data collection to bring back the MIB II information. It also makes autodiscovery possible, by supplying the SNMP MIB II SysOID of the device for identification by IM 7.

In order for SNMP traps to be directed to the IM 7 server, a user will have to fill in the First IP Address and Second IP Address of the SNMP Trap Host sections. These are the SNMP Trap Destinations.

It should be noted that IM 7 SP2 only supports SNMP V1 traps. This means that the “Version” should be set to 1.

If the user would like to see authentication traps (if users are speaking SNMP at the HP SR2122-2, with an incorrect community string) then they configure it to be enabled.

Likewise, if you wish each Link state change to be sent as a trap, you must enable Link up/Down for whichever Link you wish to monitor state changes with.

Configuring IM 7 SP2 to integrate with the SR2122-2

Discovering the HP SR2122-2

There are a number of ways that IM 7 can discover the SR2122-2:

Automatic Discovery

Using the Automatic Discovery page add the SR2122-2 Management port TCP/IP address to the IP Address Range.

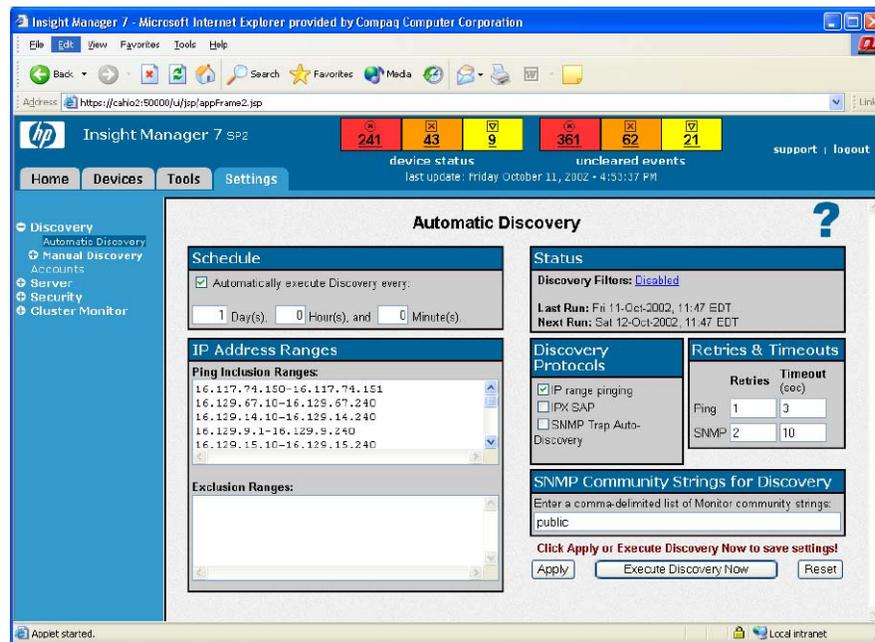


Figure 44: Automatic Discovery

Note: The Discovery filters have to be Disabled in order to allow the discovery of a network device like the SR2122-2. By default IM 7 will be setup to only discover servers.

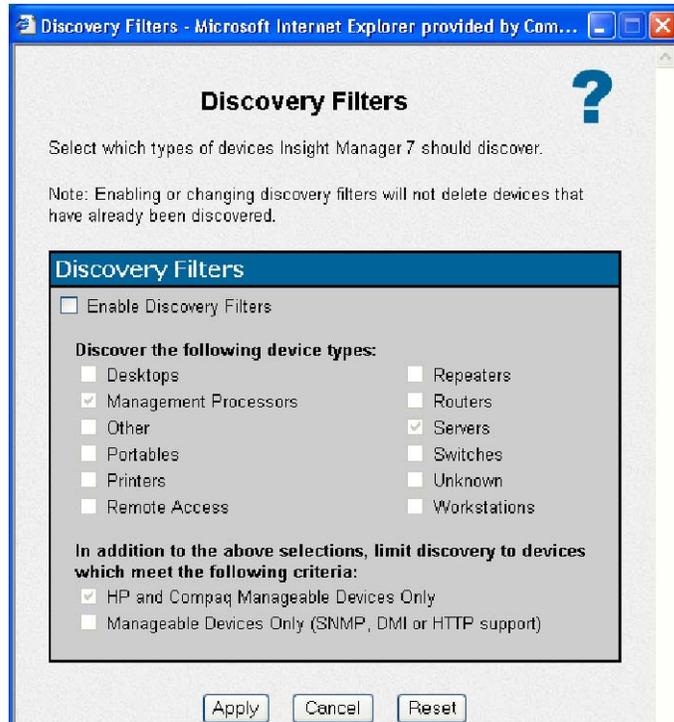


Figure 45: Discovery Filters

Manual Discovery

You can also just add the device one at a time. But be aware that Device filters should be set properly to allow for network devices to be discovered.

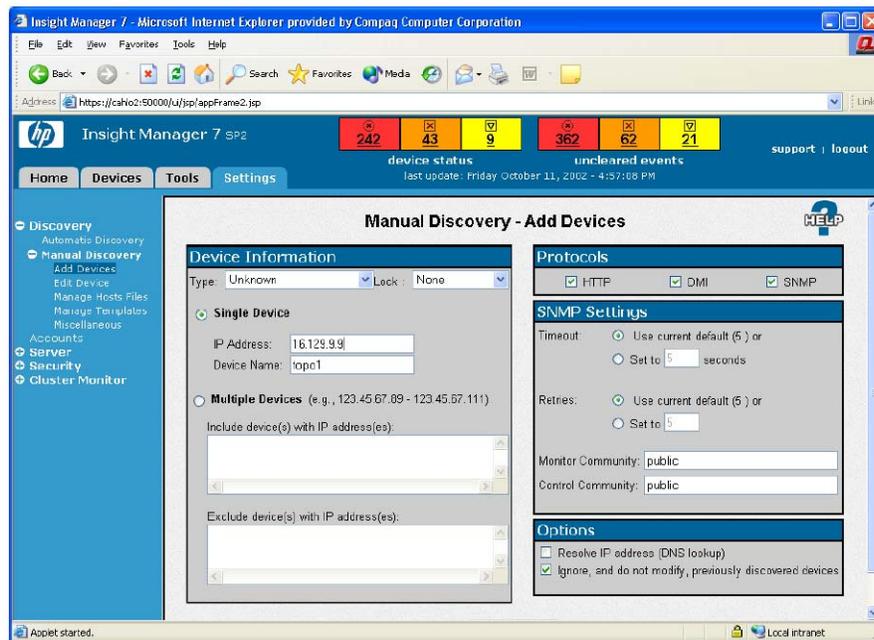


Figure 46: Manual Discovery

SNMP Customizations

SNMP Community Strings

The SNMP community strings for “Monitor” and “Control” of the devices must correspond to the HP SR2122-2’s Read and Write Community settings.

SNMP Authentication Trap Enabling

By default, this trap is disabled in IM 7, meaning it is ignored and discarded. To enable it you have to edit the settings of RFC 1215.mib as seen below:

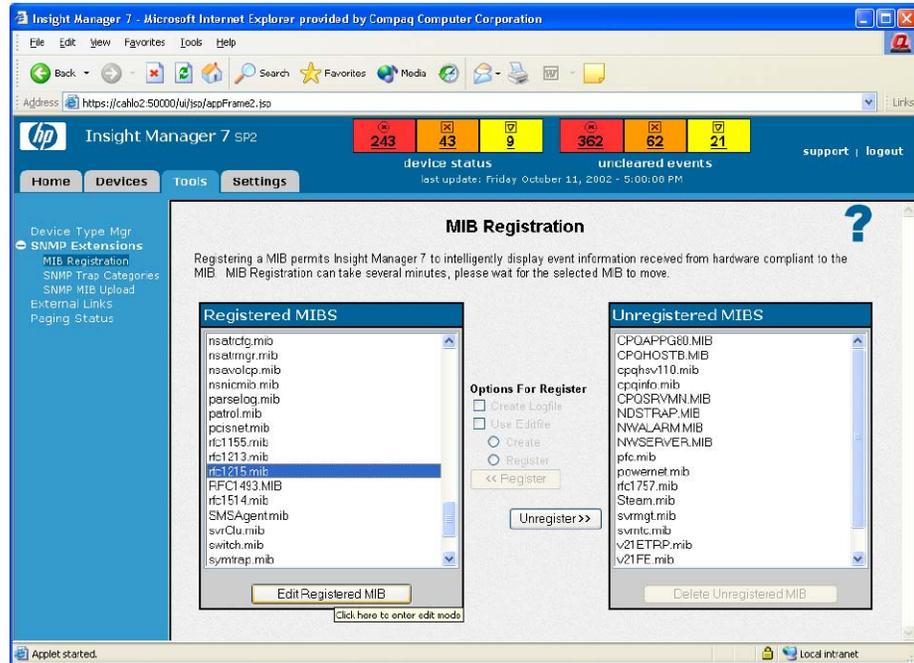


Figure 47: SNMP Authentication Trap Enabling

Click on MB Registration, then highlight rfc1215.mib in the Registered MIBS scroll menu the click on Edit Registered MIB button.

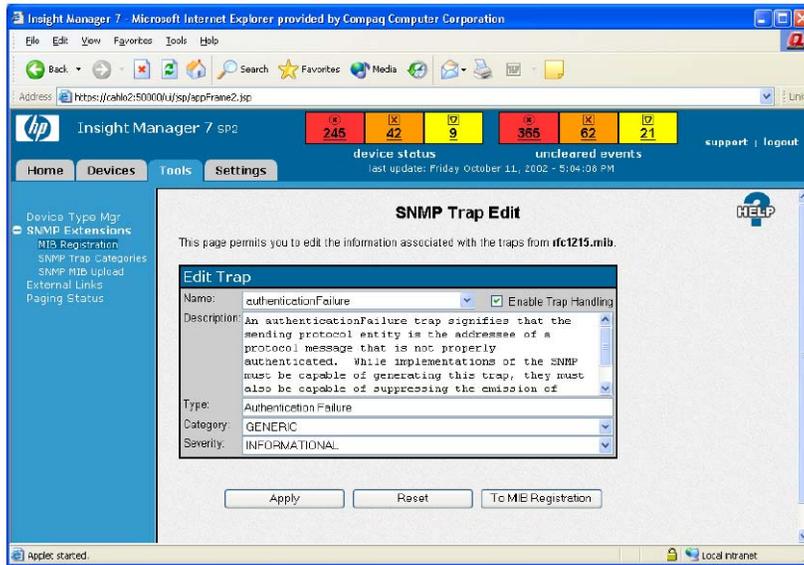


Figure 48: SNMP Trap Edit

Click on Enable Trap Handling then click Apply.

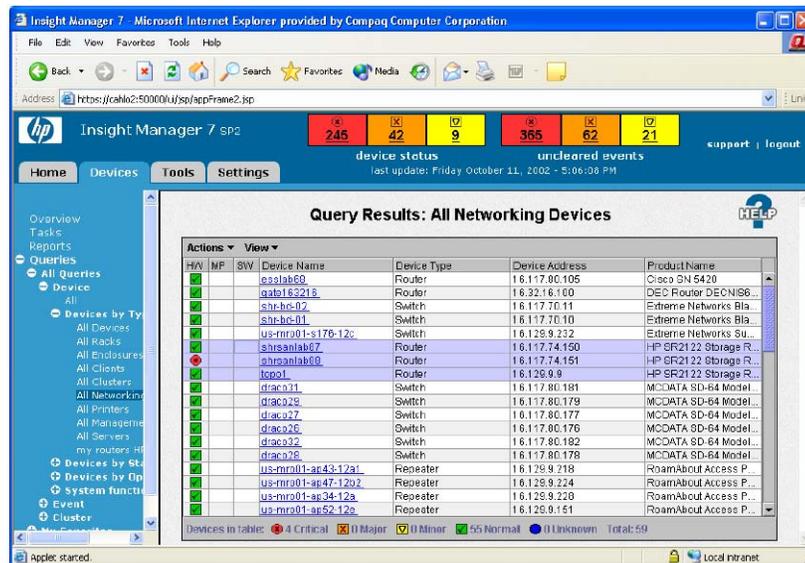


Figure 49: SNMP Network Query

You will find that the HP SR2122-2 is a network device and will be found via the network device query.

Sample Configurations

For maximum supported SAN and Storage configurations, please refer to Chapters 3 and 4 of the "*HP StorageWorks SAN Design Reference Guide*."

For maximum supported IP configurations please consult with your network administrator

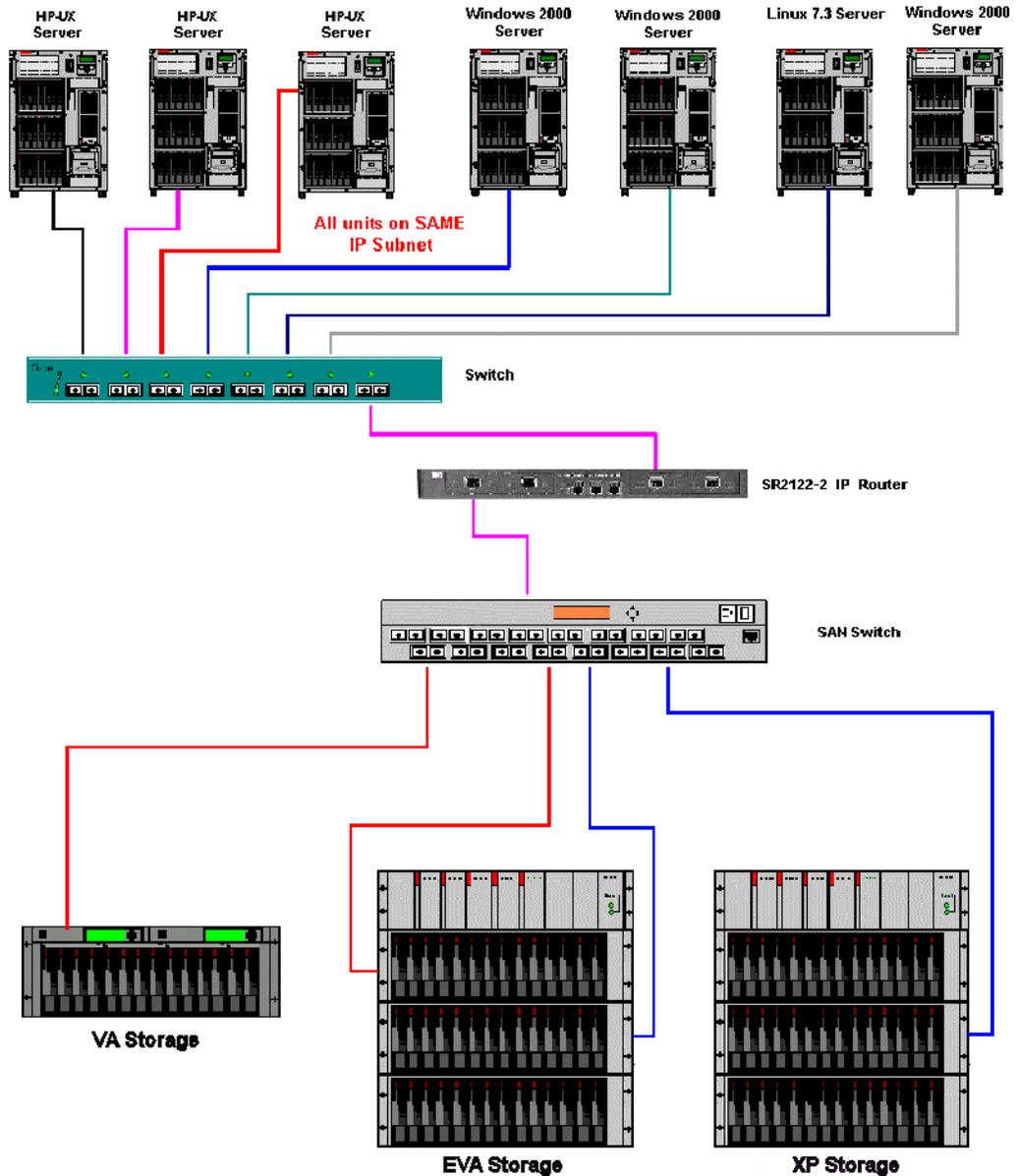


Figure 50: Example of Multiple OS Systems in a Non-Redundant Path Configuration

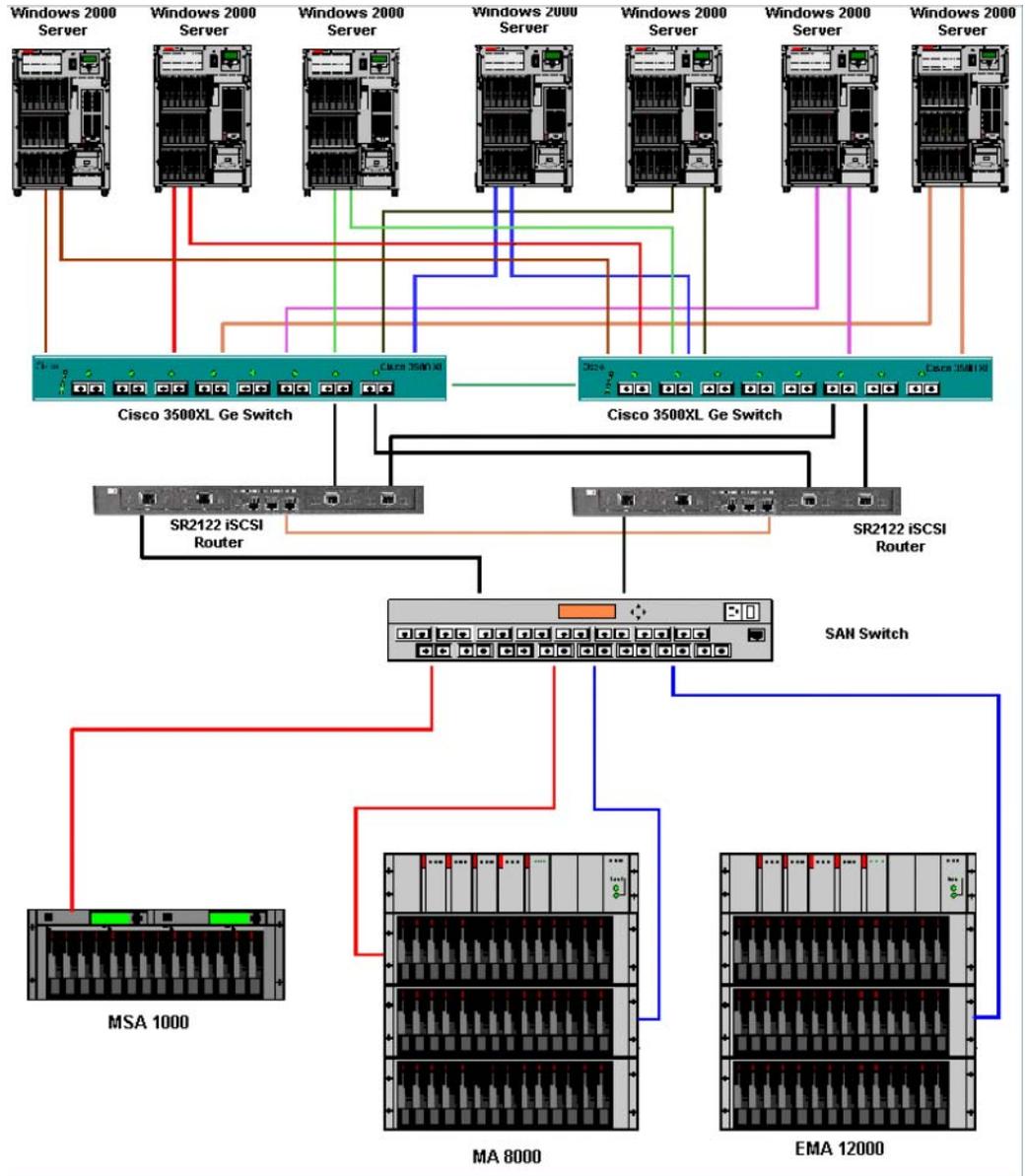


Figure 51: Windows 2000 Servers with NIC Teaming: 2 Node SR2122-2 Cluster

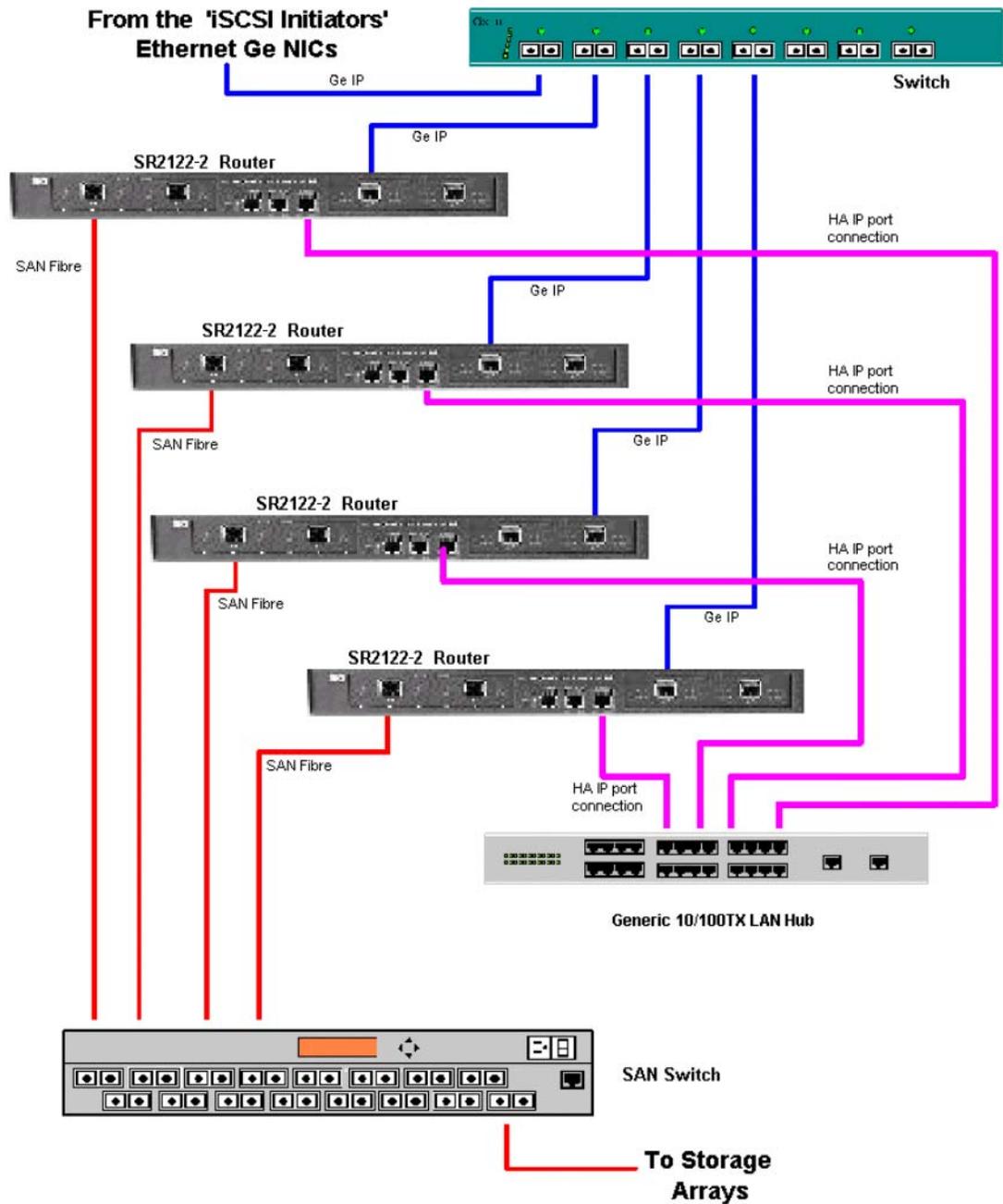


Figure 52: Maximum SR2122-2 Cluster Configuration Using HA Ports