addendum

hp StorageWorks using the iSCSI SR2122 storage router

bridging from TCP/IP hosts to Fibre Channel storage

First Edition (February 2003)

Part Number: AA-RTE1A-TE

This document describes the integration of IP-based Storage Networks using the iSCSI protocol to Compaq Fibre Channel SAN and HP Storage arrays. The HP SR2122 iSCSI Router is used to bridge from TCP/IP hosts to Fibre Channel storage.

For the latest version of these Addendum, access the HP storage website at: http://www.hp.com/country/us/eng/prodserv/storage.html.

Using the iSCSI SR2122 Storage Router: Bridging from TCP/IP to Fibre Channel Storage Addendum
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About this Document

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

Addendum Information

These Addendum cover the following major topics:

Intended Audience

This document is intended for customers who purchased the iSCSI SR2122 Storage Router.

Other iSCSI SR2122 Storage Router Documentation

The iSCSI SR2122 Storage Router kit also includes:

- hp StorageWorks iSCSI Storage Router 2122 Command Line Interface Reference Guide: Part Number 306001-002
- hp StorageWorks iSCSI Storage Router 2122 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.

Figures

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 chapter 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 FC switches and storage as well as a basic understanding of TCP/IP networking.

iSCSI in a Large 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 iSCSI Router.

For further details please read "*hp StorageWorks iSCSI storage router 2122 User Gui*de PN: 304835-002" Section 4 -SCSI Routing Overview.

Typical Network Structure

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

A typical IP/FC network example**:**

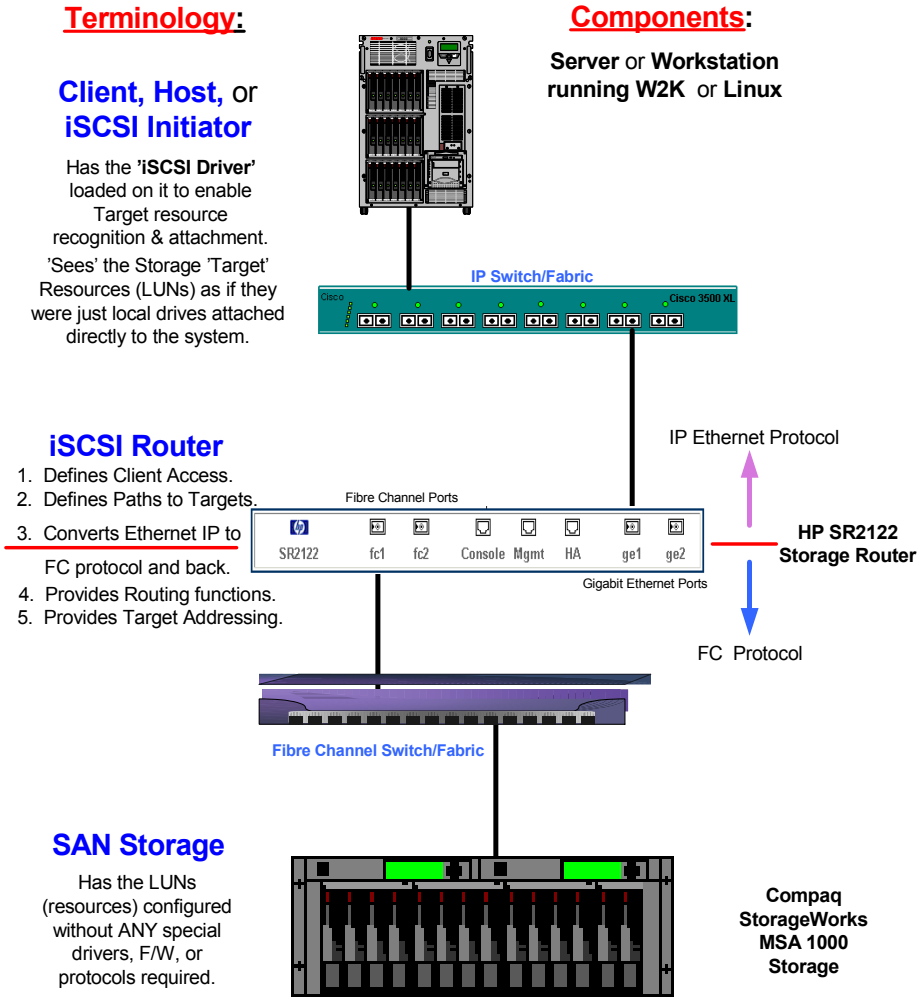


Figure 1: IP/FC Network Example

iSCSI Initiator

The IP host, or iSCSI Initiator uses the iSCSI Driver to enable target resource recognition & attachment to the SR2122 over IP. The iSCSI driver is configured with the Gigabit Ethernet IP address of each SCSI routing instance running on the SR2122 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 SR 2122, 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.

IP Network

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

SR2122 iSCSI router

The HP SR2122 iSCSI Router is the bridge between the iSCSI Initiators and the SAN storage that converts IP to FC protocol and provides iSCSI Initiator access to FC storage.

SCSI routing provides IP hosts with access to FC 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 FC 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 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

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 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 iSCSI Router is supported on any currently supported hp Infrastructure Switch fabric. Please read "hp StorageWorks SAN Design Reference Guide – January 2003 Part Number: AA-RMPNF-TE" for the latest hp Infrastructure switch topologies and fabric rules.

SAN Storage

The SR2122 supports the RA/MA8000, ESA/EMA12000, EVA, VA and XP storage arrays.

Please read "*hp StorageWorks SAN Design Reference Guide* – January 2003 Part Number: AA-RMPNF-TE" for the latest hp storage configurations and rules.

SR2122 Hardware and Software Support

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

Storage Array Hardware Support

The following hp Storage Array products are supported:

- MSA1000
- RA/MA8000
- ESA/EMA12000
- EMA16000
- Enterprise Virtual Array V2
- VA7100
- VA7400/7410
- XP48/512

Fibre Channel Switch Hardware Support

The following hp Infrastructure fibre channel switches are supported:

Table 1: Supported hp Infrastructure Fibre Channel Switches

hp StorageWorks Switch Name	
hp StorageWorks SAN Switch 2/32	
hp StorageWorks Core Switch 2/64	
HP Switch Name	**Compaq StorageWorks Switch Name**
Brocade 2400	SAN Switch 8
N/A	SAN Switch 8-EL
Brocade 2800	SAN Switch 16
N/A	SAN Switch 16-EL
SurestoreFC Switch 6164 (64 ISL Ports)	SAN Switch Integrated/32 (64 ISL Ports)
Surestore FC Switch 6164 (32 ISL Ports)	SAN Switch Integrated/64 (32 ISL Ports)
N/A	SAN Switch 2/8-EL
Surestore FC 1Gb/2Gb Switch 16B	SAN Switch 2/16
N/A	SAN Switch 2/16-EL

Network Interface Controller (NIC) Hardware Support

The following Network Interface Controllers are supported:

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

Operating System Software Support

- Microsoft Windows 2000 SP2 with either Microsoft hotfix Q302895 or Q248720 and Microsoft hotfix Q318271, SP3
- Red Hat Linux v7.3, 8.0 Red Hat Advanced Server 2.1

Compaq Network Teaming Software Support

- Compaq Network Teaming (Windows 2000 only)

SR2122 Management Software Support

The following HP management software is supported:

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

SR2122 Configuration Rules

SR2122 Router Rules

Table 2: SR2122 Router Rules

Maximum scsirouter instances per SR2122 Router (and per SR2122 Router Cluster)	12
Maximum iSCSI host connections per SR2122 SCSI Router instance	32
Maximum active targets per SR2122 Router	100

- The SR2122's 2nd fibre Channel port (FC2) is not supported as a redundant SAN port for FC1.
- Direct connect of the SR2122 FC ports to any HP storage array is not supported.
- The MSR2122 Management port must be in a different subnet than the SCSI Router Instances.

ISCSI Host Rules

Table 3: iSCSI Host Rules

Maximum targets accessed per iSCSI host	Windows 2000	8
	Red Hat Linux	16
Maximum LUNs per target	Windows 2000	255
	Red Hat Linux	256

Operating System Rules

- Windows 2000 and Linux Clustering are not supported.
- hp Secure Path for MSA1000, RA/MA8000, EMA/ESA12000 and Enterprise Virtual Array for Windows 2000 and Linux are not supported.
- hp Auto Path for VA/XP for Windows 2000 and Linux are not supported.
- hp Secure Manager on XP and VA is not supported.
- Multi Linux iSCSI initiators connected to a single SR2122 is not supported.

Storage Array Rules

- The HSG80 is supported in SCSI-3 Transparent Failover Mode only.
- Without hp Secure Path the Enterprise Virtual Array is supported with the SR2122 accessing only one EVA controller port. This will disable controller failover protection.
- Without hp Secure Path the MSA1000 is supported with the SR2122 accessing only one MSA controller port. This will disable controller failover protection.
- The SR2122 fibre channel ports appear as host bus adapters to the FC switches and to all storage arrays.
- Please read "*hp StorageWorks SAN Design Reference Guide* – January 2003 Part Number: AA-RMPNF-TE" for the latest hp storage configurations and rules.

Fibre Channel Switch/Fabric Rules

- The SR2122 is only supported on the hp Infrastructure SAN Switches. HP High Availability Switches are not supported.
- The SR2122 should only be zoned with the storage devices that it will access. Zoning the SR2122 with other servers is not supported.
- The SR2122 iSCSI Router is supported on any currently supported hp Infrastructure Switch fabric. Please read "hp StorageWorks SAN Design Reference Guide – January 2003 Part Number: AA-RMPNF-TE" for the latest hp Infrastructure switch topologies and fabric rules.

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 is available on the SAM Website.
- CIM 7 Supports the SR2122's SNMP management capabilities.
- Management of the storage arrays through the SR2122 is not supported. Please use the recommended application/element manager to configure the storage array.

Configuring the SR2122 iSCSI Storage Router in a SAN

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

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

SR2122 Setup

The SR2122 can be configured either as a standalone or clustered device. In Standalone Mode, as the name implies, the SR2122 does not have failover capabilities to other SR2122s. In Clustered Mode up to four SR2122s can be used as failover when presenting storage to iSCSI Initiators.

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

For further SR2122 configuration details, please read "*hp StorageWorks iSCSI storage router 2122 User Gui*de PN: 304835-002" Chapter 5 – Configuring the Storage Router.

Whether adding SR2122'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 FC ports using the SR2122'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 FC ports using the SR2122's GUI, click on the FC port in the Monitor window:

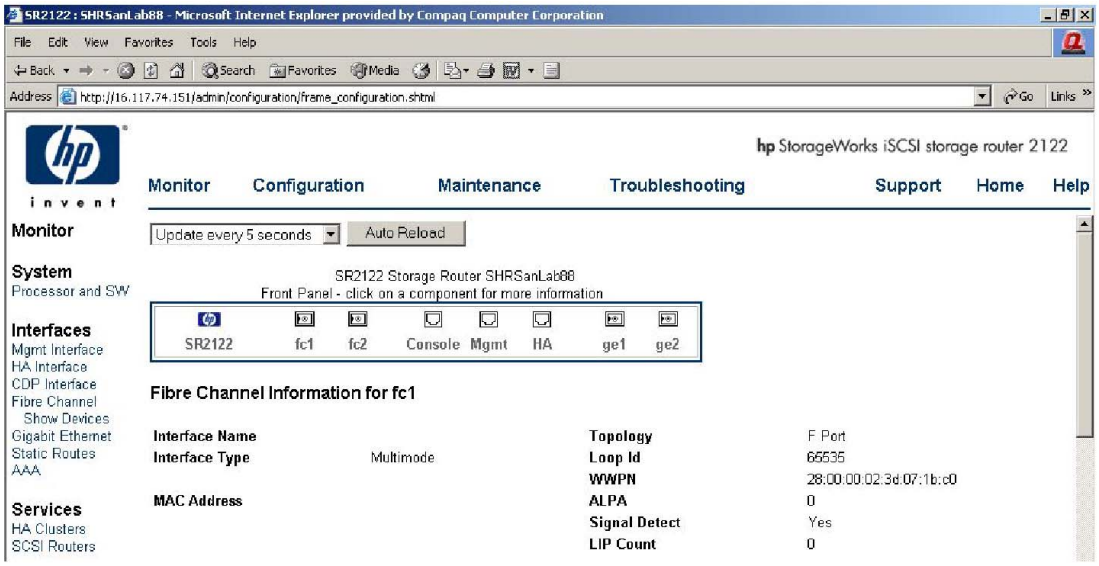


Figure 2: GUI Display of the FC port WWPN

Adding a Standalone SR2122 to a SAN

The two SR2122 FC ports are recognized as F-Ports by the FC switch and as FC 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, as multi-pathing is currently not supported.

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

Standalone SR2122 examples:

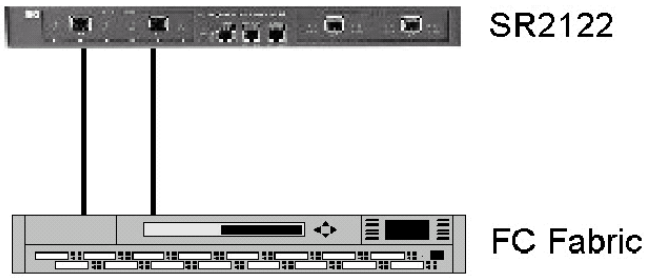


Figure 3: Standalone SR2122; Single SAN

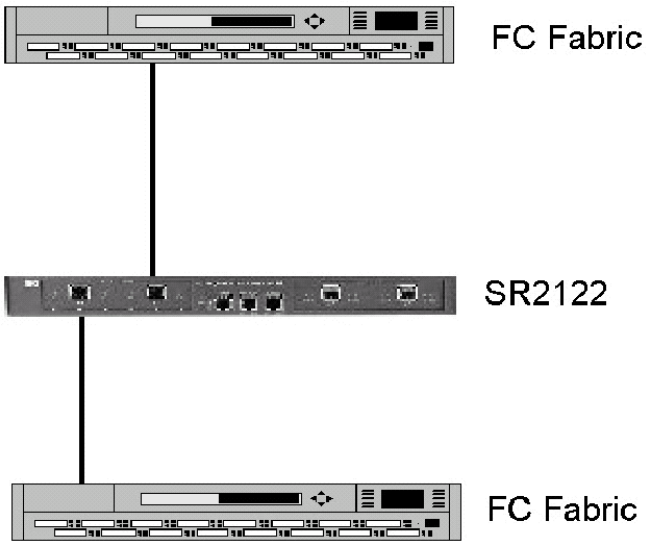


Figure 4: Standalone SR2122; Dual SANs

Adding a Clustered SR2122 to a SAN

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

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

Note: Important: Although Multi/Auto Pathing is not supported at the iSCSI Initiator a certain level of failover is available at the SR2122 when configured in a cluster.

Normally, only one SR2122 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 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 FC ports in the same zone.

Clustered SR2122 Example:

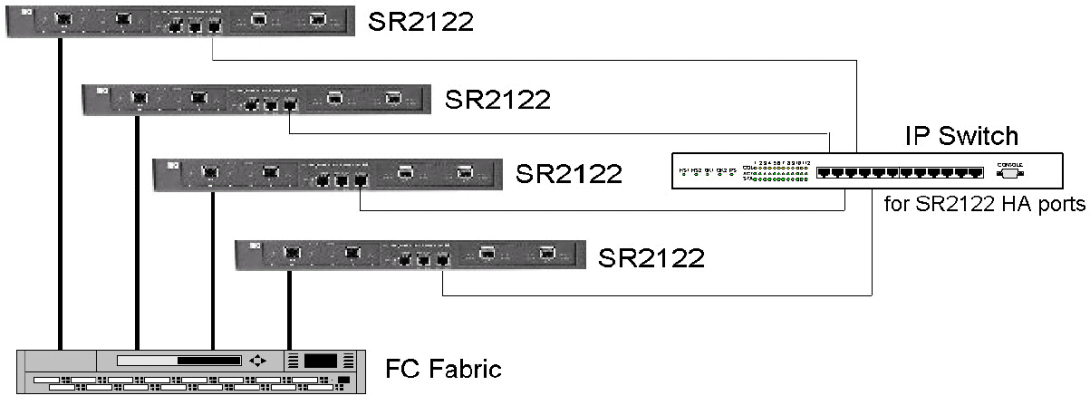


Figure 5: Clustered SR2122

Serving Fibre Channel Storage to the SR2122

Once the SR2122 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 FC storage to the SR2122, then we have to present that storage to the iSCSI Initiators over IP.

As previously mentioned, the SR2122 FC 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's FC port. This section describes how to serve storage from each supported storage array – MSA1000, RA/MA8000, ESA/EMA12000, Entriprise Storage Array, VA and XP – to the SR2122.

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. If not, if is suggested to read the configuration/user/reference guides for the storage array in question.

Please read "*hp StorageWorks SAN Design Reference Guide* – January 2003 Part Number: AA-RMPNF-TE" for the latest HP storage configurations and rules.

Presenting MSA1000 LUNs to the SR2122

MSA1000 storage volumes must be pre-configured before the LUN(s) can be detected and recognized by the SR2122. 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.

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

First, the Show Connection command will determine if the MSA1000 storage array is aware of the SR2122 FC 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's FC 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, 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 will see Unit 1 as LUN 2 whereas in VSA Mode the SR2122 will see the unit as LUN 1.

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

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

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

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. The HSG80 controllers can be configured either through its serial port or through the HSG Element Manager application found on the SAN Management appliance.

Note: The HSG80 is only supported in Transparent Failover Mode.

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.

First, the Show Connection command will determine if the HSG80 is aware of the SR2122 FC 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 FC 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's FC 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 the command would be:

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

To verify D81 is enabled only for the SR2122 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 Cluster mode the WWPN for a FC port on each SR2122 cluster member must be added to the HSG80 Unit.

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

Presenting Enterprise Storage Array (EVA) LUNs to the SR2122

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

Note: Because the HSV is only configured in multi-bus mode, only one 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 FC port. **Caution**: This will prohibit controller failover.

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.

First, a host entry for the SR2122 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 

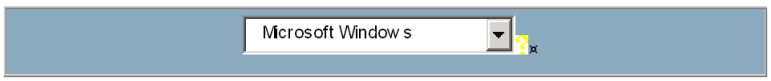
button that appears on the content screen.

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

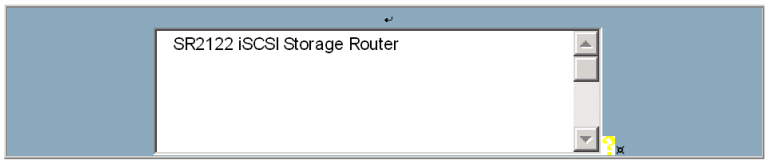
STEP 2: Enter the IP address (optional)
If your host uses a static LAN IP address, enter the address. Skip this step if your host uses dynamic IP addresses.

STEP 3: Enter an adapter port World Wide Name: Enter the SR2122's FC port WWN.

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



STEP 5: Add comments for this entry (optional)



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 :

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

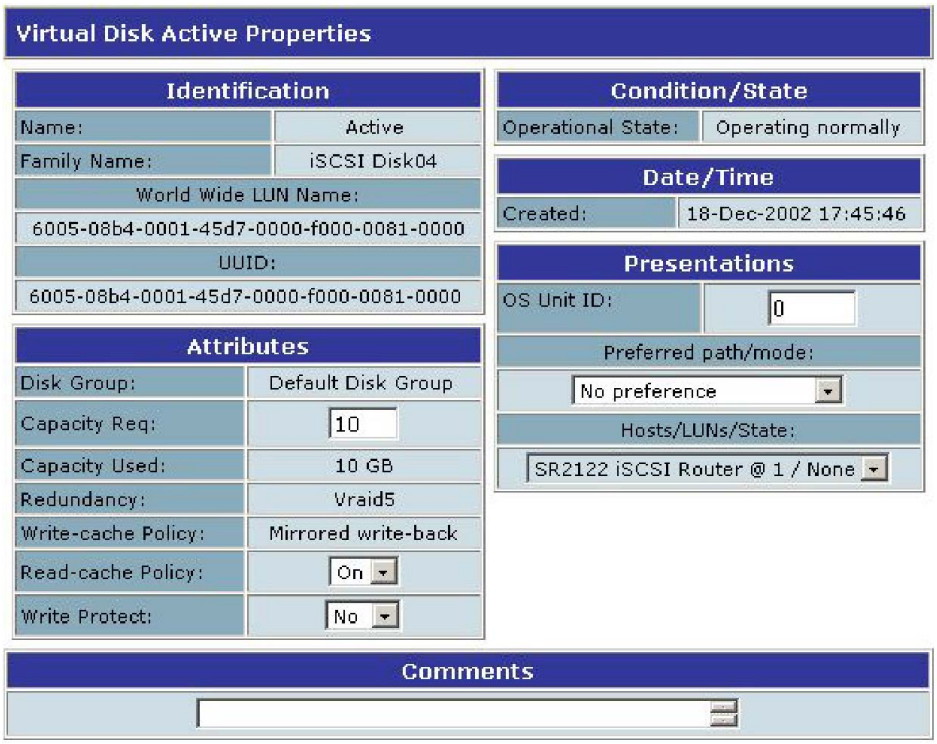


Figure 7: Virtual Disk Properties Entry

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

The SR2122 should now be able to present ‘iSCSI DISK04’ as storage to iSCSI Initiators.

Presenting VA LUNs to the SR2122

VA storage volume must be pre-configured before the LUN(s) can be detected and recognized by the SR2122. A VA can be configured either through Virtual Front Panel (VFP) via RS232 or HP SureStoreCommand 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's FC 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. It is required to have this port dedicated to the SR2122 fabric zone.

Additional required configurations are:

1. Set the Fibre Channel HOST MODE: Linux or Win2k (to reflect Linux OS orWin2K)
2. Select the FIBRE TOPOLOGY (depends on configuration)
3. Set the Loop ID of the Array Fibre Channel Port to a unique value for Private Loop topology configurations.

No additional configuration is required for running an SR2122 in cluster mode, since the other SR2122's FC 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 should now present the LUNs as storage to the iSCSI initiator.

Presenting XP LUNs to the SR2122

XP storage volume must be pre-configured before the LUN(s) can be detected and recognized by the SR2122. 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's FC 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. It is required to have this port dedicated to the SR2122 fabric zone.

---

1. Set the Fibre Channel HOST MODE: 00 (to reflect Linux OS)
2. Select the FIBRE TOPOLOGY (depends on the configuration)
3. Set the Loop ID of the Array Fibre Channel Port to a unique value for Private Loop topology configurations.
4. Updated SAN support is available via HP's internel web at http://turbo.rose.hp.com/spock :select "XP SAN Support Connectivitiy Streams" on the web page.

Note: No additional configuration is required for running SR2122 in cluster mode, since the other SR2122's FC 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 should now present the LUNs as storage to iSCSI initiator.

Serving Storage to the iSCSI Initiators from the SR2122 over IP

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

SR2122 Devices

Regardless of the SR2122 being in a Standalone or Cluster configuration once storage is presented to a SR2122, the SR2122 node should recognize these new devices. If not, the SR2122 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 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 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 ZG95004670.
5. This is the CCL from the HSG80 served from storage port ZG95004670.
6. This is unit D181 from an HSG80 served from storage port ZG95004670.

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

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

SR2122 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 storage to a specific iSCSI initiator. Much like selective storage presentation on the storage controllers, the SR2122 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 4: SR2122 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 router must have an access list entry for each iSCSI initiator

Access List entries may be created through the SR2122 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 (all 32 bits of the IP address). If the mask /24 was used, it would mean to allow any iSCSI Initiators with an IP address that begins with 16.117.74.0. The mask /16 would mean any iSCSI Initiators that begin 16.117.0.0.

If the mask /24 was used it would mean allow any iSCSI Initiators with an IP address that begins with 16.117.74.0. The mask /16 would mean any iSCSI Initiators that begins 16.117.0.0.

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 the Add Access List from the Configuration page:

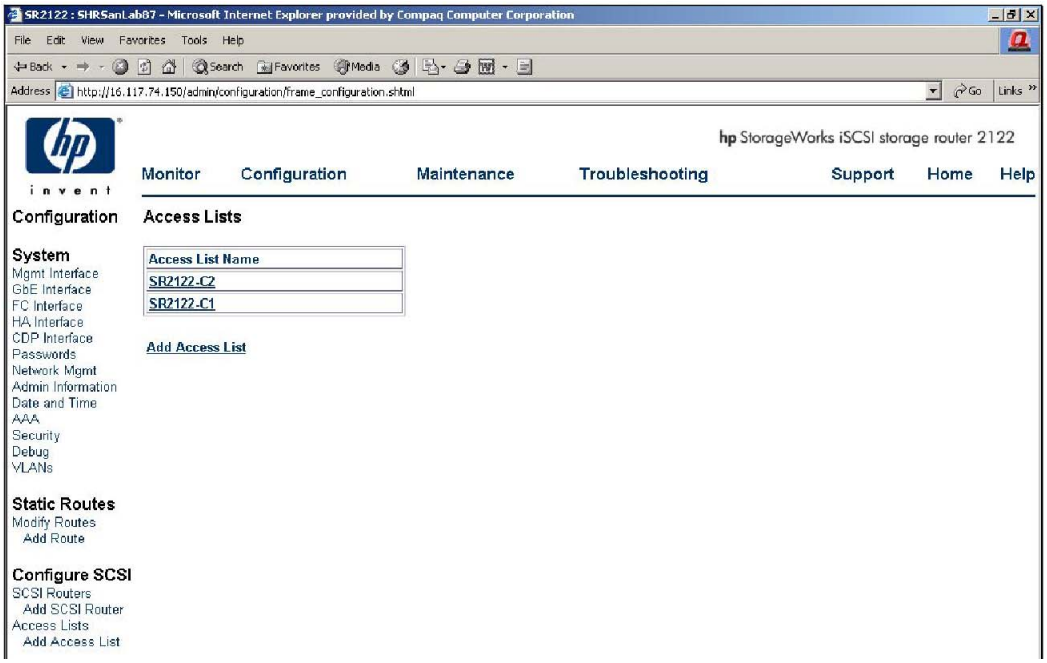


Figure 8: Access List Entry

Enter the iSCSI Initiator name and click ADD.

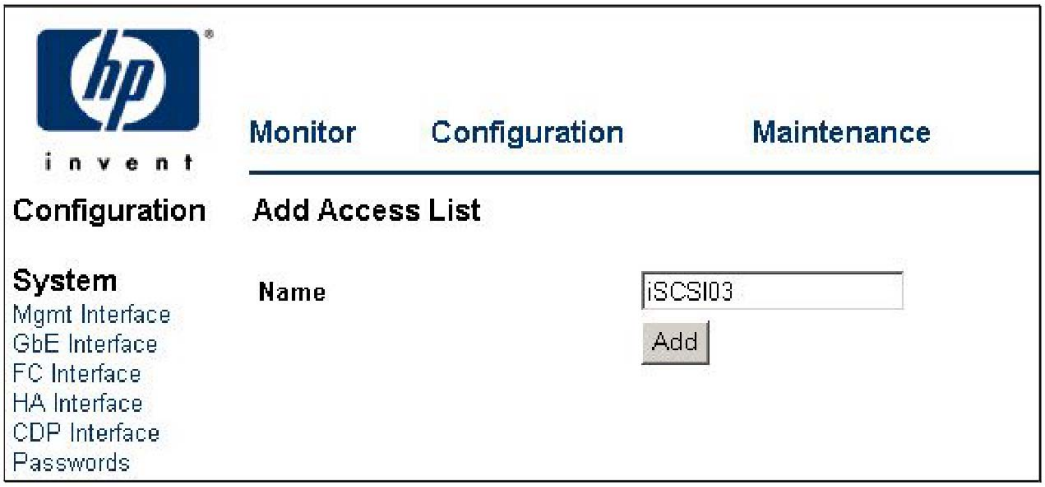


Figure 9: iSCSI Initiator Name

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

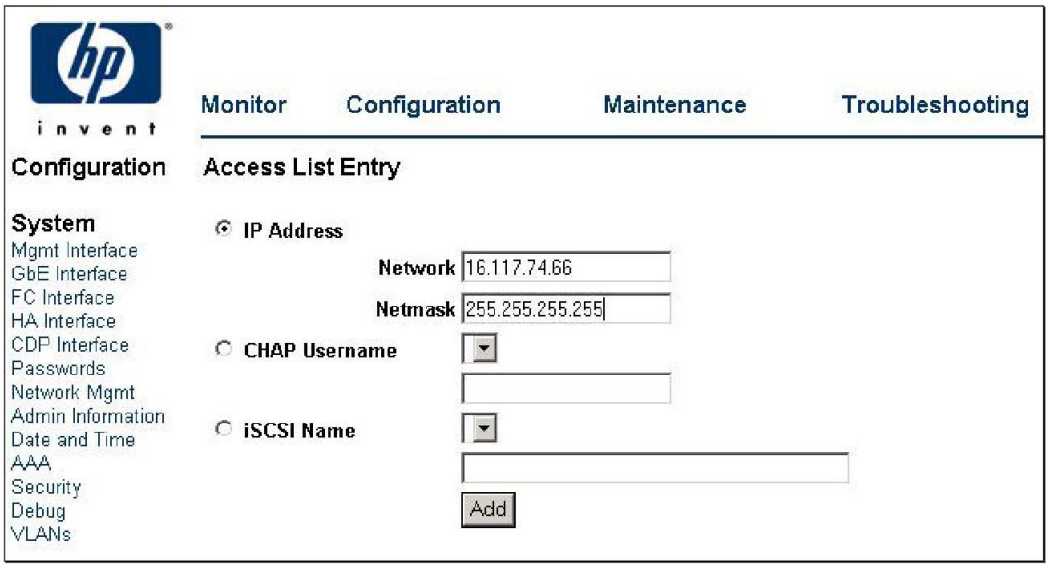


Figure 10: iSCSI Initiator IP Address

The Access List entry will now display.

Figure 11: Completed Access List Entry

SR2122 SCSI Router Instances

Presenting SAN storage over IP to the iSCSI Initiators from the SR2122 is done by creating a SCSI Router Instance within the SR2122. 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 it's storage from the SR2122.

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

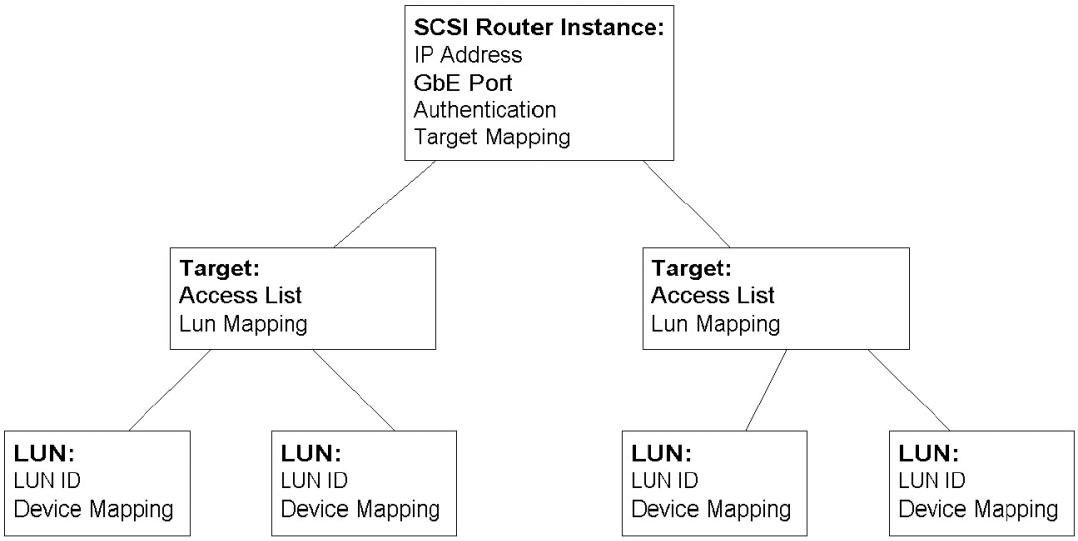


Figure 12: SCSI Router Instance Structure

SCSI Router Instance – Contains the IP address used by the iSCSI Initiator, the SR2122 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 Device associated with the LUN.

Creating a SCSI Router Instance

The SCSI Router Instance may be created using the SR2122 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 5: SCSI Router Instance Example

SCSI Router Name / IP address	Target Name	Target LUN #	WWID	Controller LUN #
ISCSI03_Disks	HSV23_T1	1	50001fe150002f78	1
33.33.33.101/24		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 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 ge1
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 ge1                33.33.33.105/24                 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 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 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.

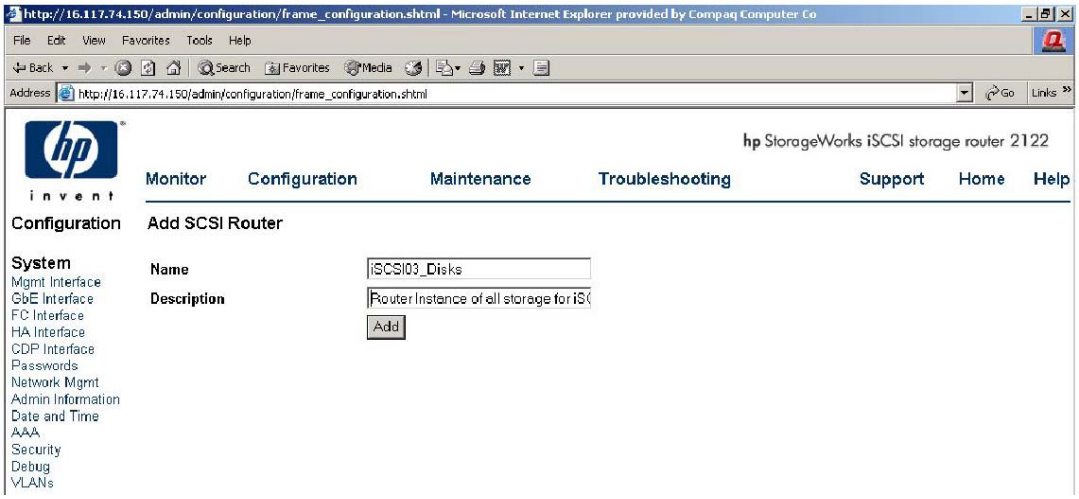


Figure 13: SCSI Router Instance Name and Description

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

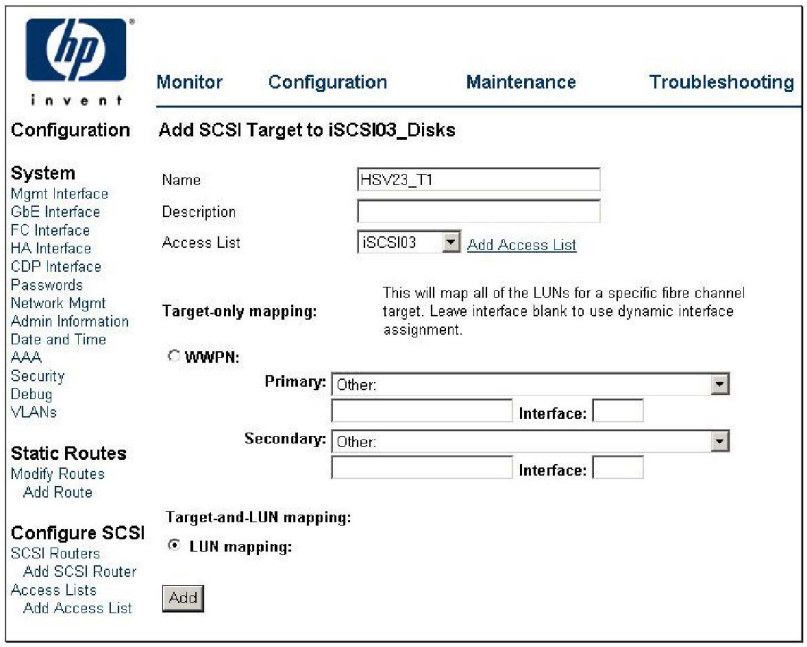


Figure 14: Add Target Name and Access List Entry

At the Configure LUNs screen click Add LUN.

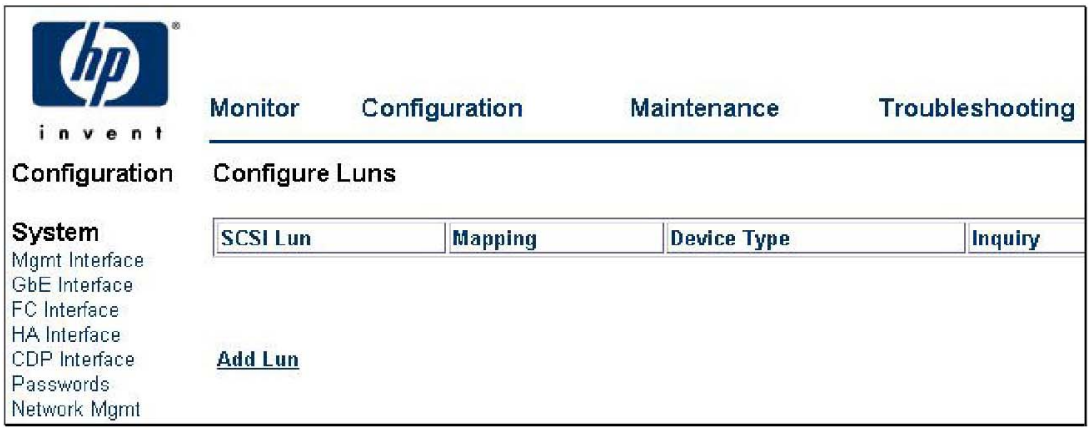


Figure 15: Configure/Add LUN

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.

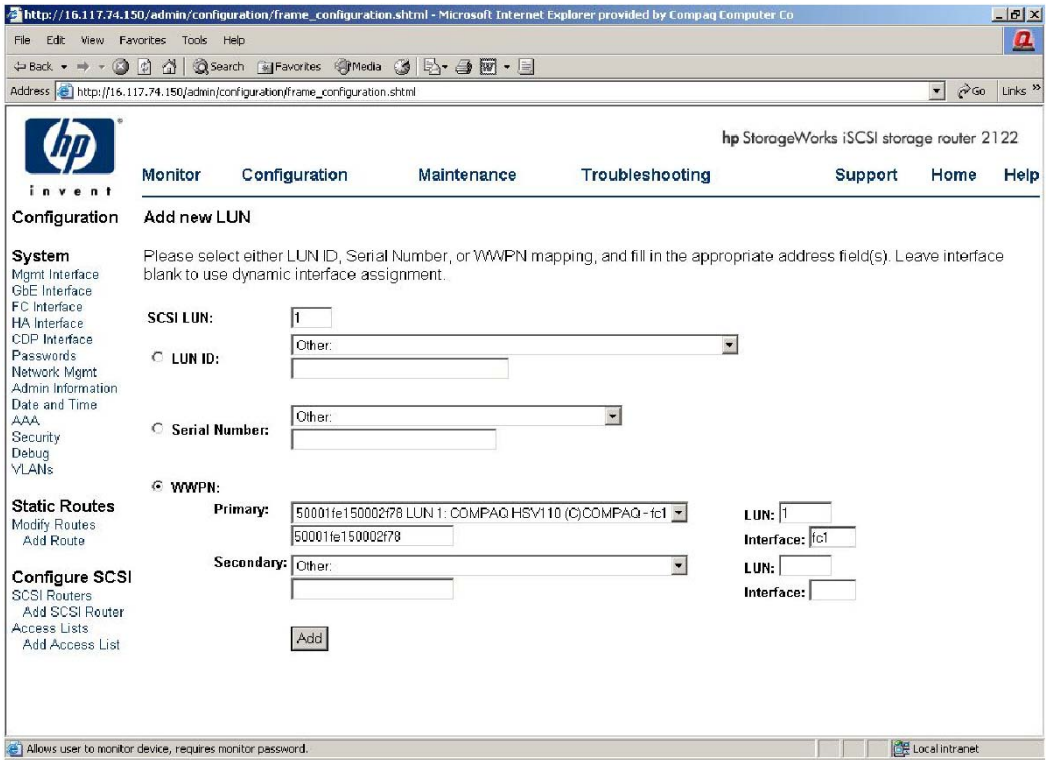


Figure 16: Add New Lun

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

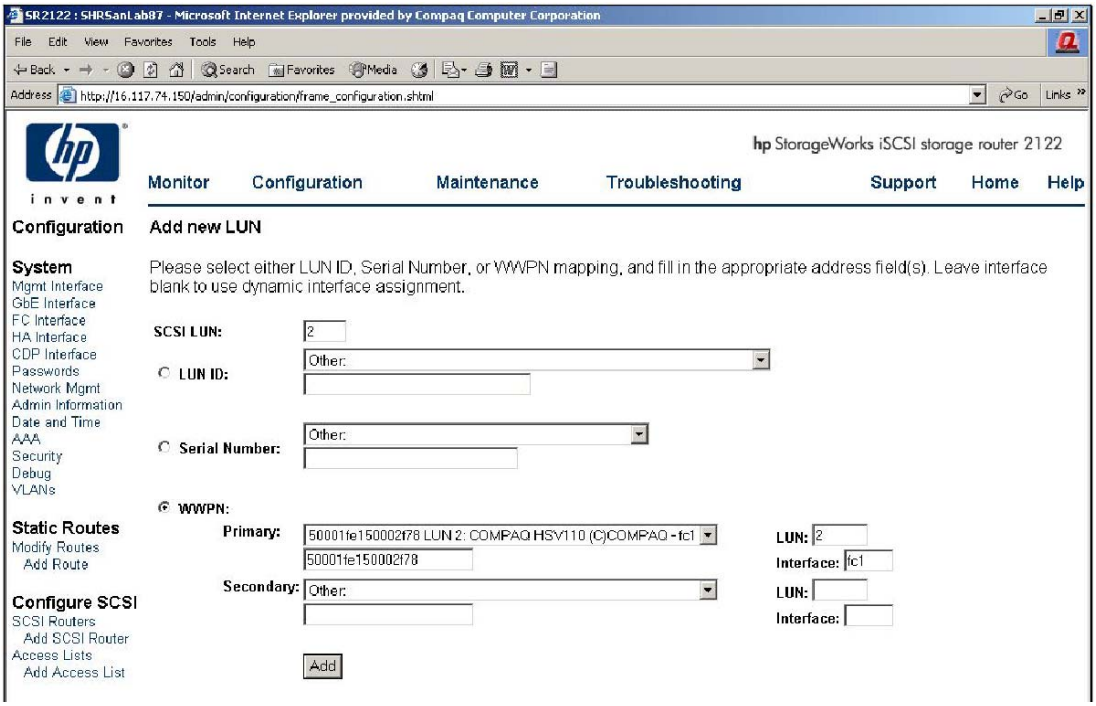


Figure 17: Add Second LUN

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

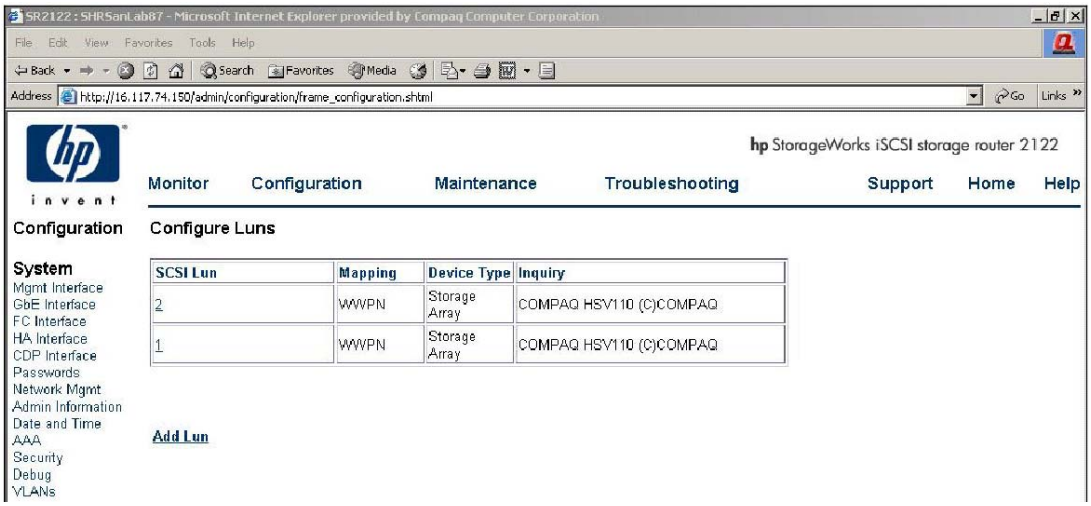


Figure 18: New LUNs

Click on SCSI Routers to display all SCSI Router Instances.

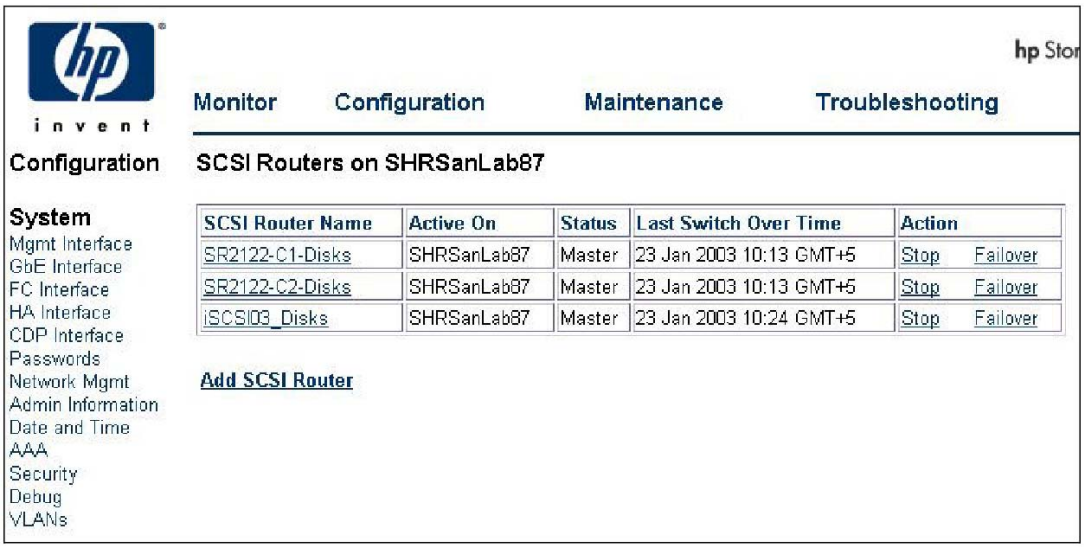


Figure 19: All SCSI Router Instances

Click on the newly created Instance, iSCSI03.

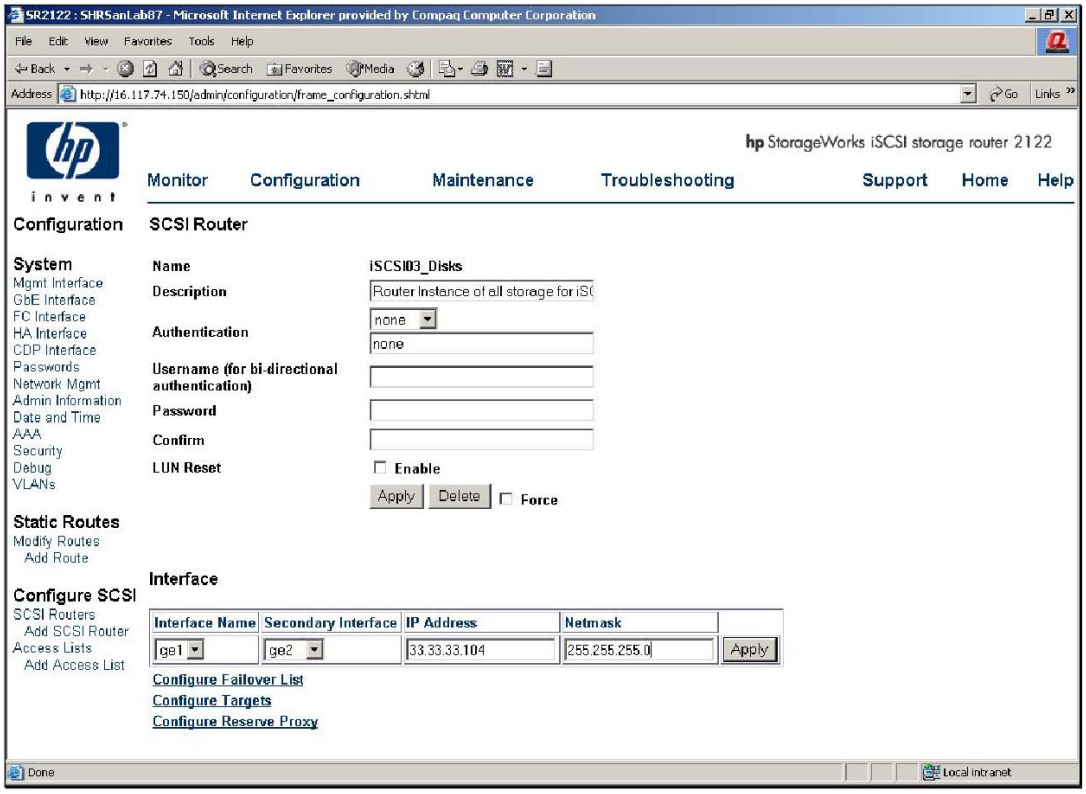


Figure 20: Instance iSCSI03

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

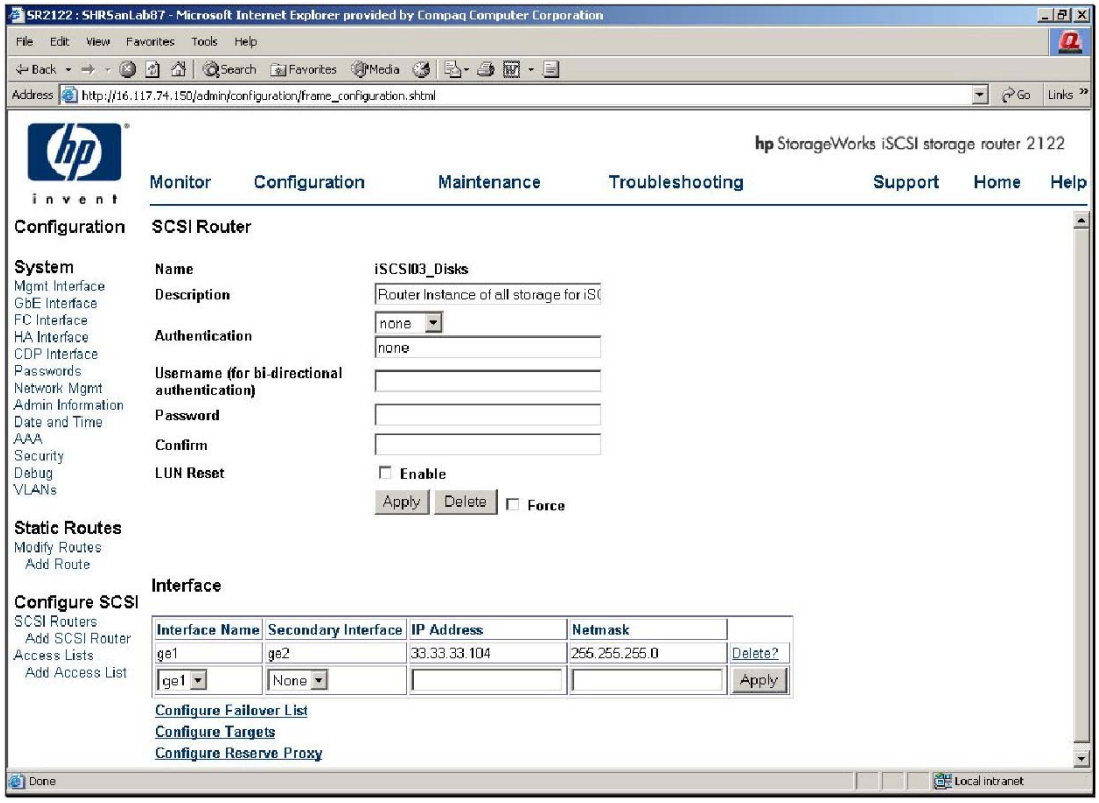


Figure 21: Secondary Interface

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 over IP. The iSCSI driver is configured with the Gigabit Ethernet IP address of each SCSI routing instance running on the SR2122 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.

Currently, the SR2122 supports Microsoft Windows 2000 and Red Hat Linux as iSCSI Initiators.

iSCSI Initiator Setup for Windows 2000

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 via an IP network. The SR2122, 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 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 Solution CD and choose Install iSCSI Driver from the install menu or by running Setup.exe from the SR2122 Solution CD directory: iscsi_initiator\HP\Win2K

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 eight 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.

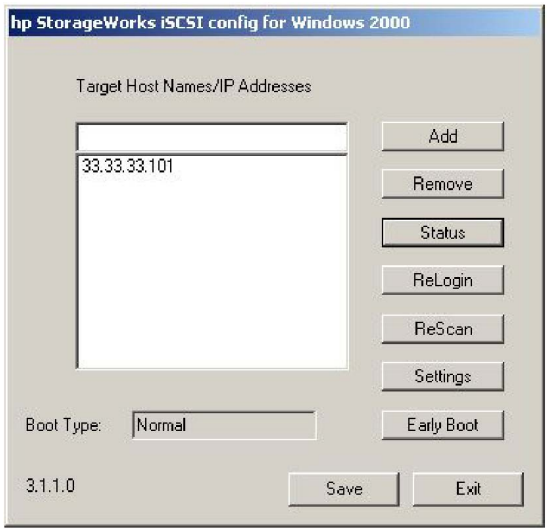


Figure 22: SCSI Router Instance IP Address

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.

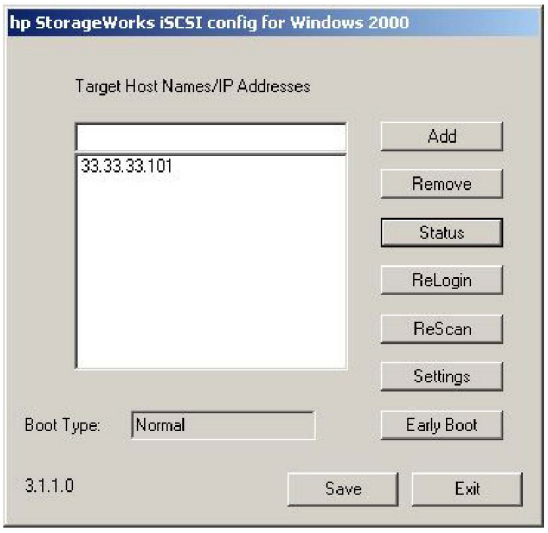


Figure 24: iSCSI Configuration Screen

The **Status** button is used to display iSCSI connection status to the SCSI Router Instance IP address and it's 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.

Settings: 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 until after most of the Windows 2000 operating system 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. The SR2122 sends available iSCSI target names to the IP host.
3. The IP host logs in to the iSCSI targets.
4. The SR2122 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 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 6: 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.).

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 iSCSI router:

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

Loading the iSCSI Driver

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 exists 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 'mtln', '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 it's 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, no matter how many times the driver is 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 Filesystems

Because the Linux boot process normally mounts filesystems 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 filesystems 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 filesystem 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 Filesystems

It is very important to unmount all filesystems 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 filesystem corruption may occur.

Since Linux will not unmount filesystems 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 filesystem 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 filesystems and kill the iSCSI daemon, terminating all connections to iSCSI devices.

Caution: Filesystems 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
```

SR2122 / Insight Manager 7 Service Pack 2 Integration

The purpose of this section is to describe the integration of the HP SR2122 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.
- 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.

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

Management Server Feature	Minimum Requirements
Management Server Operating System	Microsoft Windows NT Server 4.0 Retail with Service Pack 6a or later Microsoft Windows NT Server 4.0 Enterprise with Service Pack 6a or later Microsoft Windows NT Server 4.0 International with Service Pack 6a or later Microsoft Windows XP with Service Pack 1 or later Microsoft Windows 2000 Server with Service Pack 2 or later Microsoft Windows 2000 Advanced Server with Service Pack 2 or later Microsoft Windows 2000 Professional with Service Pack 2 or later Microsoft Windows 2000 International, International English, French, German, Spanish, and Japanese with latest Microsoft Service Pack applied Windows .NET Server 2003, Standard Edition Windows .NET Server 2003, Enterprise Edition 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. Microsoft Internet Explorer 5.5 or later is only required if you want to browse.
Server Software	TCP/IP installed SNMP services installed and active Microsoft Internet Explorer 5.5 with Service Pack 2 or later Microsoft Internet Explorer 6.0 Microsoft Internet Explorer 5.5 or Microsoft Internet Explorer 6.0 is only required if you want to browse locally on the server.

Table 7: Management Server Hardware and Software Minimum Requirements

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

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 Management Port

The SR2122 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 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 has been enabled to be managed and is configured correctly for the level of SNMP and management support.

SR2122 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 to integrate with IM 7 SP2

First, the SR2122 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 Management Port TCP/IP configuration:

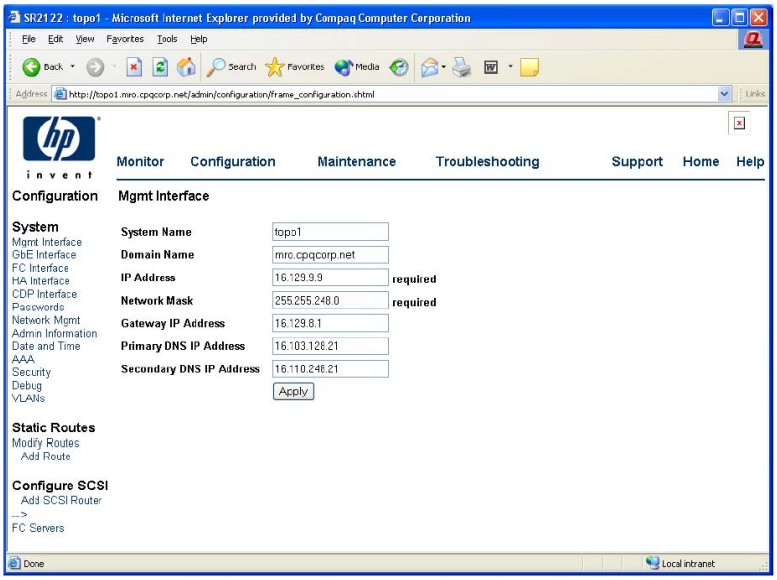


Figure 26: Valid SR2122 Management Port TCP/IP Configuration

Next, Network Management information must be configured:

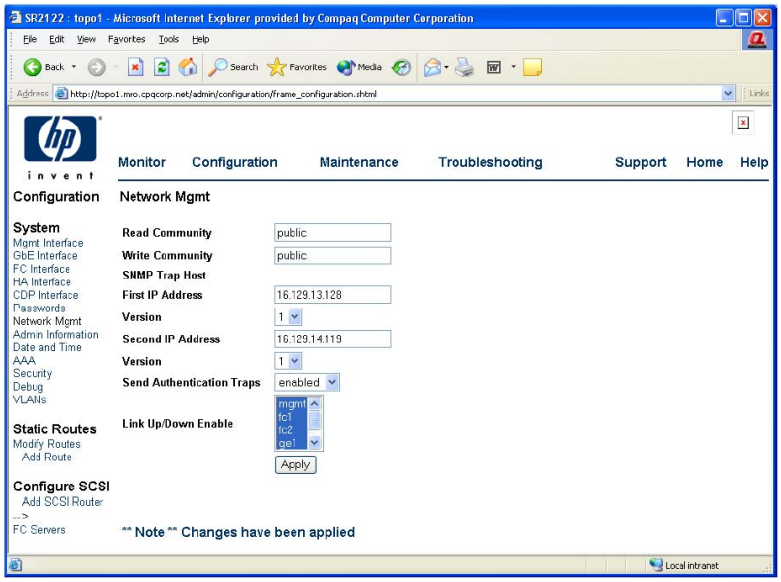


Figure 27: Network Management Configuration

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, 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

Discovering the HP SR2122

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

Automatic Discovery

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

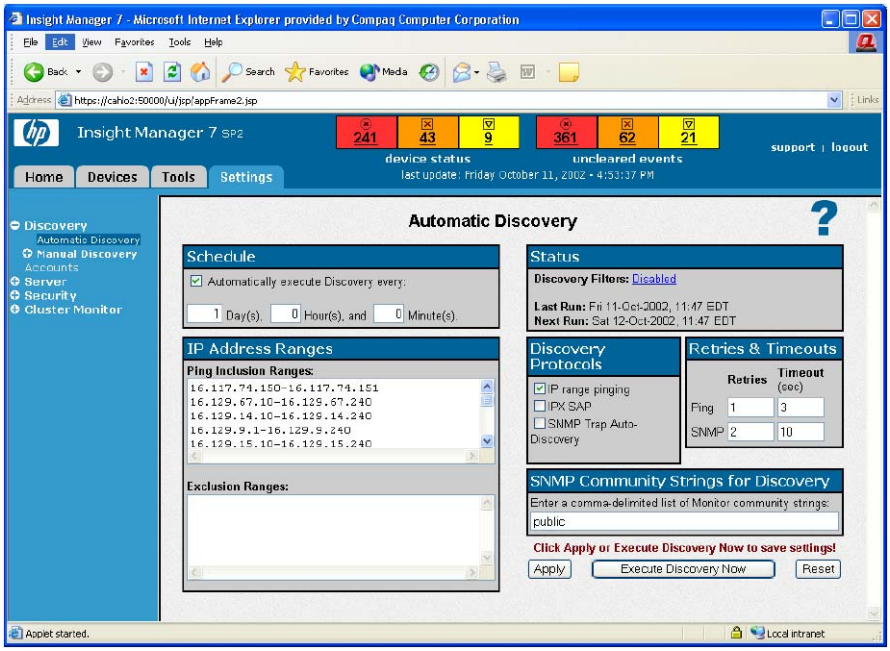


Figure 28: Automatic Discovery

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

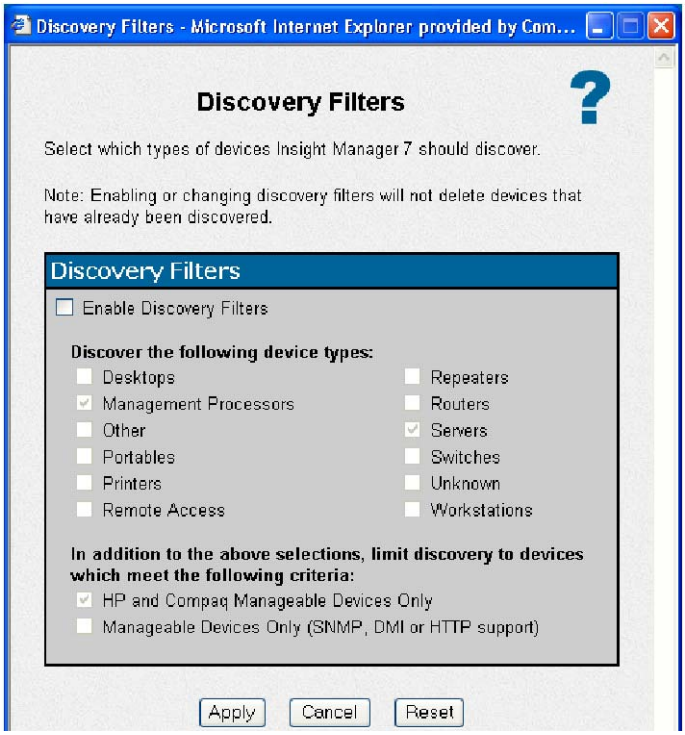


Figure 29: Discovery Filters

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.

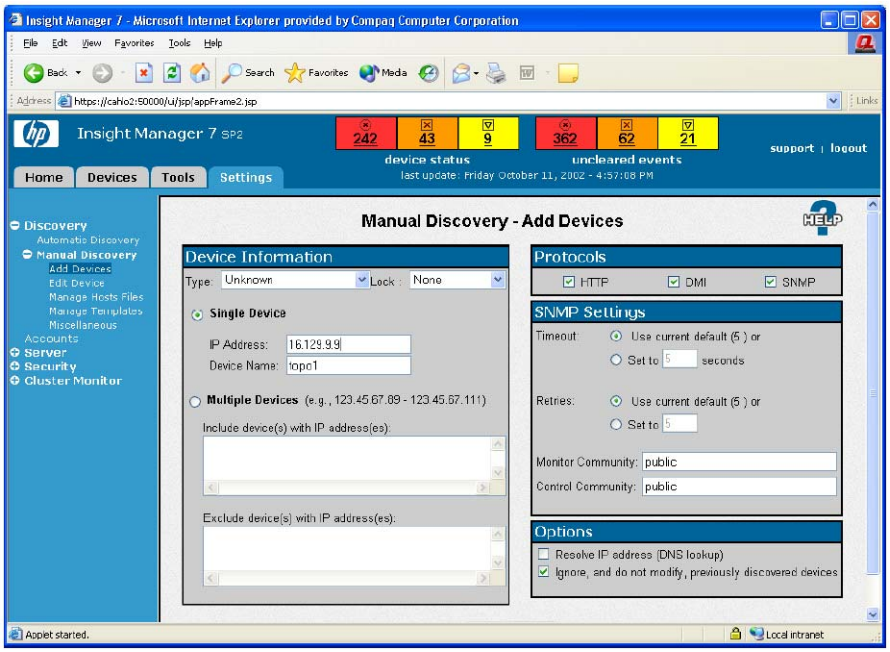


Figure 30: Manual Discovery

SNMP Customizations

SNMP Community Strings

The SNMP community strings for “Monitor” and “Control” of the devices must correspond to the HP SR2122’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:

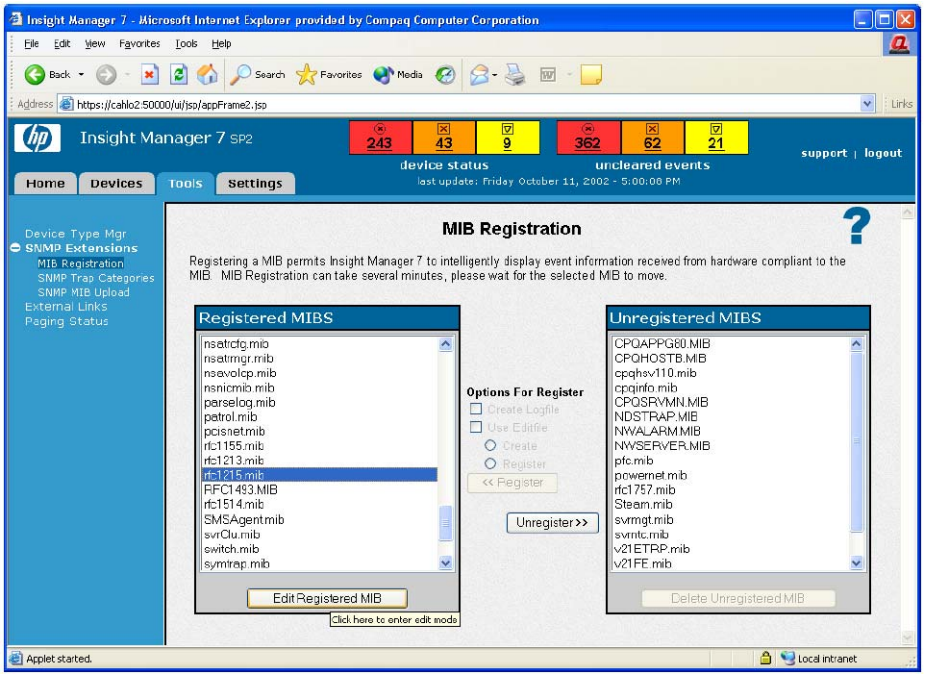


Figure 31: SNMP Authentication Trap Enabling

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

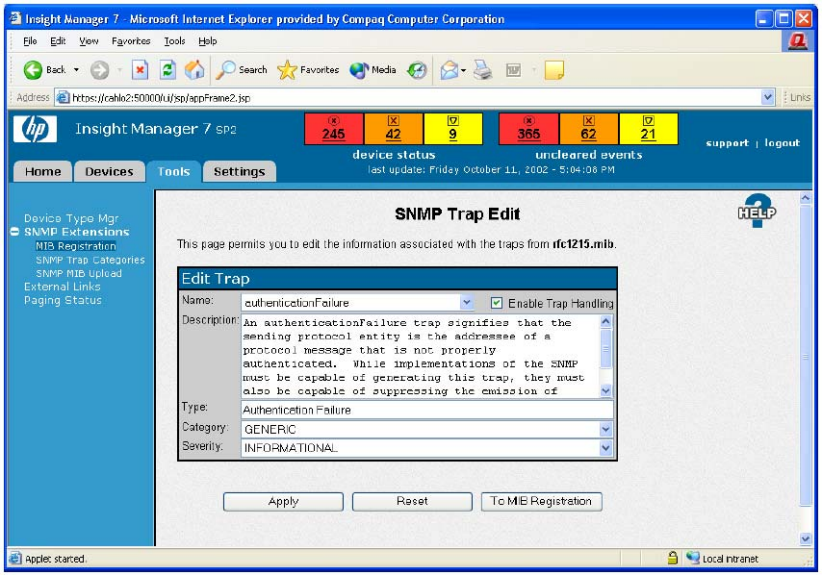


Figure 32: SNMP Trap Edit

Click on Enable Trap Handling then click Apply.

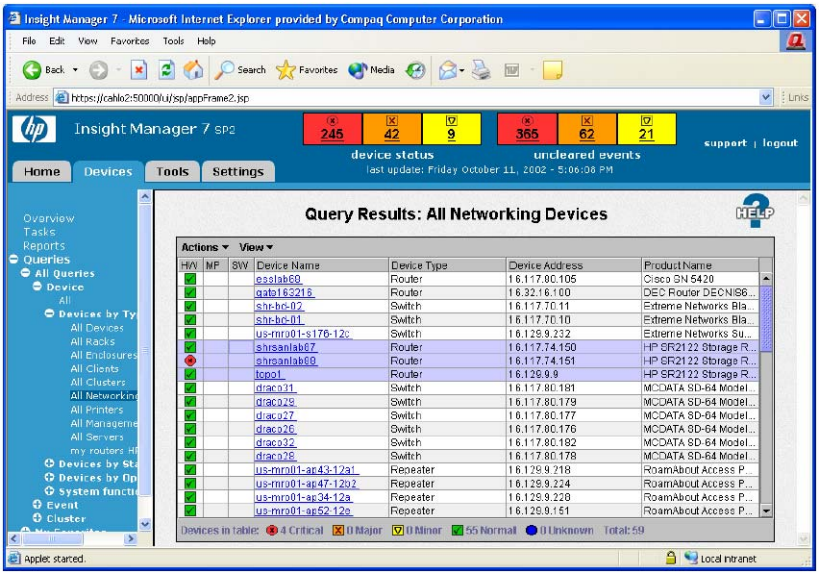


Figure 33: SNMP Network Query

You will find that the HP SR2122 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 the "*hp StorageWorks SAN Design Reference Guide* - January 2003 Part Number: AA-RMPNF-TE"

For maximum supported IP configurations please consult with your network administrator

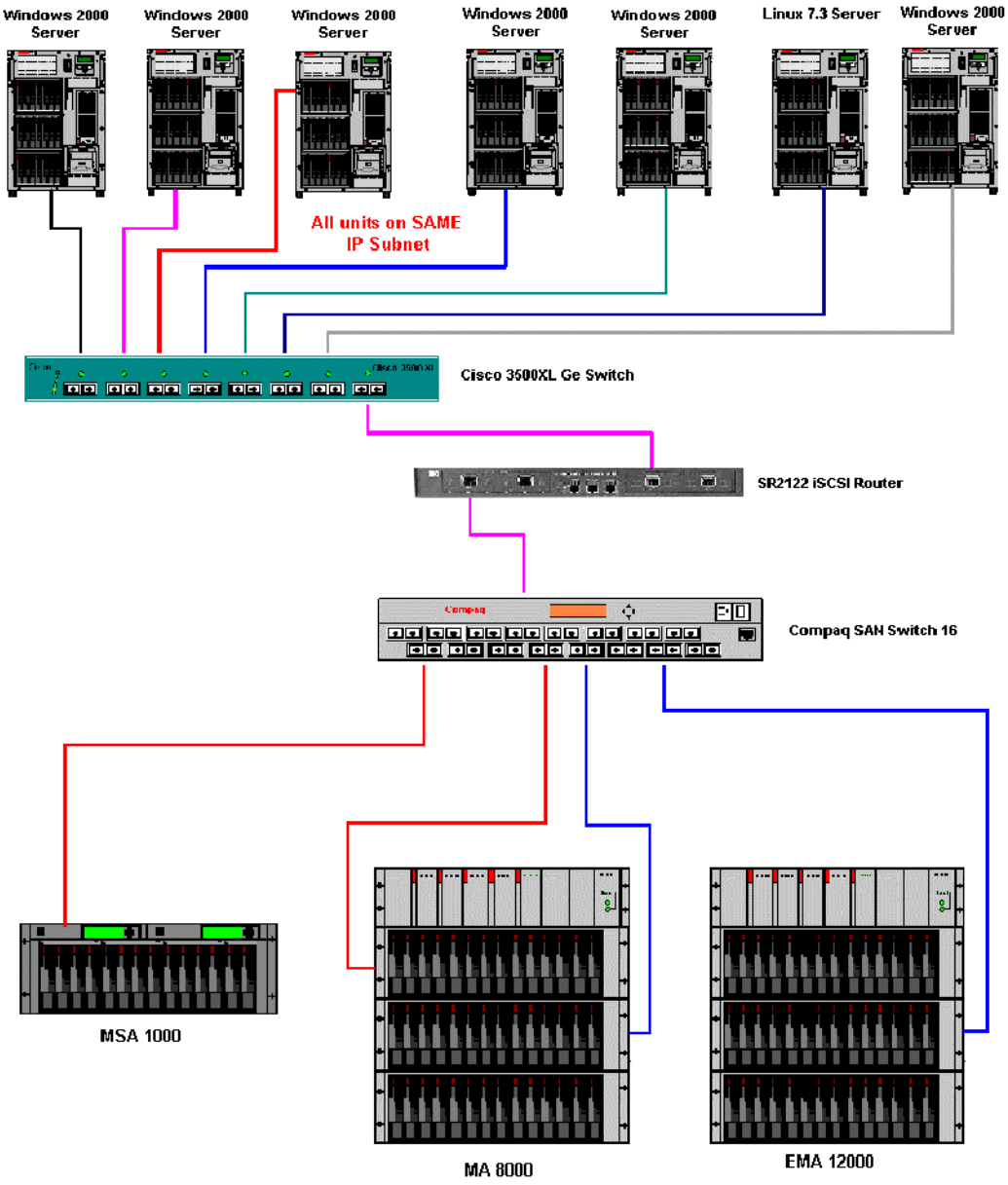


Figure 34: Example of Multiple OS Systems in a Non-Redundant Path Configuration

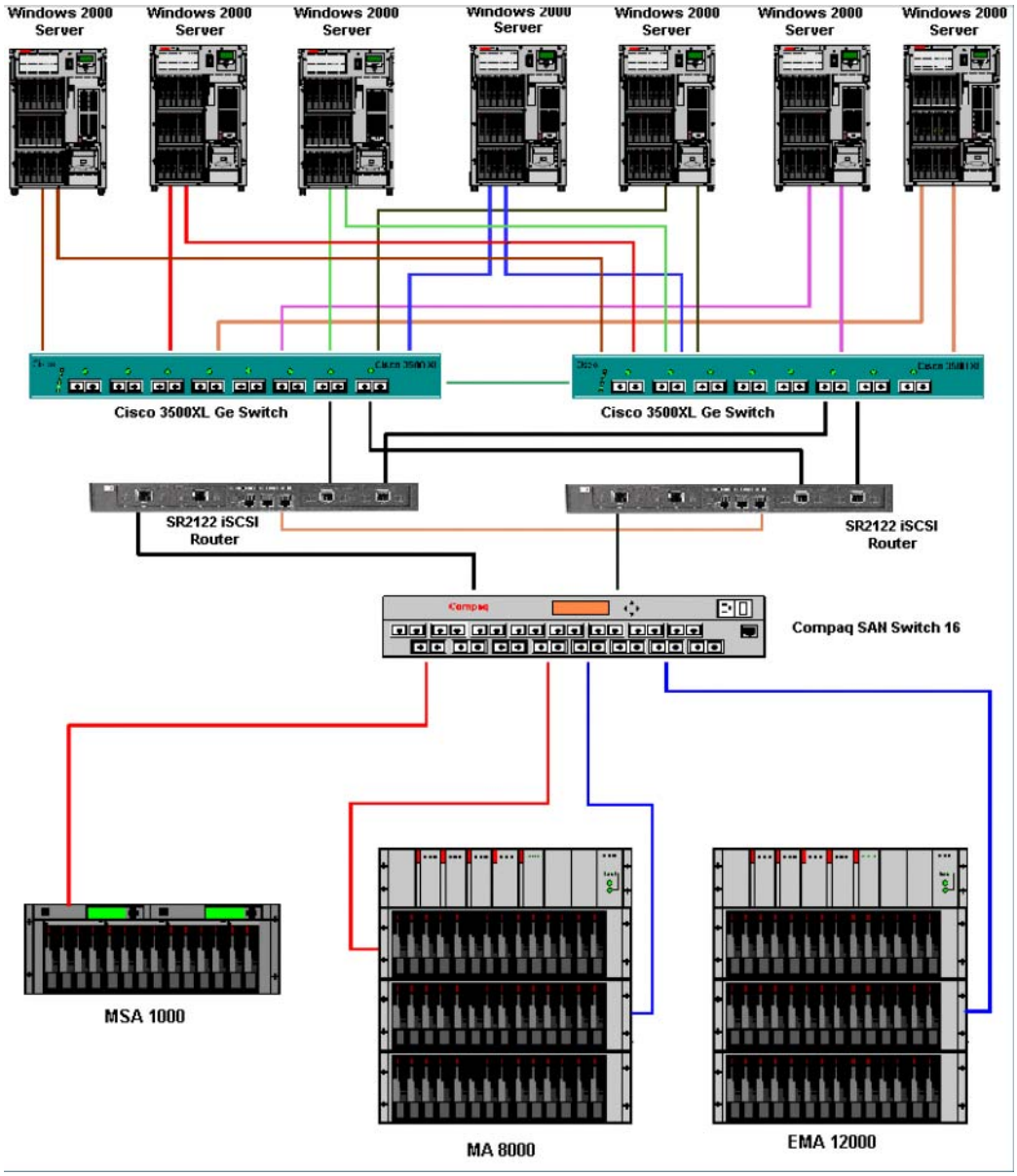


Figure 35: Windows 2000 Servers with NIC Teaming: 2 Node SR2122 Cluster

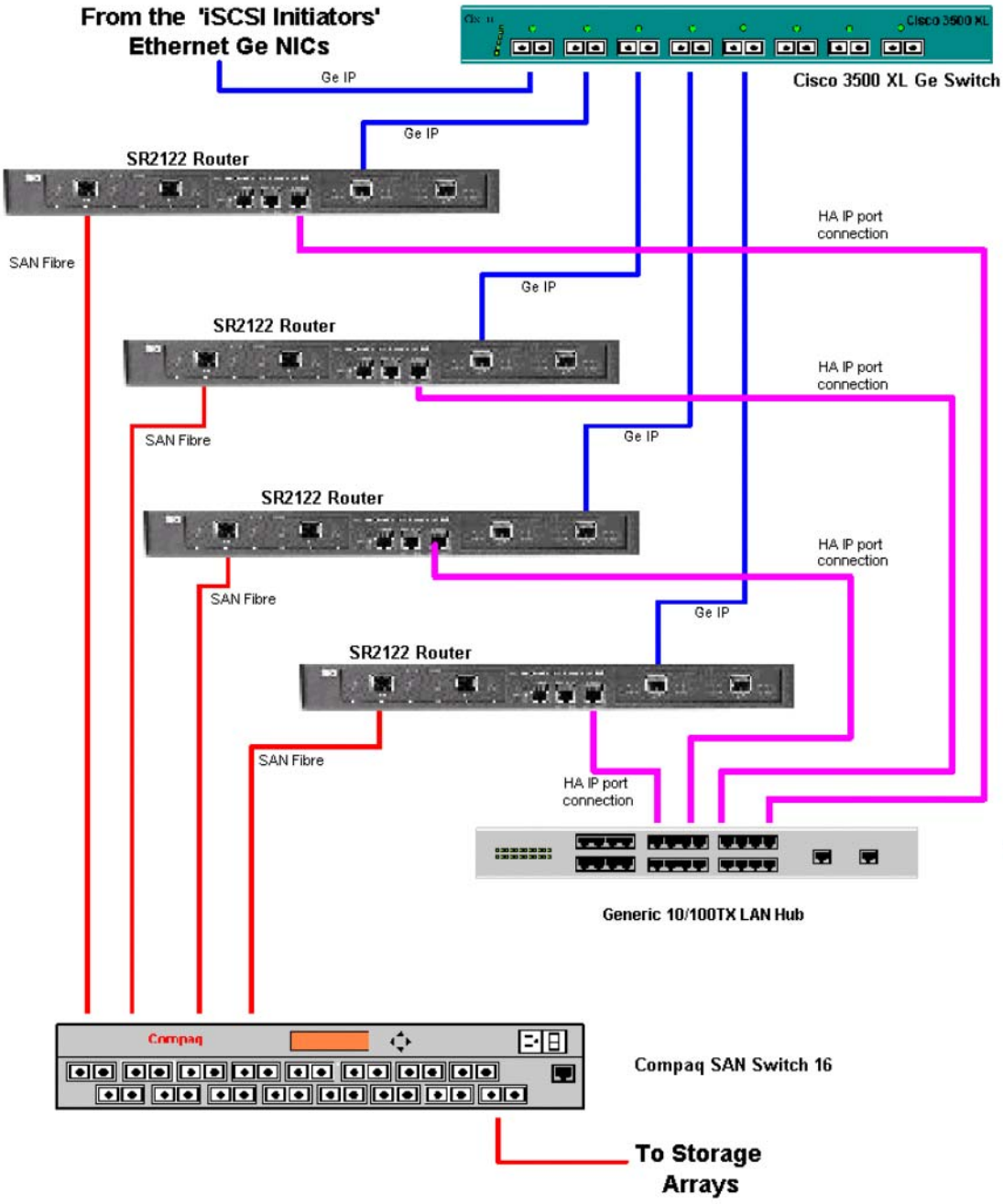


Figure 36: Maximum SR2122 Cluster Configuration Using HA Ports