

# **SANRAD White Paper: IP SANs to Replace NAS WP 006-01**

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## Introduction

A number of businesses are selecting IP SAN solutions over traditional NAS products for fulfilling storage consolidation projects. This document reviews the advantages and disadvantage of NAS vs. SAN, how NAS vendors address their disadvantages, and introduces an IP SAN solution, which combines any disk storage system with SANRAD's iSCSI V-Switches. This complete IP SAN solution will deliver a better solution than NAS.

## Why has NAS emerged as an alternative for storage consolidation?

NAS solutions allow file sharing over IP networks. This is the early form of IP-Storage, which provided central storage over an IP Network. NAS provided the following advantages over traditional FC SANs.

**Table 1: NAS advantages over Fibre Channel**

	<b>Fibre Channel</b>	<b>NAS</b>
Cost of adding a server to the shared storage	<b>\$2,000 to \$7,000 per server:</b> - Need for FC HBA (one or two per server) - Need for software agents on the server for volume management	<b>No cost:</b> Every server has LAN connection
Infrastructure Cost	<b>Expensive:</b> Need for FC switching infrastructure. Special Cabling (Copper) or dedicated cabling (Fibre)	<b>No Cost:</b> Use of Existing LAN
Required Skills	Need specialized FC training and tools	No need for special training or tools
Sharing Storage with Remote Servers	Limited distance (FC) or expensive FC tunnelling	IP – can work easily over LAN, WAN of MAN
Ease of use	Requires special management software, special training- allocation and management of volumes is complex	Easy – file based access allows for simpler management
Interoperability	Issues with multi vendor, integrating many technologies (Host agents, switches and storage from different vendors are difficult to manage)	Operates over LAN, NAS stand alone systems are easy to install and integrate

These advantages present a very appealing economic and management proposition allowing NAS to gain market share in places where FC performance is not required or in places where file sharing is the problem (e.g. R&D organizations that perform joint development and have a large file base to manage with no other applications).

In spite of these advantages, NAS has many obstacles.

**Table 2: NAS drawbacks compared to FC**

	Fibre Channel	NAS
Fit for Block / Non-File Based applications like databases	Easy	Difficult: Due to performance, block management issues and clustering issues, it is not possible to run many applications on a NAS system
Performance	High: - Can get to 2GBs per port with multiple ports - Block based access does not impose a bottleneck	Low: - Most NAS solutions run over Fast Ethernet networks. - NAS has to run a file system and perform protocol translation causing large performance bottlenecks
Scale without degrading performance and availability	Adding more servers and storage while maintaining QoS is simple	Poor Scalability: The NAS file system and software is limited in size and performance. NAS controllers are difficult multi-path and cluster.
High Availability	Very Easy: Providing multiple paths for storage traffic is very easy because FC is a network.	Very Difficult: Need to create a synchronized file system, which greatly reduces the performance, and requires much higher costs. NAS is an end node not a network

A few NAS providers started using iSCSI as a storage protocol. iSCSI eliminated the need for special agents to simulate volumes at the host and allowed the host to communicate with the NAS solution at the block level instead of the file level. Although iSCSI layered over NAS systems did allow for block-based access, it did not eliminate performance, scalability and high availability limitations inherent with the end-node, server architecture of NAS products.

## Combine Any Disk Storage with SANRAD iSCSI V-Switch to Build an IP SAN and eliminate the need for NAS

SANRAD is one of the pioneers of the iSCSI technology. The V-Switch supports the iSCSI storage protocol providing IP networked servers, desktops and remote users with secure access to logical volumes residing across an IP Network. The traditional NAS server is no longer required for delivering storage resources over IP. The V-Switch storage management and virtualization features allow you to manage and scale a virtually infinite pool of storage. From these pooled resources, you can define new logical volumes that are independent of enclosures, LUNs or physical disks and define secure user access for each individual volume.

The V-Switch provides multiple storage and host network ports and performs block level storage routing. Features include volume mirroring, striping, snapshot, data migration, volume concatenation and precise LUN carving. The V-Switch ensures multi-pathing, failover and high-availability. Future features include remote replication and DR over IP.

The SANRAD V-Switch, combined with any storage system provides an economic, easy to use, integrated, high performance storage consolidation solution. The IP SAN solution can easily out perform any NAS solution in terms of price/performance, scalability, reliability and data availability.

A sample configuration of the solution is as follows:

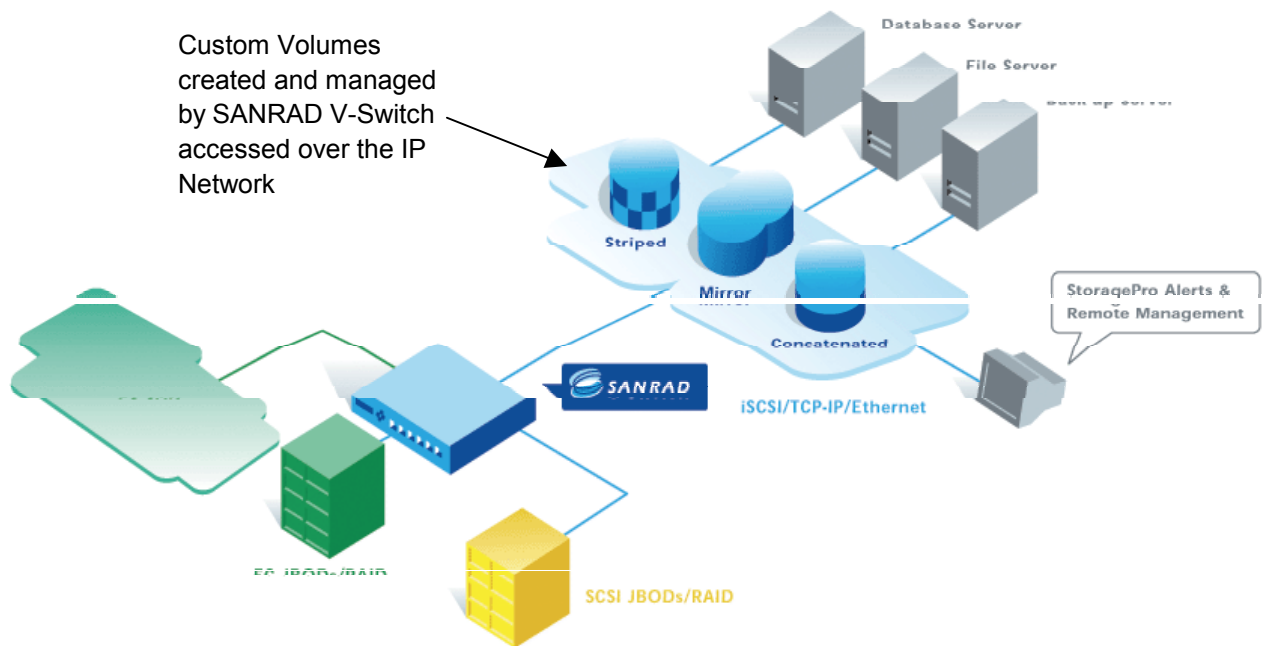


Figure 1. A sample configuration of the solution

The following Table 3 provides a comparison between NAS and the SANRAD IP SAN solution. The IP SAN solution takes the value proposition of NAS combined with the advantages of FC SAN and delivers a robust solution that is clearly superior to NAS alone. And delivers that solution for a competitive price

**Table 3: IP SAN Solution compared to NAS**

	NAS	IP SAN
Cost of adding a server to the shared storage	<b>No cost:</b> Every server has LAN connection	<b>No Cost:</b> using direct LAN connection and OS included free iSCSI initiator / driver
Infrastructure Cost	<b>No Cost:</b> Use Existing LAN	<b>No Cost:</b> Use iSCSI over existing LAN
Required Skills	<b>Not Required</b>	<b>Not Required</b>
Sharing Storage to Remote Servers	<b>IP – can work easily over LAN, MAN and WAN</b>	<b>IP – can work easily over LAN, MAN and WAN</b>
Ease of use	Easy – file based access allows for simpler management	Easy – native OS support, no need for agents, easy volume management
Interoperability	Operates over LAN, NAS stand alone systems are easy to install and integrate	Native OS support over IP networks. IETF governed protocol, no interoperability issues
Fit for Non-File / Block Based applications	<b>Impossible:</b> Due to performance issues, block management issues and clustering issues. It is impossible to run many applications on a NAS system	<b>Very easy:</b> An IP SAN is a block based SAN technology and supports almost all applications.
Performance	<b>Very Low:</b> <ul style="list-style-type: none"> <li>- Most NAS today runs over Fast Ethernet networks.</li> <li>- NAS has to run a file system and translation operation which is a large performance bottleneck.</li> <li>- NAS is based on a server architecture</li> </ul>	<b>Very High:</b> Using an IP SAN delivers performance that is 10 times faster than traditional NAS. IP SAN is based on true network architecture.
Scalability	<b>Poor Scalability:</b> The NAS server, file system, and software are limited in size and performance creating difficult to overcome scalability limitations.	<b>Highly Scalable:</b> From a single interface you can add hundreds of servers and manage hundreds of TBs of storage using SANRAD's IP SAN architecture.
High Availability	<b>Very Difficult:</b> NAS is a server with attached storage and needs a synchronized file system which greatly degrades the performance, and requires much higher costs.	<b>Very Easy:</b> Inherent multi-path and failover technology in iSCSI and SANRAD's IP SAN V-Switch's makes the solution highly available with no single point of failure

## Sample User Applications for the IP SAN Solution

### All Mid-Range Consolidation issues:

Exchange

Oracle

SQL

Departmental Storage

File Sharing (with a file server using the iSCSI SAN as its storage)

Disk Backup

D2D2T

Disk Backup

Secondary Storage

Near-Line Storage

Email Archiving

Disaster Recovery

Extension to an FC-SAN

Stranded Servers

Remote access

Tiered Storage

## Market and Financial Information

Gartner report on storage networking from 2003 predicts that average business server will be connected to SANs via iSCSI. The following Table 4 provides the breakdown of iSCSI connected servers in 2004 through 2007.

**Table 4: Gartner, 2003 Initiator market forecasts**

	2004	2005	2006	2007
<b>Servers Price Greater Than \$100K</b>				
FC SAN-Attached Servers	14,700	17,000	19,200	22,000
iSCSI Initiator SAN Servers	0	1,100	3,900	6,400
InfiniBand Server Nodes	0	400	800	1,200
<b>Servers \$25K-\$100K</b>				
FC SAN-Attached Servers	40,800	47,200	54,100	60,000
iSCSI Initiator SAN Servers	0	4,300	20,800	35,200
InfiniBand Server Nodes	0	1,300	2,800	4,200
<b>Servers \$10K-\$25K</b>				
FC SAN-Attached Servers	70,400	78,600	97,000	123,100
iSCSI Initiator SAN Servers	24,600	48,600	116,400	143,600
InfiniBand Server Nodes	0	7,500	15,500	20,500
<b>Servers \$5K-\$10K</b>				
FC SAN-Attached Servers	68,700	83,400	110,200	140,700
iSCSI Initiator SAN Servers	27,500	50,000	146,300	221,100
InfiniBand Server Nodes	4,900	11,100	24,500	33,500
<b>Servers \$0-\$5K</b>				
FC SAN-Attached Servers	66,600	118,500	274,800	586,500
iSCSI Initiator SAN Servers	166,400	438,800	885,000	1,241,500
InfiniBand Server Nodes	41,600	87,800	186,300	244,400
<b>Total FC SAN-Attached Servers</b>	<b>261,000</b>	<b>345,000</b>	<b>555,000</b>	<b>932,000</b>
<b>Total iSCSI Initiator SAN Servers</b>	<b>218,500</b>	<b>542,800</b>	<b>1,172,400</b>	<b>1,647,800</b>
<b>Total InfiniBand Server Nodes</b>	<b>46,500</b>	<b>108,100</b>	<b>229,900</b>	<b>303,800</b>

Source: Gartner Dataquest (June 2003)

## Summary

iSCSI technology offers a unique inflection point in the storage market, where SAN technology becomes economically viable to mid range customers. Today, iSCSI broadens the definition of a SAN. In the past, building a SAN meant deploying high performance fibre channel while NAS was used for reaching storage over an IP LAN. With the introduction of IP SANs, the once captive NAS customer can now select an IP SAN for reaching and using data over the LAN. Users can now deploy a simple and highly managed IP SAN to displace NAS. By combining any standard disk storage with SANRAD V-Switch's, users can not only reach their storage over the LAN but also take advantage SAN benefits, which include block level performance, scalability and high availability. For many businesses, the need for NAS will be eliminated when offered the benefits of an IP SAN.

Users can benefit from iSCSI technology, especially in mid-range and departmental applications. SANRAD's offering is a unique solution – not only do we offer protocol bridging, but we add storage services from the network layer such as high-availability, security, volume management, storage pooling, virtualization, disaster recovery and data migration while simplifying management.

The IP SAN solution offers an extremely flexible answer for enabling customers to customize storage needs for all their business applications – from a simple 500GB IP-SAN using SCSI/ATA or SCSI/IDE storage to a 100TB IP SAN with Enterprise class FC RAID systems, the SANRAD iSCSI V Switch provides a simple to use, highly scalable and application independent alternative to NAS.

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