



Cisco SN 5428 Storage Router — The Time Has Come for Workgroup SANs

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Management Summary

In the last few years, storage area networks (SANs) have swept through larger enterprises by storm. The growing deluge of data has forced IT departments to seek more efficient and cost-effective storage architectures, and SANs have emerged as the best way to connect multiple servers to a consolidated pool of storage. **It's about low total cost of ownership (TCO), and SANs deliver.**

Meanwhile, small- and mid-sized IT environments have not yet broadly adopted SANs. They have the same spiraling storage requirements, but certain costs and complexities associated with Fibre Channel (FC) SANs have been an impediment. Lacking the big IT budgets and staffing depths of larger enterprises, they continue to struggle with the inefficiencies of direct-attach storage.

Cisco's answer is the SN 5428 Storage Router, which allows customers to deploy relatively inexpensive, easy-to-use SANs based on IP networks. The new router supports iSCSI, which enables block-level storage access over TCP/IP, as well as FC for connecting to storage devices. It offers several benefits that are especially attractive to workgroups:

- **Low Price** – Significantly lower price per port than full FC SANs
- **Security and Manageability** – Simple management plus support for IP security features
- **High Availability** – Clustered configurations for fully redundant data paths
- **Complete Solutions** – Tested, turnkey solutions from VARs for easy implementation

The tradeoff – and there are always tradeoffs – is lower performance than full FC SANs, though most midrange servers will find it quite adequate.

Cisco has brought its networking credibility and resources to bear in delivering a “SAN for the masses”. **The time has come for departmental workgroups, remote offices, and small- and mid-sized businesses to (re)consider SAN adoption.** As much as anyone, they could benefit from the higher storage utilization, simpler management, and lower TCO that SANs deliver. Read on for more details about the Cisco workgroup SAN.

IN THIS ISSUE

➤ The Necessity of SANs.....	2
➤ The SAN Alternative: IP Storage	2
➤ Cisco Delivers a SAN for the Masses.....	3
➤ The Cisco SN 5428 Storage Router.....	3
➤ Conclusion.....	4

The Necessity of SANs

In a few short years, storage area networks (SANs) have become mainstream technology, especially for larger enterprises. **A SAN separates storage from individual servers and consolidates it into a pool of storage that is universally-accessible on a network.** It is much easier to share, manage, and utilize storage with this approach. As a result, management is simplified, and each storage administrator can handle far more capacity. Asset utilization is higher, postponing additional storage purchases. Backup and restore is faster, improving data availability. **And best of all, enterprises with SANs enjoy a lower storage total cost of ownership (TCO).**

This is good news, especially in light of the rapid growth of digital data and the importance of information in modern business. Information technology has connected the world together and made enterprises more productive. Productivity, in turn, drives profitability, GDP growth, and, yes, shareholder value. **However,**

the benign byproduct of these efficiency gains is the rapid accumulation of data. Annual growth rates of 100% are not uncommon.

To keep up with this digital deluge without corresponding increases in the IT budget, many have turned to SANs. **The previous paradigm – direct-attach storage (DAS) – simply does not scale economically.** It creates islands of information that are hard to manage, not readily shared, and poorly utilized. TCO is much higher, especially due to administration costs, which are several-to-many times the cost of storage hardware over its useful life. **SANs saved the day because they deliver economies of scale.**

However, not all enterprises have had the means to deploy SANs due to certain costs and complexities associated with Fibre Channel (FC), the de facto standard SAN interconnect. FC emerged as a storage transport because it is fast, low-latency, supports extended distances, and can be deployed as a highly scalable network. The downside is that FC

The SAN Alternative: IP Storage

There is no shortage of promotion and enthusiasm around IP storage. It refers to networking storage using the TCP/IP protocol, typically over Ethernet. **Since IP is already the network protocol of choice for corporate data networks and the Internet, proponents say IP storage will unify the SAN and the LAN under a single, ubiquitous, relatively affordable, matured networking technology.** One network instead of two would bring synergies in deployment and administration. Since IP has existed for over 30 years, it has withstood the Darwinian test of time and evolved advanced features like security, virtual private networking, and quality of service. Its wide deployment ensures economies of scale in production and therefore a low cost per port. And with the advent of Gigabit and eventually 10 Gigabit Ethernet, its wire speeds will rival FC.

However, IP has drawbacks in the areas of performance and CPU consumption. It is optimized for connecting together a large number of geographically-dispersed computers over a patchwork network of varying speeds and degrees of reliability. This is what makes the wonders of the World Wide Web possible, but it also requires more overhead processing. Compared to FC, IP puts an added burden on servers and introduces latencies in data transmission. **A number of storage vendors are working to overcome these issues through hardware acceleration in host bus adapters or circumventing part of the protocol stack.**

There are several protocols being developed to carry IP storage traffic. **However, iSCSI has come to the forefront because it provides access to block-level storage directly over IP networks.** It is also backed by vendors large and small, including Cisco, IBM, and Intel. iSCSI takes the traditional SCSI (Small Computer Systems Interface) command set for reads and writes and maps them to TCP/IP, providing storage access over an IP network. The Internet Engineering Task Force, an independent standards body, is on track to ratify iSCSI later in 2002. Meanwhile, products incorporating workable draft versions of iSCSI have been on the market for over a year.

equipment costs more than Ethernet, the standard interconnect for local-area networks (LANs). It also requires an IT department to develop expertise in an additional networking technology. Furthermore, interoperability issues among FC components cause SAN deployment not to be a plug-and-play operation. As a result, most small- and mid-sized IT environments, including workgroups, remote offices, and SMBs, have not had the budgets or technical expertise to take on FC. Therefore, they still struggle with the limitations of DAS. **The market is ripe for the industry to deliver a “SAN for the masses”.**

Cisco Delivers a SAN for the Masses

Cisco has stepped up to the plate with its new SN 5428 Storage Router, designed for workgroup SANs. It creates a SAN using an IP network (more specifically, TCP/IP over Ethernet), while still connecting to FC storage devices. This allows for a low cost per port without sacrificing access to the broad range of FC storage devices on the market. The SN 5428 supports IP security features and includes easy-to-use software for SAN management, providing simpler configuration and administration. Furthermore, Cisco value-added resellers (VARs) sell complete, tested SAN solutions that eliminate the hassle of integration. **By addressing the perceived shortcomings of FC, Cisco has opened the door for the workgroup SAN – the SAN for the masses – with its new SN 5428.**

Price

Cisco lowers the barrier to entry for price-sensitive customers by offering a low-cost SAN alternative. For example, the SN 5428 can connect 20 servers to a SAN at 40% of the price of a comparable full FC configuration – a substantial savings. To achieve this, Cisco employs inexpensive 10/100 Mbps Ethernet switches. This technology has been around for many years and has come down the cost curve through high-volume production and integrated components. Furthermore, servers connected via Ethernet do not require host bus adapters (HBAs), unlike FC SANs. Instead, they can run

The Cisco SN 5428 Storage Router

The SN 5428 is a router that translates between iSCSI, a block-level storage access protocol that runs over IP networks, and FC, the incumbent SAN interconnect. Each unit has 8 FC ports at 1 or 2 Gbps (auto-sensing) and 2 Ethernet ports at 1 Gbps. The FC ports connect to devices such as storage arrays, tape libraries, and even application servers that require highest performance. The Gigabit Ethernet ports connect to as many as 48 workgroup servers by fanning out through an inexpensive 10/100 Mbps Ethernet switch, such as the Cisco Catalyst. **In this way, the SN 5428 enables many servers to connect to and share multiple storage resources in a SAN configuration.**

free, Cisco-supplied iSCSI drivers¹ and use the network-interface cards (NICs) typically included with servers. At about \$700 list per FC HBA, the savings add up quickly.

Performance

The issue of performance in the Cisco workgroup SAN centers on the idea of sufficiency. Though performance is not as high as in a full FC SAN, one must consider it in light of the total value proposition. Performance is a good thing, whether one is buying a car, bicycle, or SAN. But it is also costly. A car for family outings doesn't have to be a Ferrari – a sedan or minivan would work just fine and cost much less. The same principle applies to SANs. **So the question is: Is there enough performance for the particular application?**

In fact, the performance of the Cisco workgroup SAN should be sufficient for many midrange applications such as e-mail, Web serving, file and print serving, and even smaller databases. The workload in this environment is typically not large enough to require more throughput than a 100 Mbps Ethernet connection. Though the iSCSI driver may consume from around 1 to 10% more CPU utilization than a FC HBA, depending on application and workload, this does not become prohibitive unless CPU utilization is very high.

¹ Supported operating systems include Windows NT/2000, Solaris, Linux, HP-UX, and AIX.

In short, most workgroup applications should perform well in a Cisco workgroup SAN.

For application servers that need more performance, there is the option of connecting directly to one of the 8 FC ports on the SN 5428. With this approach, the servers would have the same performance as a full FC SAN.

High Availability

The Cisco workgroup SAN also supports redundant components for high availability. The SN 5428 routers and Ethernet switches can be clustered for failover purposes. **This provides redundant connections from the server to the storage array, ensuring access to information if a path fails.**

Security and Manageability

The Cisco workgroup SAN is also designed to be managed by the same person who manages the LAN and computer systems. Since many workgroup environments cannot afford the luxury of having multiple, specialized administrators, the SN 5428 allows IT departments to leverage existing IP expertise for SAN management. Skills in IP networking are more commonplace than FC, contributing to lower management costs.

More specifically, the SN 5428 supports advanced IP security features like Access Control Lists², Virtual LANs³, authentication⁴, and so forth. **There is no learning curve if the administrator is already familiar with these features in a LAN environment.** It also provides LUN⁵ masking for attached storage arrays. This feature maps LUNs to specific servers by IP address to ensure data integrity in a shared storage environment.

Furthermore, the SN 5428 has easy-to-use management software with configuration wizards that simplifies SAN administration. Even managing the router's FC connections is not complicated for configurations with directly-

² Specifies which servers can access storage by filtering IP addresses.

³ Partitions the network for greater security and manageability.

⁴ Ensures only authorized administrators can access and configure the SAN.

⁵ Logical Unit Number – a unit of storage capacity comprised of multiple blocks.

attached storage devices. However, the SN 5428 does support FC zoning and fabric ports if the user wishes to connect to a FC switched fabric. This configuration is useful for cost-effectively connecting a large number of midrange servers into an enterprise data center SAN.

Complete Solution

Cisco has partnered with VARs to deliver turnkey solution sets. These tested and qualified packages include the SN 5428, storage arrays, tape backup systems, FC HBAs, and software. **This saves the time and risk associated with integrating and testing solutions in-house.**

Finally, enterprises that wish to deploy network-attached storage (NAS) for file sharing can integrate it into a workgroup SAN. NAS appliances or servers can share files across the IP SAN and/or access block-level storage via iSCSI or FC (in the case of a NAS head⁶). These configurations can deliver greater storage consolidation by converging SAN and NAS.

Conclusion

The time has come for small- and mid-sized IT departments to benefit from SAN technology. They face the same rapid data growth and accompanying storage costs and complexities as large enterprises. A SAN can allow them to get their arms around storage and achieve a much lower TCO – but only if the technology is within reach.

With the new SN 5428 Storage Router, Cisco has delivered the SAN for the common man. By offering a lower cost per port, easier installation, simpler administration, and an acceptable performance tradeoff, the SN 5428 removes the barriers to SAN adoption in workgroup environments. If you have looked longingly at the greener grasses of networked storage, but weren't sure how to get there, then it's time to have a second look. The Cisco workgroup SAN may be your ticket to ride.



⁶ A NAS server without integrated disk arrays.

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