

SAN/iQ® Storage Clustering

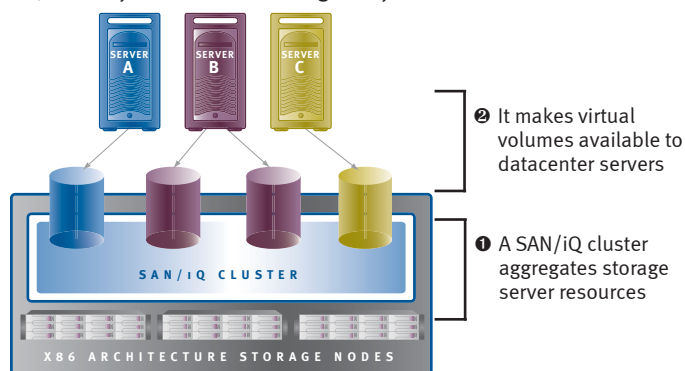
True clustering brings reliability, performance, and ease of management

TRUE CLUSTERING FOR ISCSI STORAGE

True clustering is a proven technology that has been used for years in systems that must provide both high performance and high availability. SAN/iQ® storage software uses true clustering to deliver high-performance, highly available storage solutions. SAN/iQ clusters are managed as a single unit, and they provide virtualized storage volumes that are drawn from a single, dynamically scalable pool of storage resources. In SAN/iQ software, true clustering enables a grow-on-demand model that allows you to purchase storage as you need it, not years in advances as with many traditional SANs. SAN/iQ clusters have no single point of failure, and they can gracefully recover from errors. You manage SAN/iQ storage clusters through a single graphical user interface that makes managing large clusters as easy as managing small ones. Best of all, SAN/iQ clusters use standard IP networking technology that every IT organization already knows how to use.

SAN/iQ software provides the above features by aggregating the resources of a pool of enterprise-class, x86-architecture servers into a single iSCSI storage cluster. The cluster accepts and responds to iSCSI requests as a single unit, and delivers all of its processing and storage resources to the application servers that use it. This means that, as you scale a storage cluster, you scale capacity and performance at the same time. The cluster consists of a single pool of storage from which you configure virtual volumes, each of whose data blocks are striped and replicated across the cluster using Network RAID.

LeftHand Networks uses clustering for high availability, performance, and ease of management. Contrast this to traditional SANs, where you can scale storage only until centralized controllers



True clustering creates a pool of storage resources from a set of enterprise-class, x86-architecture servers, and delivers them in the form of virtual volumes to application servers.

KEY FEATURES AND BENEFITS

The SAN/iQ storage software platform is based on true n-way clustering, giving it the edge over traditional SAN technology where controllers act as a bottleneck.

- Single, scalable pool of storage resources
- All cluster components actively contribute to performance and capacity
- Performance and capacity scale together
- Non-disruptive scalability
- Highly available with no single point of failure
- Uses standard IP networking
- Centralized management of multiple clusters

become a bottleneck, where the loss of a controller means serious performance degradation, and where virtually any SAN configuration change means application downtime.

RESILIENT AGAINST FAILURES

As implemented by SAN/iQ software, n-way, true clustering is highly resilient to failures. The cluster stripes and replicates data on a per-volume basis so that a storage node failure only affects performance by a factor of 1/n. The cluster manages resources internally so that it is continuously available — even when you add storage to the cluster, it reorganizes itself without disrupting the applications that depend on it.

SCALABLE PERFORMANCE

In a true cluster, every component contributes to performance. The cluster balances its own workload, distributing connections across all of the nodes in a cluster. More nodes means not only more storage — it also means more network bandwidth, more RAID controllers, more cache, and more CPUs, all of which contribute to performance. Try scaling a traditional SAN without replacing controllers and taking your applications down while you do it.

CENTRALIZED SAN MANAGEMENT

A true cluster has a single point of management, making the task of managing a large cluster as easy as managing a small one. LeftHand Networks provides a single management interface for all of your storage, allowing you to create multiple clusters, tailor them for specific purposes, and migrate volumes from cluster to cluster, all through the same convenient interface.

SINGLE, SCALABLE POOL OF RESOURCES

A SAN/iQ storage cluster aggregates and virtualizes all of the components of a SAN and delivers them to applications without any resources having to sit idle as hot spares. This approach maximizes resource utilization, giving you the full benefit of every storage node in the cluster. Virtual volumes draw storage from the cluster's pool of resources, and they can scale up and down independently from the cluster itself. This approach eliminates storage islands because each virtual volume's storage is striped and replicated across the entire cluster. And because of this striping and replication, every volume is distributed and hot spots are a thing of the past.

NON-DISRUPTIVE SCALABILITY

Traditional SANs take a monolithic approach: plan your storage needs years in advance, and purchase all of it today because scaling and reconfiguring a traditional SAN is a time-consuming and disruptive process that requires intricate coordination between storage and application administrators. In contrast LeftHand Networks' storage clustering is a flexible, modular alternative that adapts as your storage needs change.

In a SAN/iQ cluster, all storage nodes actively contribute to performance and capacity, and both can be scaled non-disruptively.

SAN Feature:	SAN/iQ True Clustering	Traditional SANs
All controllers active/active	✓	(some)
Non-disruptive performance scaling	✓	✗
Non-disruptive capacity scaling	✓	✗

You can grow your storage cluster with storage purchased at today's prices. Add a storage node, and the cluster automatically, transparently restripes its data without applications ever noticing. You can add more storage to support an increasing number of volumes, and to grow the size of existing volumes. Unlike with traditional SANs, there is never a need to take applications offline.

HIGH AVAILABILITY

Storage clustering, combined with Network RAID, allows a SAN/iQ cluster to service requests in the face of any single-component, and many multi-component failures. You can configure your storage volumes to have the resiliency to failures that your business requirements dictate — virtually any amount of resilience can be configured with SAN/iQ software's true clustering technology.

SAN/iQ software's resiliency to failures allows you to add, repair, or replace storage nodes on the fly without affecting application availability. Take a storage node offline, and the cluster adapts by satisfying requests with alternate blocks stored on other nodes.

Bring the node back online, and the cluster re-synchronizes any changed data with the restored or replaced node. Recovery is transparent and automatic.

Cluster resources are always available to application servers through a VIP — a virtual IP address to which the cluster always responds. If a node hosting the VIP fails, automatic iSCSI session recovery reconnects application servers with storage without disruption.

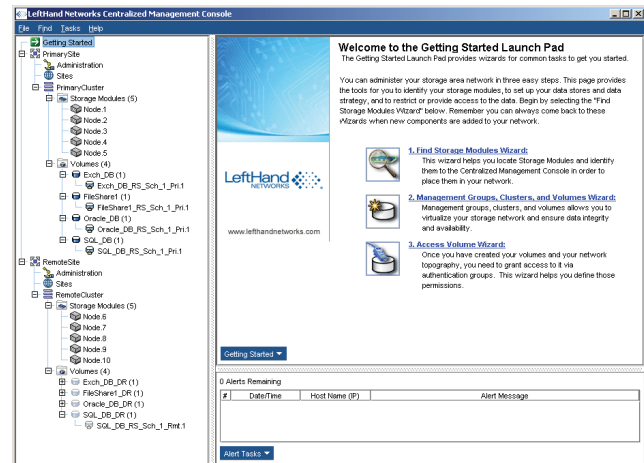
INVESTMENT PROTECTION WITH IP NETWORKING

SAN/iQ clusters use standard Gigabit and 10 Gigabit Ethernet, allowing you to leverage your existing network infrastructure and your existing skill in managing those networks.

With storage clustering, a SAN/iQ cluster's bandwidth easily exceeds that of a traditional SAN connected with 1, 2, or 4 Gbps Fibre Channel networks. For example, if your SAN/iQ cluster has six nodes, each of which is configured with dual Gigabit Ethernet interfaces, the cluster can provide six nodes times 2 Gbps, or a total of 12 Gbps aggregate bandwidth.

SINGLE POINT OF MANAGEMENT

SAN/iQ clusters support scaling capacity without scaling complexity. Through a single GUI, you can manage all of your storage without creating islands of inaccessible storage. The ability to manage multiple clusters through the same interface enables you to create storage tiers. Online volume migration allows you to configure and reconfigure the relationship between virtual volumes and the underlying cluster — all with no application downtime.



SAN/iQ clusters are managed through a single, intuitive graphical user interface..



ABOUT LEFTHAND NETWORKS

At LeftHand Networks, we deliver physical and virtual SANs that are easy-to-install, easy-to-manage and designed to perform optimally in today's global data centers. LeftHand Networks pioneered IP-based SANs in 2001, and its innovative SAN products are engineered to deliver the highest availability and scalable performance, with integrated enterprise-class features.

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