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An Exaltation of Intelligent Storage Cells — LeftHand Networks Leverages the Benefits of Many

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Management Summary

Buckminster Fuller demonstrated that space could be enclosed most effectively – not by using the longest ridgepole or the largest truss – but by using multiple instances of a well-designed triangle of moderate dimensions. In theory, it could scale immeasurably large. In practice, it has scaled incredibly small in the form of nano-sized bucky-balls. The genius lay in designing a module – a cell – the virtues of which can be aggregated and the particulars of which can be modified as needed. Since Fuller's time, IT has adopted the notion of cells in the form of commodity servers and storage arrays, often known as bricks. The virtue of an architecture of cells is that *many* becomes *many points of resilience*, and *more* gives the system *expandable capability as well as capacity*.

But these virtues are limited by the capability of the brick. Intelligence, though an added cost, turns the commodity node from a cow in a herd to a skilled operative in a military maneuver. And so, most arrays (as contrasted with JBOD, or just a bunch of disks) have a processor inside to give the brick more manageability. A still more intelligent cell, with the ability to host other logic systems (applications), allows the cell to evolve - to change the parameters of its functions as needs change. This tiering of the opportunities for intelligence is needed in storage for commercial enterprises, where ease of evolution is needed for survival. With open standards, cells of computing can be easy to buy – but if they are capable of hosting intelligent life (in the forms of applications) they can be exactly what you need to built the IT environment to sustain the life and processes you find valuable.

Back in 1999, LeftHand Networks, of Boulder, Colorado, set out to do things differently in IP SAN storage. They embraced the world of virtualization, containers and distributed control that other vendors now call *grid*. They started shipping product in 2001, achieved success in a down economy, and repeat business now in the recovery, while building out their product line and evolving their business model to one where everybody ends up with some money in their pockets, particularly the customer. For more details, read on.

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The Plight of the Smaller Enterprise

For the smaller enterprise, the IT staff is usually a hand of generalists, and the budget inadequate to buy the high-end enterprise functionalities, nor is the scale such products offer usually needed. Smaller enterprises are no different from larger enterprises in the data glut they are experiencing, or the need to protect the data and replicate it so that they can recover from whatever scale of disaster that should occur. They must support more IT change in less time than they would prefer, creating discomfort.

Each enterprise will have needs, peculiar to its industry, peculiar to its role in its markets, and peculiar to the organization itself, that must be supported, Moreover, recently they have experienced enough of the velocity of IT-based processes to feel the drag of sub-optimized processes, particularly when it slows time-to-market or impedes prudent and timely business decisions. Such insufficiencies become a greater and greater impediment to success and profitability. Whatever the peculiarity, a business must find a way to support it with IT. Evolvability, and in particular, targeted evolvability, or the ability to modify without breaking something else, is a key capability of IT structures, including data storage environments.

The Benefits Virtualization Brings to Many Small Nodes

A distributed storage environment offers opportunities to configure capabilities more closely to business needs. Virtualization[1] abstracts the specifics of device management while enforcing the policies that govern them, making management of a distributed environment feasible, and allowing the following virtues to shine brightly.

[1] See **The Clipper Group Explorer** dated Sept. 8, 2004, and entitled ***Understanding the Role of IT Virtualization - It's a Matter of Architecture*** available at http://www.clipper.com/research/#TCG2004074.pdf.

The Virtues of "Many'

- Replicating data across multiple storage nodes gives many points of resilience. Secondary copies of data and paths to data can be used should the primaries become unavailable.
- Transparent access to data is enhanced by distributed, replicated copies. Multiple copies of data, and multiple paths to the data are used. If one or more data copies fail, , the system automatically finds and uses a good copy of data.
- LeftHand's distributed architecture provides scalability without impeding data availability. When additional nodes are added, the system automatically configures and stripes volumes across all the nodes, increasing performance as well as capacity.
- LeftHand fully supports all of the standard iSCSI security mechanisms, including authentication groups and tiered access permissions (restricted, read only, read/write), as well as CHAP iSCSI authentication.

The Breadth of SAN/iQ

SAN/iQ Applications
Multi-Node Pooling & Virtualization
Programmatic Snapshots
Remote IP Copy

SAN/iQ IP SAN Software
Centralized Management Console
Storage Pooling & Volume Management
Manual Snapshots
Platform/Performance Management
Security Services
Connectivity Services

SAN/iQ Express
Configuration Console
Volume Management
Platform Management
Security Services
Connectivity Services

The Virtue of "Small"

- Distributed capabilities make device failures less than fatal. Small size nodes make device failure and rebuild less intrusive on the performance of the environment as a whole.

LeftHand Networks' Architecture

LeftHand Networks gives its customers an IP SAN networked by Ethernet, with the SAN/iQ operating and management system in every node. Campus and Metropolitan LAN distances are supported synchronously. This allows enterprises to house the nodes close to end users. When the data is large and access bandwidth is constrained, this can be very important.

This distributed storage environment demands good local management and replication, which is provided by LeftHand SAN/iQ. Basically, SAN/iQ is an operating system for networked storage. It is delivered both as SAN/iQ Enterprise software and as SAN/iQ Express, an entry-level management product for a network of iSCSI targets.

The distributed storage environment also requires pooling across nodes and good but unobtrusive remote replication over IP, which LeftHand runs as applications on enterprise-level SAN/iQ. The two versions of SAN/iQ, and the applications that run on top, satisfy the needs of a broad range of enterprises.

LeftHand focuses on the Windows, Linux, and Novell enterprise or remote office with 100 to 1000 employees. Larger enterprises tend to use a LeftHand IP SAN as an auxiliary SAN network to isolate an application, like *Exchange*, that run better with a block storage environment but does not need the transaction throughput of Fibre Channel. LeftHand also supports a unified environment of SAN and NAS by reselling Microsoft's *Windows Storage Server*.

Management Options

SAN/iQ's console allows administrators to create volumes. These volumes do not commandeer space until writes demand it – a space-saving feature often called *Thin Provisioning*. If the application-host's operating system permits, LeftHand supports dynamic growth *and* shrinking of volumes (with proper alerts to keep things from getting out of hand). As new nodes are added or retired, the federated intelligence of the environment rebalances the data across the SAN environment. The console also allows administrators to set a replication policy, from simple redundancy up to three mirrors.

LeftHand Networks' Nodes

LeftHand Network Storage Modules (NSMs) work with any server that support iSCSI. These nodes now feature:

- SATA drives (but a node could use any drive protocol)
- A server-class motherboard
- Multiple GbE connections to support the synchroneity demanded by distributed virtualization
- Redundant power supplies

LeftHand Networks' Amplified Routes to Market

LeftHand has adopted an all-channel marketing strategy, but has built it out with several tweaks that, by benefiting the channel, ultimately augment the value the customer receives at a given price point. It is customary to incent the channel with the brawn of discounts, as well as the more seductive lures of training and certification, sales and marketing assists, and quick quote tools, all of which LeftHand offers to its channel. It is usual to offer the channel support partnerships, which LeftHand has with Kodak and SANZ, as well as service opportunities.

LeftHand has taken a considerable step beyond the usual by structuring its software as an open operating system, to act as a seedbed for other people's intellectual property. What LeftHand Networks offers today is a basic set of data service functionality, on which others can innovate and

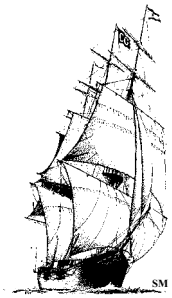
build deliverables for particular industries and particular opportunities.

This last yard of creative space that LeftHand offers its distribution channel is vitally important to all those enterprises whose size does not merit the focus of a vendor direct sales force. It allows an enterprise's particular (and perhaps peculiar) processes – those not shared by 80% of the enterprise's competitors - to be supported by IT at a reasonable price.

No one can know what will be required in the way of access to stored data in the future. From the events of the past year, we can all guess that more will be required. The ability to program locally for such capabilities as indexing and data translation as they are needed and developed may be just what your enterprise needs to function effectively and at a reasonable cost.

Conclusion

LeftHand Networks provides a storage environment that can be supported by almost any enterprise. It offers an acceptably-priced point of entry. More importantly, like geodesic dome architecture, LeftHand Networks' IP SAN of NSMs - empowered by SAN/iQ software - can be grown and evolved to meet the needs the customer - will develop in the future. If you plan to thrive, this is a good approach to consider.



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