

# HIGH-AVAILABILITY STORAGE: WHEN THERE'S ZERO TOLERANCE FOR OUTAGES

HA systems eliminate single points of failure and minimize downtime in data centers serving capital markets firms.

## Executive Summary

In the competitive capital markets industry, opportunities may exist for only a microsecond. That's why data needs to be instantaneous, accurate and always available. The systems used must handle extremely high traffic volumes – at ever-faster speeds – in a reliable, secure fashion.

For trading, securities and investment firms, having a storage system outage is not just an inconvenience – it can be a direct hit to the bottom line, with possible legal ramifications as well. That's why these companies need robust, high-speed, high-availability storage systems to support mission-critical workloads.

When CIOs look to purchase high-availability storage systems, they find a variety of technologies that fit the bill. These include server operating systems, iSCSI or Fibre-Channel storage area networks (SANs) and solid-state drives (SSDs).

Each is designed to boost transaction-processing throughput, thereby reducing the time that capital is in limbo between a decision and its execution. Whatever storage technology selected, capital markets and securities firms expect high-availability (HA) storage will be a critical component of future data center designs.

## Table of Contents

- 1 Executive Summary
- 2 Scrutinized Marketplace
- 2 Algorithmic Trading
- 3 Pain Points
- 3 The Solutions
- 4 CDW: A High Availability Storage Partner That Gets IT

## Scrutinized Marketplace

Although always highly regulated, capital markets in recent years have faced new requirements related to transparency and risk management prompted by the economic crisis. These requirements have created reporting needs that put additional strain on firm systems and highlight the need for HA storage.

The *Dodd–Frank Wall Street Reform and Consumer Protection Act* of 2010 is the biggest change to financial industry regulation since the Great Depression. Specific requirements include new regulations for hedge funds, new risk management monitoring and reporting systems, and additional transparency about CEO and employee compensation.

These new regulations have major implications for IT, including data backup, disaster recovery, security and archival systems. The regulations put a premium on a firm's ability to access reliable and real-time information on clients, risks, liquidity and other issues.

Besides new regulations, capital markets and securities firms also face increasingly stiff competition from rivals around the globe. For the affected IT teams, that translates into pressure to field flexible and innovative systems that can speed up time to market for new products and services.

From a technology standpoint, this requires storage systems with high availability and fault tolerance to support mission-critical workloads in the data center. For example, if a firm requires a storage system with what's called "five-nines of availability," that would mean that the system was up 99.999 percent of the time. Another way to think about that figure is that the system could be down just 5.25 minutes per year, making it an HA system.

### Cost of Downtime

A 2011 study by the Ponemon Institute estimates that data center downtime costs enterprises an average of \$5,600 per minute, including loss in productivity, revenue, damage to systems and legal ramifications. The cost is highest for financial services firms, which represented 12 percent of the companies that took part in the study.

HA systems typically run on clusters of redundant hardware, with automatic failover in the case of a hardware failure, software bug or human error.

Given the mission-critical nature of trading applications, CIOs justify spending money on fault-tolerant systems that are fully redundant. In fact, in some cases they may be triple redundant – as at the Tokyo Stock Exchange with multiple backup sites.

## Algorithmic Trading

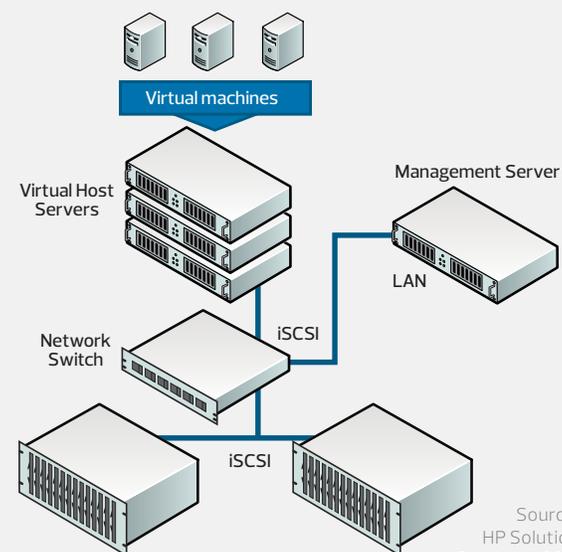
High-speed, high-volume trading systems require storing lots of small transactions, often just the price, symbol and quantity

of shares purchased. So the primary focus for data center infrastructure is on HA storage rather than huge storage capacity.

HA storage typically refers to a storage area network. SANs provide access to different tiers of storage and backup devices, with trade-offs in performance and cost. Critical data resides on more expensive disk storage, while less used or historical information is archived to less expensive optical discs or tapes. Increasingly, these storage systems are virtualized to drive up utilization rates and reduce cost.

A chief benefit of high-availability storage is uninterrupted continuity of operations in the case of, say, a server outage. Keep in mind; this differs from disaster recovery (DR) systems. DR comes into play should a massive service interruption occur and involves a specified amount of downtime. Although HA systems focus on achieving uptime – such as 99.999 percent – DR systems emphasize the turnaround time on restoring service.

### An example of an end-to-end SAN solution to extend the benefits of virtualization and iSCSI interface



Source:  
HP Solution  
Brochure, 2011

With HA systems as their ultimate goal, many capital markets firms have turned to a version of the Linux operating system called SUSE Linux Enterprise Server to run their IT infrastructure. This highly reliable, scalable and secure server operating system can manage both physical and virtual workloads. And it is interoperable with a variety of heterogeneous IT resources, including storage platforms.

More than 13,000 companies rely on SUSE Linux Enterprise Server. That includes the London Stock Exchange, the world's fourth-largest exchange. In 2011, it unveiled a new trading platform that uses SUSE for its U.K. cash markets. The exchange says the SUSE software helps effectively manage the high volumes of traffic passing through its systems in record-breaking time.

Other popular operating systems among capital markets firms are Microsoft Windows Server and Open Enterprise Server from Novell. Windows Server is due for an update in 2012 and has an interoperability agreement with SUSE Linux. Open Enterprise Server shipped a new version in December 2011 that brings advanced file and print services to the SUSE Enterprise Linux platform.

## Pain Points

High-availability storage systems help alleviate these critical pain points:

- **An explosive flow of data at peak times of the day.** Although trading is available globally around the clock, there are hours when trading volumes peak and volatility is highest. This requires the capacity to handle volume variances.
- **Transmit real-time data to staff and clients and exchange it with other systems to make trades and grow revenues.** IT systems must connect to ultra-low-latency, ultra-high-speed networks to move files in milliseconds from the data center to access points. A trend among electronic trading systems is direct data feeds from exchanges, which require ongoing investments in data centers and network bandwidth.
- **Ever-increasing data retention and archival demands.** The latest financial regulations require that more data be retained for longer periods of time, which is an expensive proposition. One factor making this issue more complicated is the wave of mergers in the financial services industry, which has resulted in archived data being stored on legacy applications.
- **Downtime is expensive and unacceptable.** Data center downtime is an expensive proposition for any industry, but it is particularly painful for securities firms. A single downtime event can damage a firm's profitability and, in extreme cases, its viability.
- **When systems go down opportunities to increase revenue are lost.** CIOs say business disruption and lost revenue are the most significant cost consequences of downtime. For financial services firms, downtime directly correlates to loss of transactional revenue and legal penalties if they fail to meet client service-level agreements (SLAs).

High-availability storage systems minimize these pain points by preventing downtime and by creating a mechanism for managing large data volumes cost-effectively.

## The Solutions

### Storage Area Networks

A variety of high-availability storage systems are on the market today to help CIOs minimize data center downtime. Numerous options are available when considering HA SANs for data centers. Vendors include EMC and HP.

Among the decisions that SAN buyers need to make are the type of storage networking protocol to run, the SAN hardware

and software to buy and whether to use solid-state drives or traditional hard drives.

IT shops typically decide between the iSCSI and Fibre-Channel protocol interface. Here are the pros and cons of each:

**iSCSI:** A storage networking IP standard, iSCSI can manage data transfers over LANs and WANs to make the most of a familiar networking infrastructure. It also allows tangible cost benefits realized by reducing the number of switches, network interface controllers (NICs), host bus adapters (HBAs) and cables in each rack.

While iSCSI does not require special-purpose cables, an iSCSI SAN requires a dedicated network or subnet for optimal performance. iSCSI is typically less expensive than Fibre Channel, which requires dedicated switches and special-purpose cabling. But Fibre-Channel storage networks also generally achieve slightly higher performance levels.

**Fibre Channel:** Another industry standard SAN protocol, Fibre Channel offers gigabit speeds and low latency because it is optimized for storage applications. It is generally pricier than iSCSI because of its hardware requirements.

Like iSCSI, Fibre Channel can connect many SCSI storage devices to a SAN, but it isn't as cost-effective as iSCSI at managing data over long distances. That's why IT departments often use a related protocol – Fibre Channel over Ethernet – for SAN-to-SAN backup over long distances.

Fibre Channel also requires special expertise within the IT department, while iSCSI requires the same knowledge as running a standard TCP/IP network. Still, Fibre Channel often edges out iSCSI in capital markets and securities firms because of its faster speeds and lower latency.

**HP:** A leader in SANs, HP offers all the components necessary to implement a high-availability storage system, from switches and adapters to storage arrays, management software and more. For example, the First National Bank of Darlington purchased a virtual HP SAN to prevent downtime. The HA storage system includes HP servers, HP switches, VMware virtualization software and HP Virtual SAN Appliance software to virtualize applications and storage.

### iSCSI vs. Fibre-Channel Performance

Backup	Fibre Channel	iSCSI
Single Stream	19.32MBps	21.14MBps
Two Stream	32.06MBps	24.82MBps
Three Stream	35.24MBps	33.72MBps
Four Stream	35.35MBps	32.72MBps

This side-by-side test shows a very small throughput performance differential between the Fibre-Channel and iSCSI network configurations.

Source: Spectra Logic White Paper, *IP SAN or Fibre-Channel SAN*

The Wisconsin-based bank was able to get the high-availability benefits of a traditional SAN without the cost and complexity. With this setup, the bank has reduced its recovery time from three days to three minutes.

**EMC:** EMC also offers an array of reliable storage solutions to help capital markets firms meet regulatory requirements, compete effectively and reach profit targets. Canadian securities firm NORTHSTAR Trade Finance created a virtualized storage system using EMC's VNXe unified storage platform and Unisphere storage management software, and VMware.

NORTHSTAR says its new storage system offers better performance and more storage space, as well as improved redundancy and backup. It's also easier to manage, cutting down the time to do a chore such as creating a new virtual disk from hours to minutes.

It offers six or 12 terabytes of flash storage and 5 gigabytes per second of bandwidth accessible through InfiniBand and 8GB Fibre-Channel interfaces. It's the first solid-state storage system to offer no single point of failure and ensure maximum availability.

**Fusion-io:** The company offers high-performance, solid-state disk drives and virtual storage layer software to create high-availability memory platforms. Built especially for virtualizing data-intensive applications, the ioCache VM Edition offers low-latency, interoperability with legacy systems and ease of management. For financial customers such as NYSE Euronext, Fusion-io enables faster transactions while lowering hardware, software and operating costs.

## CDW: A High Availability Storage Partner That Gets IT

### Solid-State Drives Versus Hard Disk Drives

	SSD Gain	SSD	HDD	
Data Capacity	1X	150-300	146-450	Device size in gigabytes
Drive I/O for Typical Data Warehouse Use	22X	>450	20	Random: 80% read and 20% write - MBps
Random I/O Latency	1000X+	Microseconds	Milliseconds	Average delay for data access
Power Usage	60%	10	17	Nominal device operating watts

Source: TERADATA MAGAZINE ONLINE, Q2, 2010

CDW offers a range of vendor partners, IT products and industry expertise to meet your needs. Our account managers are dedicated to capital markets and securities firms. They solve similar issues for industry players on a daily basis. Our solution architects offer expertise in designing customized solutions, while CDW advanced tech-

nology engineers assist with implementations and long-term management of those solutions.

In addition, offering a complete portfolio of products and services allows us to work on the entire financial industry stack. Our areas of focus include:

- **Data Storage:** Let us work with you to devise a scalable solution to meet ever-increasing network demands.
- **Servers:** We've formed alliances with strong technology brands to help your data center operate at peak performance – even while using limited resources.
- **Network Security:** Our brand partnerships help create the airtight, multilayer network defense you and your clients expect.
- **Telecommunications:** Discover how the latest telephony and unified communications technologies can greatly improve the efficiency and success of your firm.

**To learn more about CDW's high-availability storage solutions, contact your CDW securities and investments account manager, call 888.706.4239 or visit [CDW.com/securities](http://CDW.com/securities)**

### Solid-State Drives

SAN buyers increasingly are foregoing traditional hard drives for solid-state drives, which use chip-based flash memory. These drives contain no moving components, which improves their reliability and also makes them more rugged. They offer faster startup and transfer rates, and they consume less power, extend battery life and are quieter than hard drives.

Capital markets and securities firms also stand to gain from the super fast I/O capability of SSDs. This can allow near real-time financial data along with standard market information to provide:

- Algorithm-driven stock trading offering deep transaction analytics in a single trading session, rather than contend with overnight lag times
- Real-time credit card fraud detection performed as the bogus transaction is taking place, and based on broad account and user profiles
- Money-laundering detection enhanced by moving analysis from today's batch-oriented task to a fast-response pattern recognition query

**Texas Memory Systems:** Boasting the world's fastest storage, Texas Memory Systems recently unveiled the RamSan-720, which is a high-availability rackmount flash storage array.



The information is provided for informational purposes. It is believed to be accurate but could contain errors. CDW does not intend to make any warranties, express or implied, about the products, services, or information that is discussed. CDW®, CDW-G® and The Right Technology. Right Away® are registered trademarks of CDW LLC. PEOPLE WHO GET IT™ is a trademark of CDW LLC.

All other trademarks and registered trademarks are the sole property of their respective owners.

Together we strive for perfection. ISO 9001:2000 certified

108141 – 120417 – ©2012 CDW LLC

