

Exploring High Availability Use Cases in Regulated Industries

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In today's highly competitive, always-on global economy, downtime has become more costly than ever before for modern businesses. In addition to lost productivity and revenue, organizations risk losing customers when their business-critical systems, databases, and applications aren't available to deliver a reliable and superior customer experience.

This tech brief from SIOS explains the complexity of achieving high availability in business-critical applications.

Highlights include:

- High availability basics and design principles
- Clustering and availability group concepts
- Application and database clustering challenges

While downtime in business-critical systems, databases, and applications imposes costs on every organization, different industries have different consequences associated with unplanned downtime. Some causes of unplanned downtime include:

- **System and equipment failures** (for example, server and storage hardware, individual system components, and data center power/cooling)
- **Disasters and human error** (for example, fire, flooding, misconfigurations, and accidental deletions)
- **Cyberattacks** (for example, denial-of-service and ransomware attacks)

In this tech brief, we explore high-availability (HA) use cases and SIOS customer success stories in the financial services, healthcare, manufacturing, and education industries.

Financial Services

Ranging from small credit unions to regional banks to global investment firms, financial services is a highly regulated, fast-paced industry in which billions of dollars in electronic transactions occur every second. Thus, the average cost of downtime (\$300,000 for a single hour of downtime according to the [ITIC 2021 Hourly Cost of Downtime Survey](#)) can be significantly higher for a financial services firm than for other industries.

LARGE FINANCIAL SERVICES FIRM ADDS HA/DR FOR CRITICAL SECURITIES APPLICATIONS ON ORACLE DATABASES

One of the oldest financial services firms in China provides securities and futures brokerage as well as investment banking, asset management, private equity, alternative investments, and financial leasing services. It is listed on both the Shanghai and the Hong Kong Stock Exchanges. The firm has 343 branches spanning 30 provinces, municipalities, and autonomous regions in the Peoples Republic of China. It also operates across 14 countries and major international cities, serving approximately 18 million customers.

The Environment

The company relies on securities trading applications based on Oracle Database running in a Red Hat Linux operating system environment. While the firm's IT team was backing up these applications and database frequently, they could not recover operation quickly in the event of a failure or disaster.

The Challenge

The financial services firm wanted to implement HA (99.99% uptime) protection for its critical applications and the Oracle database upon which it relies.

The Evaluation

The firm's IT team wanted a clustering solution that would ensure they could reliably meet their service level agreements (SLAs) for HA as well as their stringent recovery time and recovery point objectives (RTO, RPO). It needed to be proven to provide HA in a Linux environment. They also wanted a solution that would reduce the complexity of clustering in an open-source environment.

The Solution

The firm created a two-node cluster on physical servers using SIOS Protection Suite for Linux clustering software. The SIOS clustering software monitors the entire application stack—network, storage, OS, and application. In the event of a failover, the software orchestrates the failover of application operation to the secondary node in the cluster. Application-aware modules in SIOS Protection Suite simplifies the complexity of configuring a cluster for Linux environments.

The Results

The firm has been using SIOS Protection Suite for Linux clustering for many years and continually implements SIOS products in their environments. In that time, the firm has consistently met its availability SLAs. From its straightforward implementation to its reliable, easy-to-use management, SIOS clustering software has met or exceeded the firm's expectations.

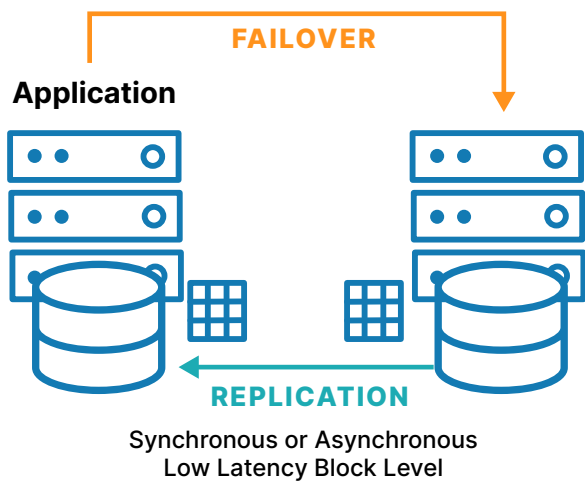


Figure 1: An example of a SIOS SANless cluster

Healthcare

Downtime for applications and storage in the healthcare industry can literally be a matter of life and death. It's imperative to assure reliable access to critical systems used in hospitals and surgery centers, as well as electronic health records (EHR) and medical imaging technology such as picture archiving and communication systems (PACS). The healthcare industry has also increasingly been targeted in ransomware attacks, leading to significant downtime.

LIFEHOUSE HOSPITAL ENSURES HA IN AMAZON WEB SERVICES (AWS) WITH SIOS DATAKEEPER

Chris O'Brien Lifehouse Hospital (www.mylifehouse.org.au) specializes in state-of-the-art research and treatment of rare and complex cancer cases. The not-for-profit hospital sees more than 40,000 patients annually for screening, diagnosis, and treatment.

The Challenge

Lifehouse uses MEDITECH for patient administration and central storage of its patients' electronic health records. "The health information system and database are vital to the care we provide. If either goes down, patient records would not be accessible, and that would paralyze the hospital's operations," explains Peter Singer, director of Information Technology at Lifehouse. In the hospital's

data center, mission-critical uptime has been provided by Windows Server Failover Clustering (WSFC) running on a SAN. Like many organizations, Lifehouse planned to migrate to the cloud to take advantage of its agility and affordability.

Lifehouse chose Amazon Web Services (AWS) and had hoped to "lift and shift" its environment directly to the AWS cloud. To simulate its on-premises configuration, Singer chose a "cloud volumes" service available in the AWS Marketplace. Failover clusters were configured using Amazon FSx software-defined storage volumes to share data between active and standby instances. However, the software-defined cloud volumes had a substantial adverse impact on throughput performance. With the "No Protection" option, the cloud volumes performed well, but "no protection" wasn't really an option for the mission-critical MEDITECH application and its database.

The Solution

After conducting an exhaustive search, Singer concluded that the best solution was SIOS DataKeeper. SIOS DataKeeper provides the high-performance, synchronous data replication that Lifehouse needs. By using real-time, block-level data mirroring between the local storage attached to all active and standby instances, the solution overcomes the problems caused by the lack of a SAN in the cloud, including the poor performance that often plagues software-defined storage. The resulting SANless cluster is compatible with WSFC, provides continuous monitoring for detecting failures at the application and database levels, and offers configurable policies for failover and fallback.

The Results

Unlike software-defined storage, SIOS DataKeeper is purpose-built for high performance and HA, so it was no surprise to Singer that the cloud-based configuration works as needed. But Singer was pleasantly surprised by how easy the solution is to implement and operate: "We were able to go from testing to production in a matter of days. Ongoing maintenance is also quite simple, which we expect will minimize our operational expenditures associated with high availability and disaster recovery."

Manufacturing

There's a great deal of attention on the supply chain today. Although much of the recent focus has been on logistics issues (such as congestion in the Port of Los Angeles) and cyberattacks (such as the Colonial Pipeline ransomware attack), many critical challenges extend further up the supply chain. For more than 50 years, lean manufacturing (also known as just-in-time inventory management) has been a hallmark of efficiency in the manufacturing industry. However, "just-in-time" means exactly that and there's no room for system or application downtime in manufacturing.

SIOS DATAKEEPER CLUSTER EDITION PROTECTS VAN DE LANDE DATA SYSTEMS

Van de Lande BV (VDL) specializes in the manufacture of PVC-U and PE pressure fittings and valves for plastic piping systems, both made from tube and injection molded. Its products are used all over the world in industrial and technical installations. What sets VDL apart is its impressive range of product types and sizes, and its continuous commitment to product improvement and enhancement. As a result, VDL has been the brand of choice for builders of systems and installations for more than 50 years.

The Challenge

VDL started with a virtualized server environment, based on Xen and CentOS. Later, the company implemented KVM and Hyper-V. This heterogeneous environment proved difficult to maintain so VDL gradually switched to the Windows Hyper-V environment.

Before implementing the SIOS DataKeeper solution, VDL relied on shared storage (SAN) for its main storage. To improve performance, they decided to move to local storage based on solid-state disk (SSD) instead of traditional spinning disks.

However, VDL relies heavily on the availability of its ERP database. With only one primary data processing system, VDL needed a reliable, comprehensive DR solution to ensure the availability of its systems in the event of a site-wide disaster.

To prevent downtime, the company needed its servers to replicate data to a backup server for disaster protection. If one server fails, the other server takes over operation. This failover process sustains operations, maximizes uptime, and enables user productivity.

VDL now has a comprehensive HA/DR solution that keeps its mission-critical applications such as its web services and ERP database always available.

The joint solution of Microsoft Hyper-V with SIOS DataKeeper Cluster Edition software provided the availability and disaster protection that was essential to VDL.

The Solution

To deliver full failover and DR protection, VDL built a Windows Server Failover Cluster (WSFC) system, with each node replicating data to the other. If one node fails, operation continues on the other server and no data is lost.

VDL use SIOS DataKeeper Cluster Edition software to ensure continuous availability of applications, databases, and web services. SIOS DataKeeper software integrates with WSFC to create a "mirrored" server system between two Windows cluster nodes. If the primary node fails, WSFC transfers all operations to the other node while enabling continuous access to applications and data (which is protected at the volume level). SIOS DataKeeper software enables DR without the long down time and recovery time associated with traditional backup and restore technology. SIOS DataKeeper works with Microsoft WSFC to monitor system and application health, maintain client connectivity, and provide uninterrupted data access, giving VDL the reliable, fault-resilient system the company needed.

SIOS DataKeeper Cluster Edition further extends the capabilities of Microsoft Cluster Services and Windows Server Failover Clustering. SIOS DataKeeper Cluster Edition also supports real-time replication of Hyper-V virtual machines

between physical servers across either LAN or WAN connections.

For companies like VDL, SIOS DataKeeper Cluster Edition software reduces the cost of deploying clusters by enabling them to create a SANless cluster that eliminating the cost, complexity, and single point of failure risk of a SAN in a traditional shared storage cluster.

The cluster implementation ran smoothly and took less than a day. Following a thorough evaluation of the VDL server configuration and testing, the installation team found that the SANless cluster with SIOS DataKeeper Cluster Edition software met all of their criteria for DR, performance, and HA. During the system failover test, the network services team easily failed over and failed back the system quickly and easily.

The Results

VDL now has a comprehensive HA/DR solution that keeps its mission-critical applications such as its web services and ERP database always available. SIOS DataKeeper software provides continuous real-time, host-based, block-level replication delivering continuous access to customer and inventory records. VDL deployed two SIOS DataKeeper clusters that protect a file server, print server, SQL Server (ERP), Microsoft Dynamics NAV web services, NiceLabel NiceWatch label service, and iSCSI server.

One two-node cluster works as a file server and iSCSI

SIOS DataKeeper software provides continuous real-time, host-based, block-level replication delivering continuous access to customer and inventory records.

server, while the other supports a SQL Server cluster and Dynamics NAV web services. The IT infrastructure consists of three Hyper-V hosts with 60 VMs installed on it, one

BackupExec server, 50 desktop users, and 25 mobile barcode scanners, which are connected via web services to the ERP system. Every host contains 24,000GB SSDs in a RAID 60 configuration with a total of 3TB local storage. The systems are connected through 10 Gigabit interfaces.

Education

In the wake of the global pandemic, distance learning has become a key teaching format in postsecondary education, as well as primary and secondary education. In postsecondary education, distance learning enables global outreach for colleges and universities to attract a diverse student body. Thus, uptime has become increasingly important in education, with students and professors requiring access to various systems including library databases, student records, and high-performance computing (HPC)—for example, to support medical research, testing applications, and more. Downtime can also be costly as students (potentially from around the world) rush to register online, vying for limited class space.

MAJOR UNIVERSITY GIVES SIOS LIFEKEEPER FOR LINUX TOP MARKS

When a leading university in New York decided to revamp its enterprise resource planning (ERP) system, it hoped to improve performance, especially during peak registration periods, and reduce overall total cost of ownership (TCO). The university serves more than 10,000 students and uses an Oracle database to maintain all the information for student registration on an HP/UX SAN-based storage environment with replication of its full SAN architecture between two fabrics in a cluster.

The Challenge

The university needed an alternative solution that would be more cost-effective, deliver faster performance, and provide HA and data protection for its mission-critical Oracle database. Realizing that it needed a more robust clustering solution than it could get with a typical Linux solution, the university turned to SIOS.

“We wanted a suitable clustering replacement,” says the university’s assistant vice president of IT. “SIOS explained that they could integrate and set up a cluster with SanDisk Fusion ioMemory products. They were completely proactive.”

The Solution

SIOS LifeKeeper for Linux provides application failover, SIOS DataKeeper provides data replication, and the SIOS Oracle Application Recovery Kit offers extra protection for the school’s database right out of the box. SIOS’s strategic alliance with Western Digital also delivers a high-performance SanDisk flash solution for the school’s clustered environment.

The cost of three servers and the SIOS solution was less than the cost of one of the university’s old HP/UX servers.

Employing servers configured with SanDisk Fusion ioMemory-based IO accelerators, the university could replace its bulky and expensive SAN-based setup with a streamlined server set running Linux. The integration of ioMemory-based IO accelerators with both the servers and SIOS LifeKeeper for Linux offers better performance and availability than traditional legacy solutions, making the SIOS solution a perfect fit.

The Results

The cost of three servers and the SIOS solution was less than the cost of one of the university’s old HP/UX servers. The school used the savings to add more memory.

The university also eliminated risk because the shared disks in a traditional SAN-based cluster can be a single point of failure. That’s why it originally had two SANs. SIOS replication with SanDisk Fusion ioMemory eliminated this single point of failure, cost far less than fabric switches, and provided more data copies.

The combination of SanDisk’s flash-based Fusion ioMemory for storage and SIOS replication improved the school’s TCO, reduced data center costs, and reduced its environmental impact thanks to reduced power and cooling demands.

Don’t wait for a disaster to find out if you have enough resiliency. Schedule a personalized demo today at <https://us.sios.com> to see what SIOS can do for your business.