HA-AP APPLIANCE (STORAGE VIRTUALIZATION ENGINES) SUCCESS STORY

A Hospital of Traditional Chinese Medicine (China)

Guaranteeing Zero-downtime Continuity for Hospital Datacenter

KEY HIGHLIGHTS

Industry: Hospital

The Challenge

- Provide high-availability access and protection of hospital datacenter data on 2 DFT-brand storage systems (including 7TB of Oracle RAC database); support 9 physical servers, 50+ VMware virtual clients, and 57.6 TB of storage capacity.
- Support 7*24 hospital operations by ensuring performance and availability of the mission-critical datacenter infrastructure.

HA-AP 8G Benefits

- Real time hot-swappable protection for critical data.
- Continuous availability of mission-critical hospital datacenter for around-the-clock operations.
- Affordable, high-availability, easy-to-manage solution that protects against failures of FC fabric and primary RAID storage.
- Simple, centralized administration.

HA-AP 8G Versatility

- HA-AP engines can be clustered over Fibre Channel to create local or remote mirroring.

The Customer

Our case subject is a hospital specializing in Traditional Chinese Medicine (TCM) in the East China Region. Originally established in the 1960s, it is now a tertiary hospital offering medical care, education, research, and healthcare services in the region. To protect its privacy, our customer has requested that we write this story under a disguised name. We honor that request and from here on out, will simply refer to it as HTCM, short for Hospital of Traditional Chinese Medicine.

HTCM consists of multiple administrative departments, 22 clinical departments, plus 10 medical and technology departments; with a 6-story outpatient building, a 20-story inpatient building, many modernized medical apparatuses, more than 900 staff members and 600 ward beds on a 17.5-acer campus. This state-of-the-art healthcare facility currently receives 1.12+ million patient-visits a year.

Background

Traditional Chinese Medicine. TCM is a style of traditional Asian medicine informed by modern medicine but built on a foundation of more than 2,500 years of Chinese medical practice that includes various forms of herbal medicine, acupuncture, massage, energy circulation within the human body, and dietary therapy. It is primarily used as a complementary alternative medicine approach. TCM is widely used in China and is becoming increasingly prevalent in Europe and North America.

Hospital Information Science. The following information systems are among the most widely used in modern hospitals:

- Hospital Information System (HIS). A comprehensive information system dealing with all aspects of information processing in a hospital.
- Picture Archiving and Communication System (PACS). A medical imaging technology which provides economical storage and convenient access to images from multiple modalities.
- Clinical Information System (CIS). A computerized database management system used in processing patient data.
- Radiology Information System (RIS). The core system for the electronic management of imaging departments in a hospital.
- Laboratory Information System (LIS). A software-based system with features that support a modern laboratory's operations.
- Electronic Medical Record (EMR). The systematized collection of patient and population electronically-stored health information in a digital format.

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Challenge: Integrated Datacenter Infrastructure Upgrade

The HTCM datacenter is planning an integrated effort to upgrade its entire infrastructure, with emphases on the adoption of virtualization technologies and addition of new equipment at various levels of the platform, including server and storage hardware, clustering and virtualization implementation, backup mechanism, network security, core switch redundancy, and integrated system services. A critical requirement of the project is to guarantee business continuity and data integrity during the entire upgrade process.

The project team identifies 3 focus areas: servers, storage system (storage area network and storage devices) and virtualization technologies (server virtualization and storage virtualization). With objectives being more dynamically assigned and highly dependable server resources that provide faster error recovery; optimized high-performance, high-availability storage pool that allows automatic failover/failback and online expansion; zero-downtime business continuity that is insured by data backup and disaster recovery measures.

Servers. Install 9 new servers, 2 for HIS application, 2 for PACS application, and 5 VMware servers. All servers are configured with redundant FC 8G HBA cards and SAN connections, also redundant Ethernet 1Gbps/10Gbps NIC cards and connections to core switches; additionally, all VM servers are equipped with solid-state accelerator cards. Existing servers will be re-purposed as administration, backup and spare VM systems.

Storage Area Network (SAN). Install 2 8G (16G-ready) SAN networks that include HBA cards, SAN switches and HA-AP storage virtualization engines to provide fully redundant data paths, with the ability to automatically failover to a health path upon any single-point-failure.

Storage Devices. Install 2 high-performance, high-bandwidth core storage systems that are capable of supporting large-scale database application. Each system has active-active dual-controller with 48GB cache memory, supports FC protocol with 8x 8GB server ports, houses 28.8TB (2x24x600GB) RAID, with total redundant capacity of 57.6TB (2x28.8TB).

Server Virtualization. Deploy VMware on 5 physical servers, partition physical servers into more than 50 smaller virtual servers to maximize resource utilization and achieve optimal load-balancing; combined with storage virtualization to provide hospital information systems with better overall platform dependability and availability.

Storage Virtualization. Deploy 2 units of HA-AP Appliance, establish synchronous data mirroring between redundant storage devices that appears as a single virtual storage to the servers, create fully redundant data paths from servers to storage through redundant FC switches, provide storage built-in fault-tolerant capability, and support heterogeneous storage devices; separate application from data, application operation is not interrupted by loss of data availability while data integrity is isolated from application errors.

Figure 1. HA-AP Appliance Dual-engine Cluster

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Solution Highlight: Storage HA Enabled by HA-AP Appliance

Unlike other "storage virtualization" solutions that primarily provide storage management function, the HA-AP Appliance uses storage virtualization technology simply as a means to accomplish storage high-availability – without the overhead and complications introduced by including those other functions. It is a purpose-built hardware device particularly suited for enabling an end-to-end IT infrastructure such as one that HTCM datacenter requires:

1. **Supports Open-System Architecture.** It supports all mainstream database applications and operating systems including Windows, Linux, Mac, and UNIX system platforms; also server virtualization solutions such as VMware, CITRIX, HYPER-V, and KVM.
2. **Maintains Total Transparency.** It requires no agent or driver software on the servers, additional servers can be added by simple configuration update, which makes the solution a lot more open and desirable for future system expansion.
3. **Enables Active-Active Storage HA.** It enables active-active-mirror of two, or all-active-mirror of multiple storage systems, which eliminates system downtime caused by a single-point-failure of any storage system; provides enterprise-grade data availability and business continuity protection with instantaneous automatic failover and failback upon hardware failure, while no interruption to the applications or human intervention is required. The solution meets true RPO=0 and RTO=0 requirements.
4. **Supports Heterogeneous Storage.** It supports and manages heterogeneous storage systems of different brands and models.

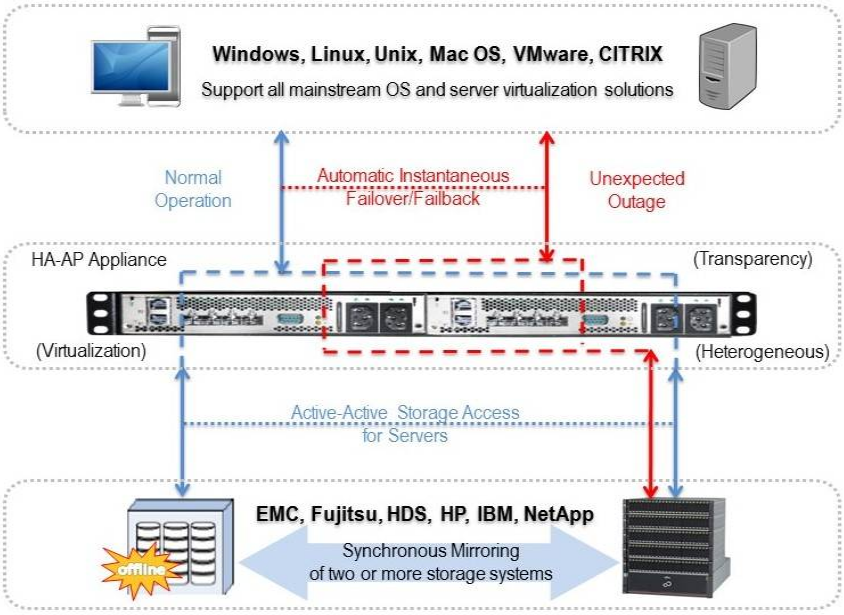

Figure 2. Storage HA by HA-AP -- Conceptual Diagram

Deployment: End-to-End Protection of Business Continuity

HTCM's business continuity must rely on a well-designed high availability (HA) datacenter infrastructure, the HA requirement must be addressed at all levels of this design, including application, host, network, and storage.

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A sound HA datacenter should deploy software-clustered hosts and virtual host technology, to ensure the availability of hosts and continuity of applications; as well as fully redundant FC switches to ensure the availability of network paths. In addition, the storage must be enabled to deliver equivalent availability, so that an end-to-end redundancy from hosts through network to storage may be achieved to insure complete availability.

The following upgrades are specifically designed to address these needs:

Server Virtualization Upgrade. Optimize workload distribution, provide LIS, EMR, PACS systems with fine-tuned operating platform, raise application efficiency and reliability.

Storage Virtualization Upgrade. Virtualized back-end storage along with fully redundant FC switches and data paths, allow for seamless failover/failback in case of error/recovery while maintaining constant data availability and integrity.

Cluster Upgrade. Provide application level protection, maximize resource utilization, minimize cost, and also increase overall system usability, agility and responsiveness.

Upon completion, the upgraded infrastructure will serve HTCM well for years to come:

- Two DFT 24-bay storage systems, total 57.6TB capacity, at the back-end
- An Oracle RAC database and the HIS/PACS systems on the front-end
- A total of 9 physical servers and 50+ VMware-based virtual clients
- Two units of clustered dual-engine Loxoll HA-AP Appliance connecting the front and back ends

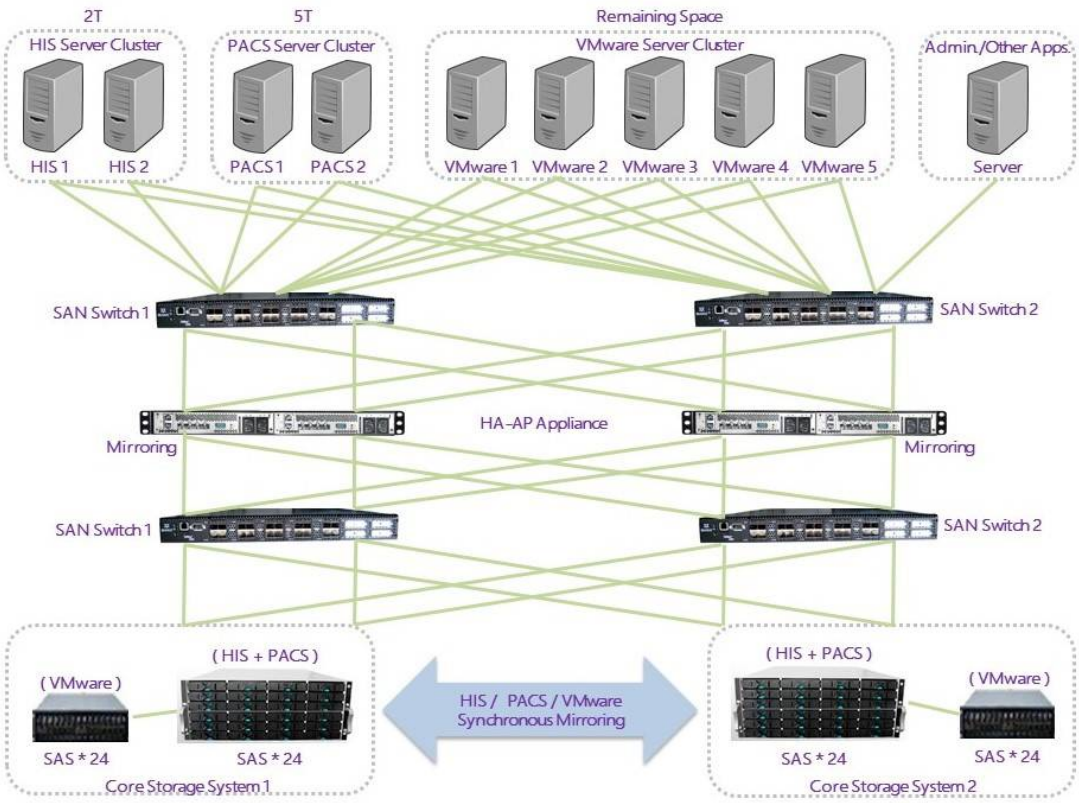

Figure 3. HTCM Datacenter – Topology Diagram