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U.S. Air Force: Electronic Systems Center, Engineering Directorate, Capabilities Integration Environment (CIE)

INDUSTRY Government

SOLUTIONS [Enterprise Platform, Storage Management and Virtualization](#)
Hardware — Hitachi Universal Storage Platform® VM, Hitachi Universal Storage Platform (4)
Software — Hitachi In-System Heterogeneous Replication bundle, Hitachi Dynamic Provisioning, Hitachi Resource Manager™ utility package, Hitachi Performance Monitor

U.S. Air Force's CIE Team Deploys Hitachi Universal Storage Platform® VM for ROI and Growth Efficiencies

The Capabilities Integration Environment (CIE) provides the cohesive infrastructure and support of software development and testing for the U.S. Air Force. To stay ahead of rapid data storage requirements, the CIE revamped its data center using Hitachi Universal Storage Platform® VM (USP VM) with extensive virtualization, thin provisioning and single-pane management.

The U.S. Air Force (USAF) has a mission to fly, fight and win. It's not so different on the ground. At Maxwell-Gunter Air Force Base in Montgomery, Alabama, the CIE has waged a battle on unbridled data storage growth and is winning, thanks to a highly virtualized and scalable data center.

On behalf of the USAF, the CIE enables the development and testing of software applications and prototypes prior to production. Since 2003, the CIE has operated as a service provider responsible for centrally managing the environment for software black box testing performed by individual laboratories that are doing work for the USAF. Today, the CIE expertly administers more than half a petabyte of centralized storage while supporting developers, system integrators and other customers, and mission critical data and compliance requirements.

Team Makes Data Storage Combat Ready

The CIE quickly realized success with its ability to manage the development environment so that developers and program offices could focus on the job of testing and integrating software. On the back end, however, data storage rapidly multiplied, leading to inadvertent sprawl and performance issues, and affecting the ability of the IT team to adeptly manage the infrastructure. The CIE team determined that by centralizing storage, it would be better able to manage the environment.

The customer base was relatively small at that time, so the CIE began by implementing two 32-port switches, 100 systems and a part-time storage engineer. Within a few years, the CIE had doubled both its footprint and customer base, once again requiring a revamp of the IT environment. A dual fabric Fibre Channel core-edge SAN was deployed with Tier 1 storage to

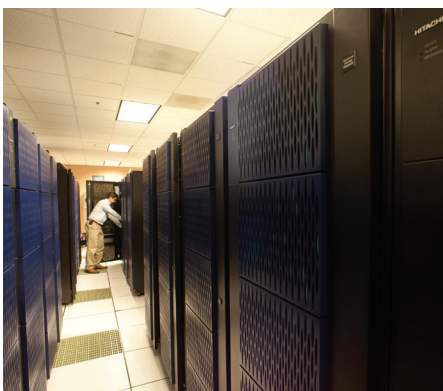
enable storage-centric scalable infrastructure and avoid further growth complexities. The CIE also virtualized servers and hired a full-time SAN engineer to architect the storage terrain moving forward.

To combat unwavering storage growth and facilitate extensive scalability and cost efficiency, the CIE team chose to add Tier 2 storage, thin provisioning and a single management interface. These attributes can contribute to a well-thought-out SAN design and growth strategy, ultimately helping to support customer requirements.

CIE Goes "PCS" with Hitachi Storage Virtualization

Air Force members usually have at least one Permanent Change of Station or PCS during their careers, assigning them to a new base. A successful PCS includes resources that help with the transition to a new base assignment. Similarly, the CIE decided to make long-lasting changes to how the storage environment would be stationed moving forward, and wanted the right set of resources to succeed.

The CIE created a storage product evaluation team to establish and weight criteria (thin provisioning and a single management interface topped the list), and then analyze potential vendor offerings against those criteria. The Hitachi Universal Storage Platform® VM was selected as the foundation for the data center overhaul because it would enable the CIE to perform business faster, smarter and more simply.



After conducting a complete return on investment (ROI) on the USP VM, the CIE was able to verify that it had indeed saved nearly half a million dollars (US\$438,880) to date by using Dynamic Provisioning across its data center.

The Universal Storage Platform VM promotes a unified data infrastructure and massive scalability by virtualizing internal and external heterogeneous storage into one common pool and integrating thin provisioning for flexible and nondisruptive volume expansion, all from a single pane of glass. The USP VM hails 1.2 million IOPS and 13.3GB/sec total internal bandwidth, and uses a highly parallel crossbar switch architecture and advanced cache design, to accommodate grueling workload demands and unpredictable growth requirements.

The CIE chose to implement a diskless edition of the USP VM with no internal storage in order to maximize virtualization flexibility. This means that the CIE team can source and attach any existing storage systems as needed. Virtualized behind the USP VM are four Hitachi Universal Storage Platforms for Tier 1 storage, used primarily for Oracle database files, mission-critical applications and everything requiring higher I/O responsiveness, along with the entire virtualized VMware ESX environment.

Virtualized behind the USP VM as Tier 2 are numerous Sun StorageTek 6140 arrays that house boot-from-SAN LUNs and anything with lesser I/O demands. With 1,500 systems, the CIE has nearly 600TB under management, split almost evenly between the tiers and managed through a single pane of glass.

Rounding out the Hitachi solution is built-in software that exploits virtualization and management capabilities across the storage environment. Hitachi In-System Heterogeneous Replication bundle is being used by CIE primarily to create and automate replicated systems for its Microsoft® Windows® environment. Additionally, the companion Hitachi Resource Manager™ utility package assists with tracking I/O usages and processor utilization, as well as capacity and configuration planning and optimization. Hitachi Dynamic Provisioning also plays a significant role in this successful PCS for storage.

Dynamic Provisioning Creates an On-the-fly Zone

Hitachi Dynamic Provisioning allows allocation of virtual storage as needed without the upfront requisite of dedicated physical disk storage, often referred to as fat provisioning. Dynamic Provisioning eliminates the need for overprovisioning storage, which can quickly become expensive, to directly address the capacity utilization issue of allocated but unused space. Designed to readily respond to new storage demands without downtime, Dynamic Provisioning contributes to a lower total cost of ownership and helps the CIE with just-in-time, on-demand provisioning functionality.

Prior to implementing the USP VM, the CIE did not have thin provisioning set up; it was still relying on block storage to meet developer and customer requirements. With a growth rate of nearly 2TB per month, the previous “fat provisioned” infrastructure would have quickly outgrown storage capacity and driven down utilization. With Dynamic Provisioning, the CIE team now has the capabilities to over-subscribe, monitor and manage storage throughout the storage system at more realistic levels. Consequently, the CIE has already cut the cost of having to purchase static storage capacity that might not get used, and now has substantial flexibility to cost-effectively meet whatever customer requirements emerge.

After conducting a complete return on investment on the USP VM, the CIE was able to verify that it had indeed saved nearly half a million dollars (US\$438,880) to date by using Dynamic Provisioning across its data center. Within one year, the CIE had recouped more than the purchase price and had exponentially expanded its storage environment without incurring any additional software or hardware costs. Storage hardware that had been part of the previous IT environment and used mainly for backup was now being virtualized through the USP VM for utilization on Tier 2.

Solution Lands on Stellar Savings and Flexibility

USP VM allows for a renewed sense of purpose for how best to manage the future of data center growth. In addition to its return on investment, the CIE has also saved in other ways.

Where the StorageTek arrays carried licensing limitations of four hosts to connect per license, the USP VM allows for greater versatility. Since the data center is virtualized, the USP VM only counts as one host, enabling the CIE to allocate and connect any server through that one host. The result is impressive savings on licensing fees and overall care. Additionally, the USP VM capacity is based per frame not terabyte for greater resiliency and cost-efficiencies.

Because the USP VM is facilitating storage virtualization across the data center, the SAN engineer no longer has to learn or install a separate management interface for each vendor product in the data center. In this way, the CIE is able to maintain a small, efficient staff and save on both labor resources and training costs. The USP VM allows for greater ease of administration, the ability to provision storage whenever and however it is necessary to meet requests, and investment protection that avoids vendor lock-in.

In relation to the overall process for the Air Force's software needs, the USP VM has delivered a critical elasticity to scale in the ways that matter.

Looking to the future, the USP VM allows a confidence in having a nimble and scalable infrastructure that can be leveraged to grow efficiently and minimize business risk while meeting customer obligations and expectations.

 **Hitachi Data Systems Corporation**

Corporate Headquarters

750 Central Expressway
Santa Clara, California 95050-2627 USA
www.hds.com

Regional Contact Information

Americas: +1 408 970 1000 or info@hds.com
Europe, Middle East and Africa: +44 (0) 1753 618000 or info.emea@hds.com
Asia Pacific: +852 3189 7900 or hds.marketing.apac@hds.com

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