Hitachi Unified Compute Platform (UCP) Pro for VMware® vSphere™

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Evaluator Group

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Executive Summary

Server virtualization has become a common part of today's IT datacenters. One of the major benefits of server virtualization is the ability to consolidate hundreds to thousands of virtualized servers in a few physical servers into a single virtual infrastructure. This consolidation can significantly reduce IT related CAPEX and OPEX. The rapid deployment of virtualized infrastructures has been maturing and growing in size which has made infrastructure management more complex. Hitachi Data Systems recently introduced a converged solution to not only simplify the deployment of a virtual infrastructure but also simplify the management of that infrastructure.

Converged infrastructure solutions can reduce OPEX by minimizing an administrator's time with provisioning resources, managing, monitoring and troubleshooting the datacenter infrastructure with centralized management. In turn, this will minimize system downtime therefore reducing the impact on SLAs. These types of converged solutions are good for rapid deployment of private cloud environments with the necessary security built in.

Hitachi Unified Compute Platform (UCP) Pro for VMware® vSphere™ is the next generation in infrastructure management and is part of the Hitachi solution for building and managing virtual infrastructures as a consolidated business resource pool. UCP Pro for VMware vSphere architecture is designed to enable rapid deployment and simplified management of enterprise class virtual infrastructures. UCP Pro for VMware vSphere fully integrates and supports both physical and virtual components of the infrastructure and supports simple automation and orchestration through its Hitachi Unified Compute Platform (UCP) Director software, which is integrated directly into VMware vCenter®. Minimal physical installation is required since all components (servers, networking and storage) are already cabled and integrated together at the factory to create a ready-made datacenter. These Hitachi branded components include Intel® Xeon® processor-based Hitachi CB500 blade chassis and a choice of Hitachi Virtual Storage Platform (VSP), Hitachi Unified Storage VM (HUS VM), or Hitachi Unified Storage 150 (HUS 150). Intel® has re-architected the Xeon® family to add the specific capabilities needed for today's IT storage problems, enabling the energy-efficient performance, data protection and scalability to address the explosion of data, improve datacenter efficiency and prepare for emergent usage models at the same power envelope in an intelligent enterprise. VMware vSphere 5.1 and the integrated UCP Director management software is also pre-installed, reducing installation and configuration time and cost, which can in turn minimize ongoing maintenance costs. Using UCP Director standard templates to deploy ESXi hosts, the user always starts from the exact same known state. This allows for faster deployment time and lower cost of operations.

Architected products like UCP Pro for VMware vSphere fulfill a requirement for those who need to rapidly deploy and manage an enterprise virtual infrastructure and/or private cloud. This converged solution from HDS is built to order, pre-tested and pre-configured to customer requirements before it reaches its destination in the datacenter. The unified management and the use of RESTful public API and/or CLI integrated into VMware vCenter gives the administrator the ability to visualize the complete virtual and physical infrastructure from VMware vCenter. In addition, unified orchestration, monitoring and troubleshooting offers the ability to provision, configure, and correlate physical and virtual alerts for faster troubleshooting.

VMware vSphere is the first of several hypervisors and native tier 1 applications (like Microsoft Hyper-V, Oracle Database, Microsoft Exchange, etc…) UCP Pro for VMware vSphere will support.

Evaluator Group assessed the UCP Pro for VMware vSphere hardware architecture and software systems management in December 2012. We reviewed the UCP Director software integrated within VMware vCenter and validated its functionality.

Enterprise System Management Challenges with Virtual Infrastructures

Evaluator Group speaks with IT users from companies of all sizes across the world. Although new architectures, capabilities and applications present ongoing challenges for IT staff in VMware environments, the fact remains that a large portion of time and resources remain dedicated to installations of virtualized infrastructures. Despite the recent widespread adoption of server virtualization and all its benefits, the process of building and managing a new non-integrated virtual infrastructure (servers, network, storage, virtualization, OS and applications) can be as time consuming as a non-virtualized infrastructure. In addition, some of the time consuming management tasks IT staff find with a traditional non-integrated are:

- **Image management** – Managing updates, changing default images and maintaining active images for each host (ESXi Server) can be time consuming and at times difficult to manage in larger environments. Keeping track of new updates and patches, along with creating new images and modifying auto-deploy rules can become tedious.
- **Monitoring** – It can be difficult to monitor a virtualized infrastructure when there is no single interface to monitor both the physical and virtual components. Alerts of pending hardware failures can be missed or go undetected. Without the holistic picture in a single management system this could cause longer troubleshooting times.
- **Provisioning**
  - **Host** (Configuring a host and deploying an ESXi image) – Performing this process manually raises the possibility of making errors along the way. Finding the right images and drivers online can be time consuming.

o **Storage** (Creating and attaching volumes or LUNs) – In many cases, the way organizations are structured can affect the time needed to create and attach storage volumes and LUNs. These tasks can sometimes add weeks to the process. A typical scenario can look like the following:
  - Once the administrator puts in a request for storage to the storage administrator, he/she has to identify space and location to create the volume or LUN and add it to the infrastructure.
  - When the volume or LUN has been added, the SAN administrator needs to identify the WWNs for the host and array ports and create the zones in the appropriate fabric.
  - At this point the VI administrator can mount the new storage volume, then create and format partitions, and create the needed datastores.
o **Network** (Configuring a VLAN) – Performing this process manually can be error prone, time consuming and complex too. Identifying all of the hosts in a cluster to collect VLAN information, determining port connections from each host, and configuring all switch ports connected to the cluster manually increases administrative time requirements.

A primary value of the Hitachi UCP Pro for VMware vSphere is the elimination of the time spent on these common tasks. The hardware and software are pre-installed and pre-configured by product experts and developers. This offers a high degree of integration.

Hitachi Unified Compute Platform Overview

Orchestration

Hitachi Unified Compute Platform (UCP) Pro for VMware vSphere provides orchestration capabilities, which combine computing, networking, management and storage into one integrated product to provision, manage and offer services from a single console. Orchestration can offer:

- **Consolidated management** – The ability to consolidate management from multiple sites makes it easier to perform updates from a corporate level and allows for a single team to manage SLAs via centralized templates.
- **Cost** – Centralizing within a single console can save time and money in simplified management, lower the risk of human error with automated tasks, and provide the ability to coordinate workflow.
- **Flexibility and Agility** – Rapid deployment allows the administrator to respond quickly to requests and effectively meet SLAs. This consolidated approach makes activities like chargeback and reporting easier and less time consuming.

- **Application Aligned Infrastructure** – Business strategy and processes can be aligned with chargeback and SLAs. Applications can be scaled to the required size to meet SLAs and optimize the use of resources.
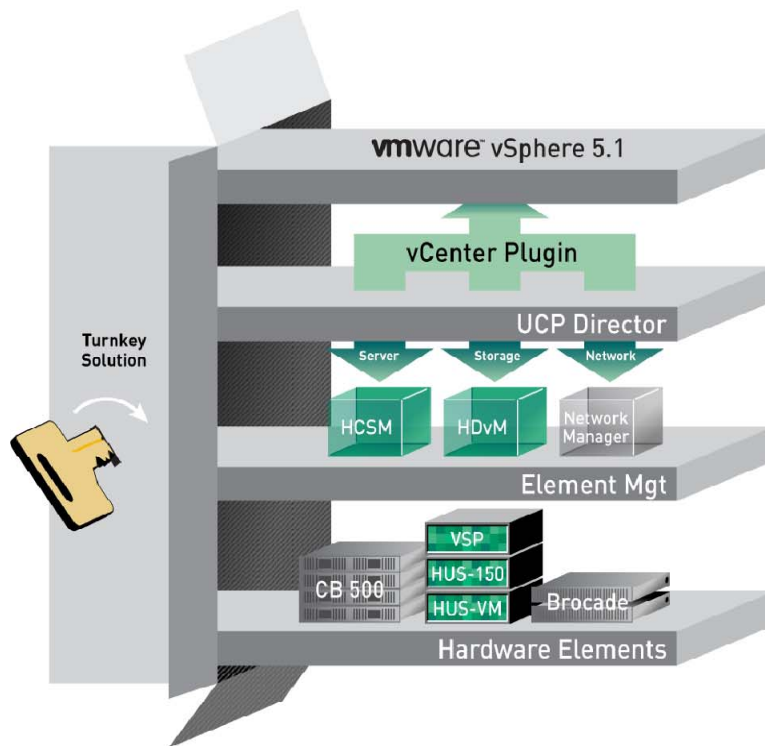

Figure 1 - UCP Orchestration

(HCSM = Hitachi Compute System Manager, HDvM = Hitachi Device Manager, VSP = Virtual Storage Platform, HUS VM = Hitachi Unified Storage VM, HUS = Hitachi Unified Storage)

Hardware

The hardware configuration (Storage, Server, Ethernet and Fibre Channel Networks, and management console) comes pre-configured and built to order. Figure 2 shows the base configuration which can be expanded to an additional compute rack with up to four more compute blocks (up to 32 servers), additional supporting power, and 2 additional 8GB FC switches. In addition the storage can be expanded with an additional storage rack of Hitachi Virtual Storage Platform (VSP) FC storage or any supported 3rd party storage (see references).

- Compute blocks – each compute block is comprised of a 6U CB500 chassis with up to 8 internal blade servers based on the latest generation Intel Xeon processors built to especially support virtualized environments. Hitachi has designed these blade servers to take advantage of the Intel Xeon architecture for performance and capacity in a highly dense form factor.   Key Intelligent storage benefits enabled by Intel include data de-duplication, data compression, intelligent tiering and thin provisioning. Additional compute blocks can be added as needed for growth.
- Network – Brocade Ethernet and SAN switches are pre-installed and configured to assist in rapid deployment of VLANs and SAN provisioning
- Storage
    - Hitachi Virtual Storage Platform (VSP) is pre-installed and offers storage virtualization, provisioning, and automatic tiering for convenience. VSP supports virtualizing third-party storage arrays (see references) behind the VSP.
    - Hitachi Unified Storage 150 (HUS 150) consolidates file, block and object storage needs.
    - Hitachi Unified Storage VM (HUS VM) consolidates file, block and object storage needs especially for virtualized infrastructures.

Hitachi storage solutions, utilizing Intel's Xeon processors can help relieve bottlenecks, allowing data to flow more freely. Virtualized applications can be fully utilized, the growing volume of data can be quickly captured and users demand for content and real time data access can be easily and quickly supported.

- Management – There are redundant management servers (CR-210H) that host VMware vCenter, Hitachi Unified Compute Platform (UCP) Director, and all other infrastructure management tools.
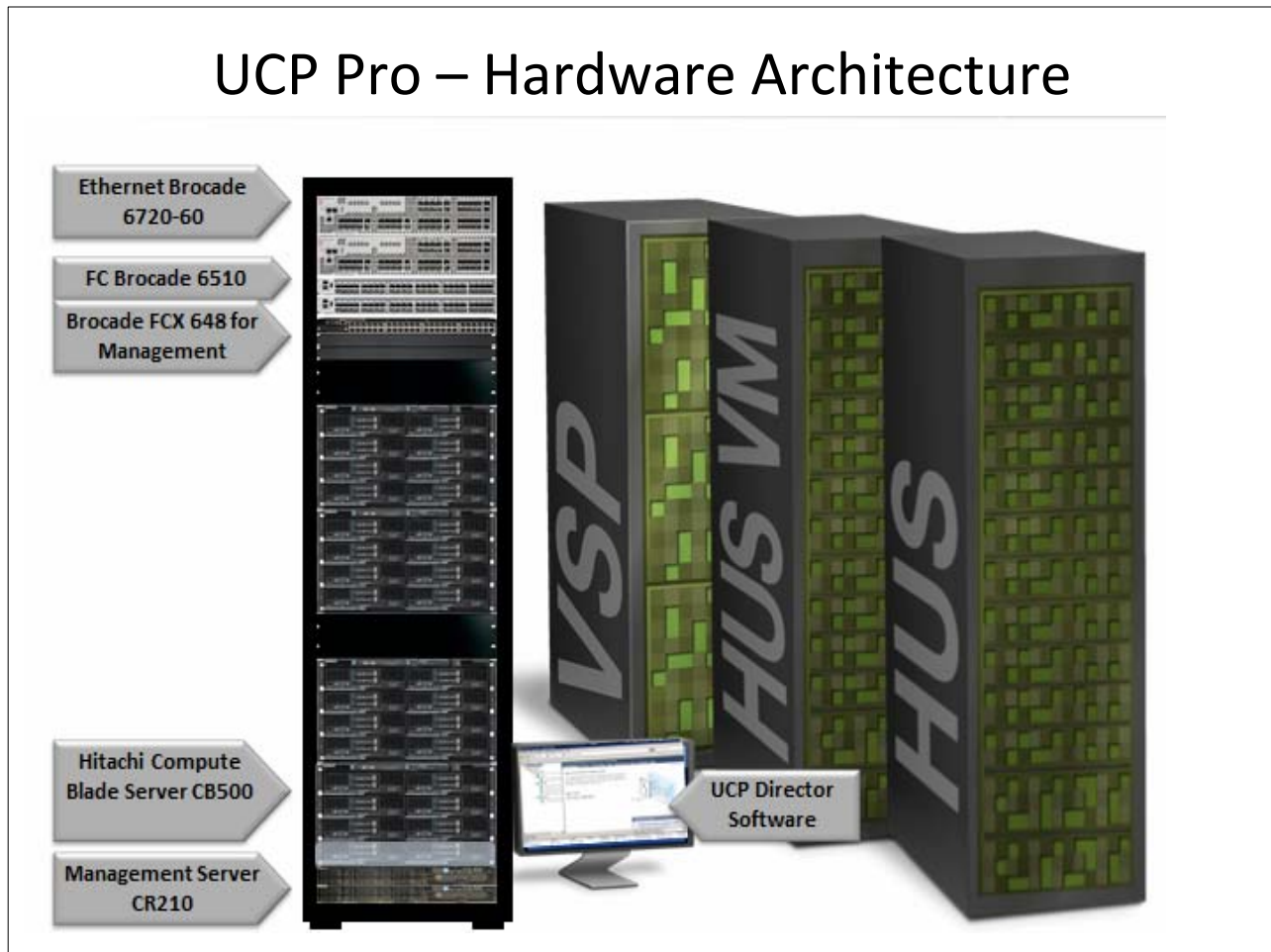
Figure 2 – Hitachi Unified Compute Platform (UCP) Hardware

Software - Hitachi Unified Compute Platform Director and Console

Hitachi Unified Compute Platform (UCP) Director software is integrated directly into vCenter and provides management and process orchestration for a collective group of assets as business resource pools. UCP Director can simplify the integration and ongoing management of large environments and can help reduce capital expenditure (CAPEX) and operating expenditure (OPEX), as scope and scale of these environments continue to grow.

Note: At times there may be specialized server or storage management features that require the use of the server and storage element managers. In these cases UCP Director will link to them to complete the task.

UCP Director integrates four main functions into VMware vCenter:

- Inventory of hardware
- Monitor hardware related events
- Manage images to individual servers and server types
- Automate Ethernet and Fibre Channel configuration
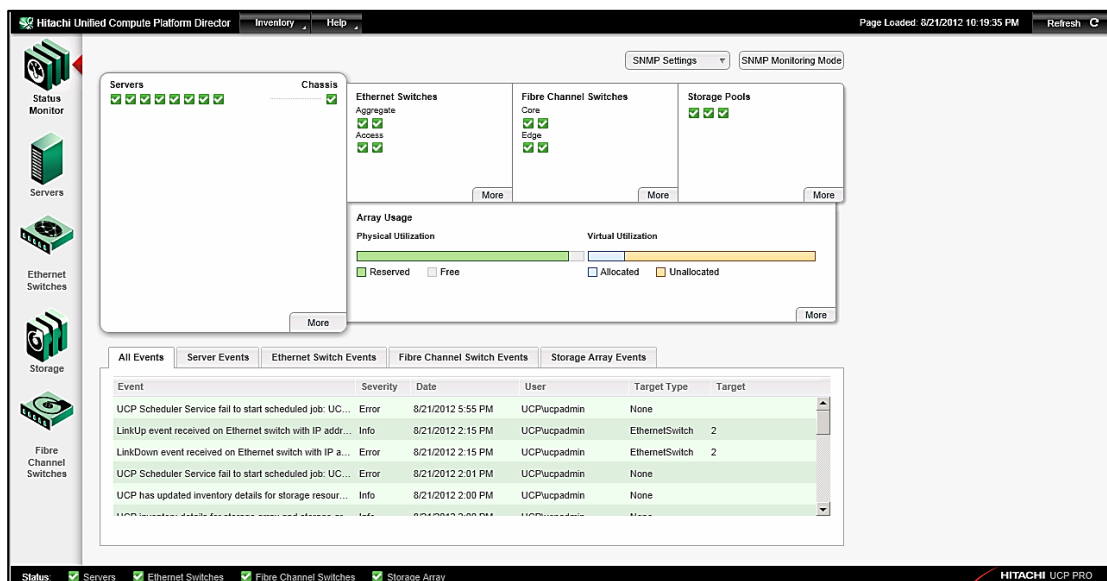
UCP Director Monitoring with vCenter

Figure 3 – Thick Client - UCP Director Console

In UCP Pro for VMware vSphere v2.1, Hitachi developed a rich web-based client version of their UCP Director software. The UCP Director web client offers cross platform support and can be run using any standard web browser. Additional features such as inventory lists, related objects and portlets offer a more comprehensive view of the datacenter to the vCenter administrator. Like the "thick" or server-based version (figure 3), the web client version of UCP Director is tightly integrated within VMware vCenter and its graphical user interface. Developing a web client version of UCP Director is in keeping with VMware's strategy of developing web-based client versions of all their major applications and management tools. The web client version of UCP Director offers all the features and functionality of the "thick" server-based version of the software and even extends functionality into standard parts of VMware vCenter.
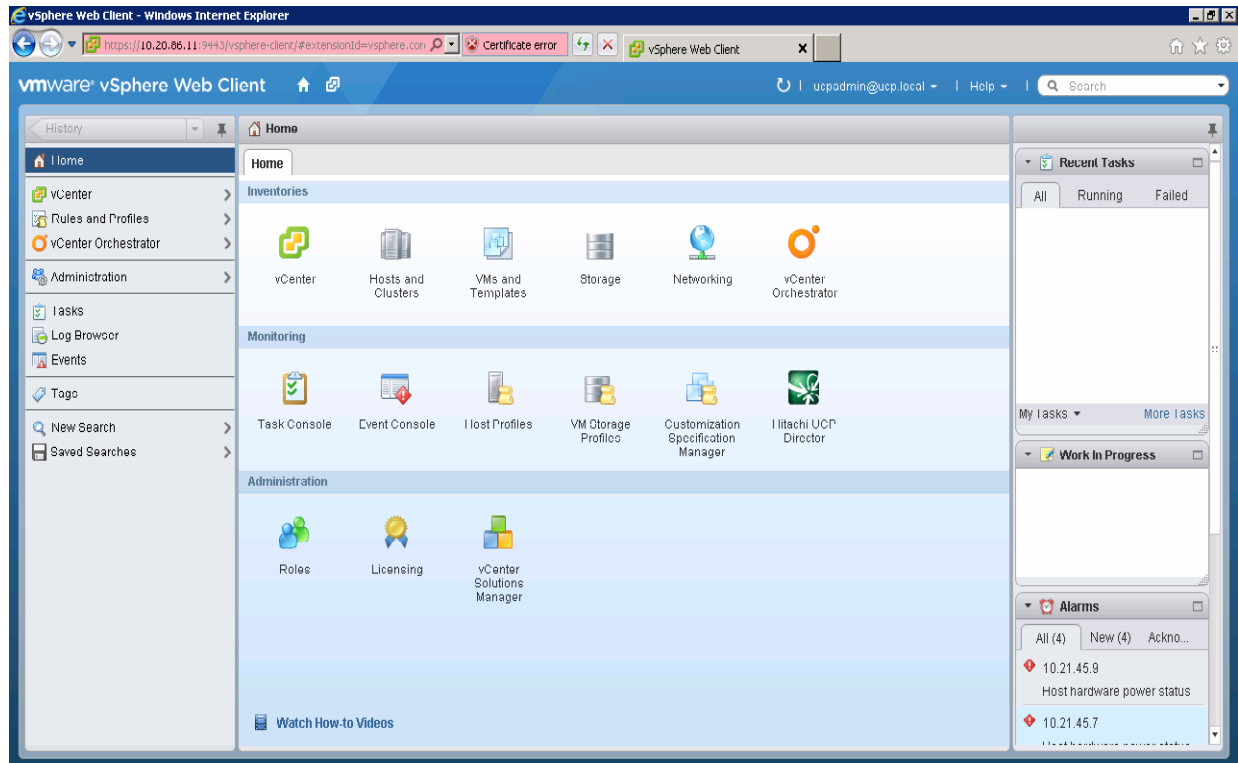
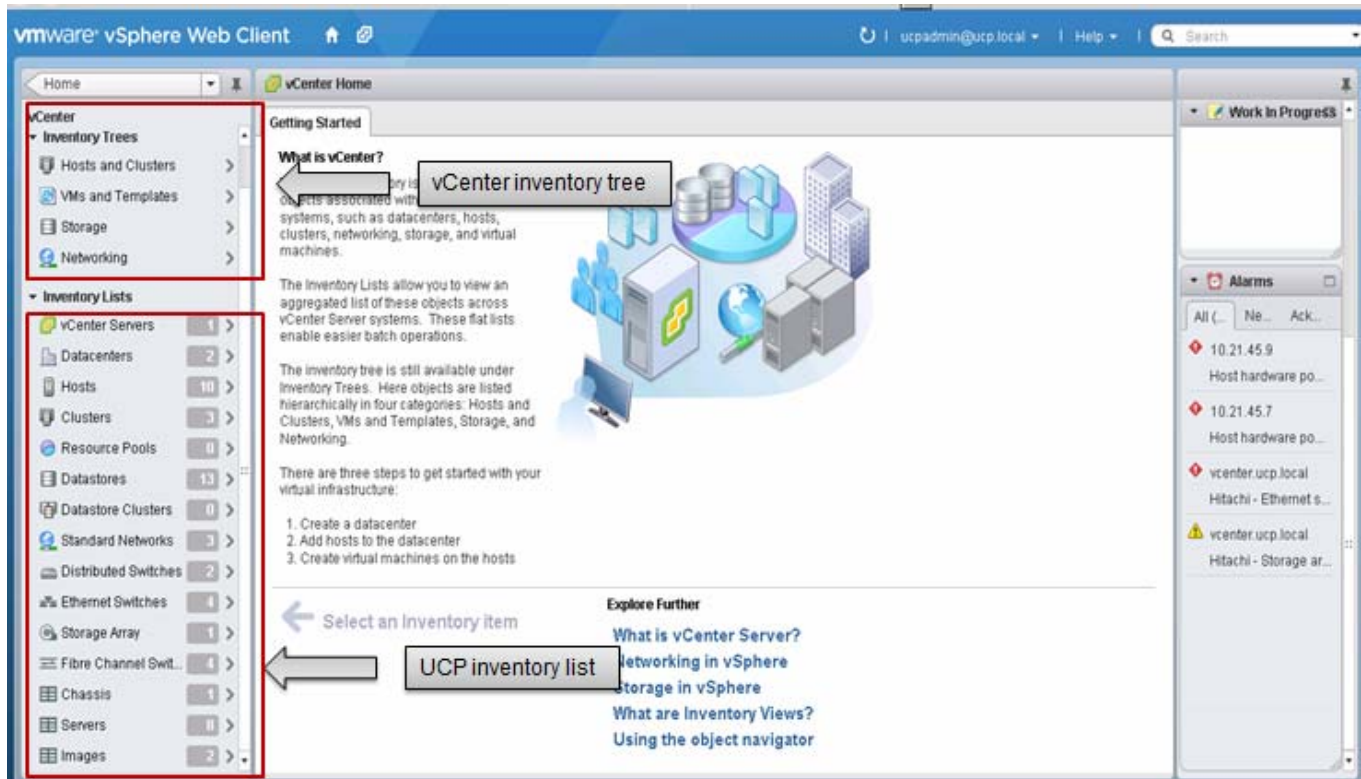**Figure 4 – v2.1 Thin Client - UCP Director Integrated in VMware vCenter**

Figure 5 – vSphere Web Client - View UCP physical infrastructure inventory

Validation Overview & Objectives

Hitachi Data Systems commissioned Evaluator Group to validate their claims of the rapid deployment and ease of management of Hitachi Unified Compute Platform (UCP) Pro for VMware vSphere. The validation objectives were to observe and conduct the following functionality:

1. Provision physical servers and ESXi servers
2. Image Management and Deployment
3. Storage Provisioning
4. Configuring VLANs
5. Ease of use and feel of inventory with UCP Pro for VMware vSphere

Evaluation Findings

Monitoring with Hitachi Unified Compute Platform (UCP) Director

UCP Pro for VMware vSphere shows a complete hardware inventory (compute chassis, servers, storage, Ethernet and FC switches). Scans are performed regularly to keep hardware details up to date. The following tables not only showed inventory information but also status and health (green or red) of the hardware. This hardware information coupled with the vCenter information about the virtual infrastructure gives the administrator an end-to-end view to help with monitoring for SLAs and troubleshooting for issues.

- **Compute Chassis table** - There was good detail of the compute chassis, including details of each blade's configuration. There are two ways to view the physical server inventory.
- **Storage table** – Details of the Hitachi Virtual Storage Platform (VSP) storage array was easy to find on the storage page. The top level storage page shows tabs for which Pools, Volumes and Ports are available and the page shows hardware details, such as serial number, microcode version, capacity and ID. Details about available, reserved allocated or unallocated capacity was also information easily found.
- **Fibre Channel Switches table** - This table showed the port ID, state (online, no light, no sync), status, WWN connection, and the device the port is connected to. We drilled down to the Credentials and IP address tab and were able to get the username, password detection and management IP address.
- **Ethernet switches table** – Networking mapping can be viewed through server details. VLAN IDs, ports and Ethernet devices connected to are displayed. This table displayed switch name, status (active, unreachable, unsupported, initializing), serial number, type, make and model, firmware version, management IP address and ID.

Provisioning physical servers and ESXi servers

UCP Pro for VMware vSphere UCP Director within vCenter provides a complete server hardware inventory view to provision physical servers and build ESXi servers with ESXi Auto Deploy. Images for deployment were easy to create. UCP Director works with the Hitachi Compute System Manager (HCSM) to provide the server hardware view in vCenter. In addition, events communication created by the UCP Director between vCenter and HCSM gave us a chance to see alerts, such as hardware failures, show up and trigger an alarm automatically. This allowed us to observe a physical server automatically put into maintenance mode and the migration of the VMs to another physical server.

In order to administer physical servers and images, new UCP administrator roles with the appropriate permissions must be added. The actual management of all physical servers was shown through using UCP Director. Each server has a table of information (Figure 5) showing power, host names from vCenter, health statistics, server serial number, slot location in a chassis, image information, component resources and more.

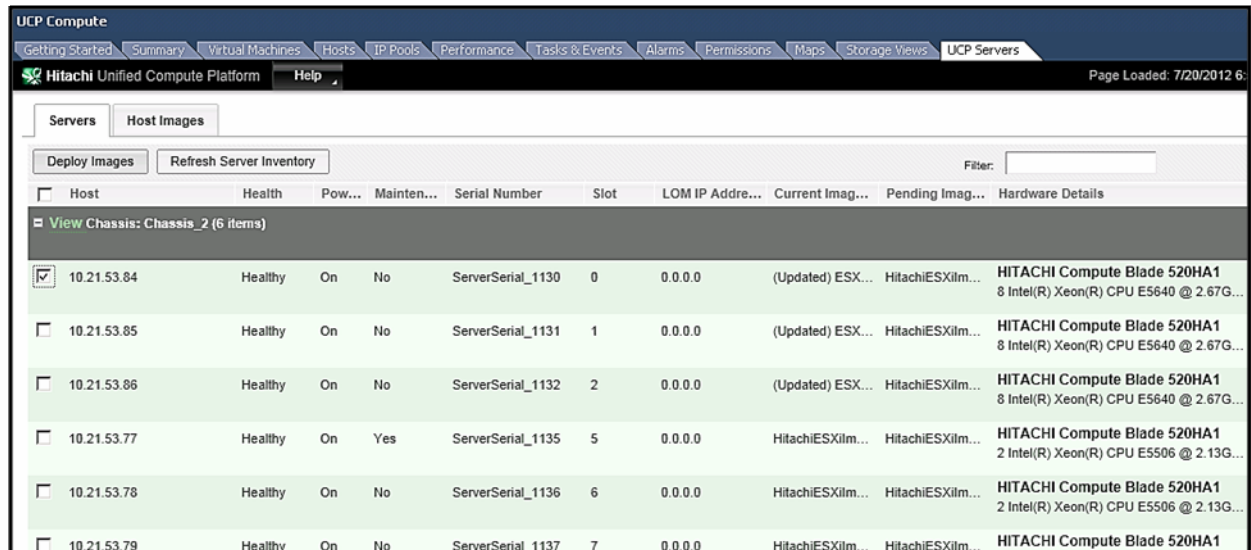| Host	Health	Power	Maintenance Mode	Serial Number	Slot	LOM IP Address	Current Image	Pending Image
⊟ View Chassis: 323GG-RE3A1NBX1-Y00000010 (8 items)								
esxi01.ucp.local	Healthy	On	No	323GGAGC0A1-TNNX14Y00000...	0	10.21.45.16	ESXi-51RC-AllDrivers	ESXi-51RC-AllDrivers
esxi02.ucp.local	Healthy	On	No	323GGAGC0A1-TNNX14Y00000...	1	10.21.45.17	ESXi-51RC-AllDrivers	ESXi-51RC-AllDrivers
Not Configured	Healthy	On	No	323GGAGC0A1-TNNX14Y00000...	2	10.21.45.18		ESXi-51RC-AllDrivers
Not Configured	Healthy	On	No	323GGAGC0A1-TNNX14Y00000...	3	10.21.45.19		ESXi-51RC-AllDrivers
Not Configured	Healthy	On	No	323GGAGC0A1-TNNX14Y00000...	4	10.21.45.20		ESXi-51RC-AllDrivers
Not Configured	Healthy	On	No	323GGAGC0A1-TNNX14Y00000...	5	10.21.45.21		ESXi-51RC-AllDrivers
Not Configured	Healthy	On	No	323GGAGC0A1-TNNX14Y00000...	6	10.21.45.22		ESXi-51RC-AllDrivers
Not Configured	Healthy	On	No	323GGAGC0A1-TNNX14Y00000...	7	10.21.45.23		ESXi-51RC-AllDrivers

Figure 5 – Physical Server Details

Image Management and Deployment

Normally managing host images (ESXi server images) in VMware vCenter is a manual process which requires multiple steps or can be automated using VMware PowerCLI. Hitachi Unified Compute Platform (UCP) Pro for VMware vSphere has already automated this process so there is no need to write anything in PowerCLI, saving time for the administrator. We observed that UCP Director allowed us to review repositories for images. Then we were able to clone that repository to the inventory as a UCP image which can be deployed on one of the servers.

One default image comes with UCP Pro for VMware vSphere that contains all the supported drivers. We observed this image being deployed on a server, copied to be cloned, and copied to be changed for other requirements. Each server type will have a default image from which to work. In addition, we observed that when a physical server is reset then through vCenter an image will be automatically deployed. If there is no specific image configured for the physical server the default image for that server type would be deployed. In our case the default image was deployed. We easily cloned an image from the host images table with just a right-click, filling in a new name for the image in the dialog box, then clicking OK.

Figure 6 shows the table for viewing and managing images. Hitachi Unified Compute Platform (UCP) Director Console has a 'host images' tab under the server section that gave us a view of the image details, such as, image name, ID, default or not, status, UCP image, description of the image, vendor, last modified and more. Then we drilled down deeper to see other image details, such as package information (name, vendor, version, release data and more).

We observed other image management operations, like editing and configuring images, checking for updates, making changes to the default image, assigned an image to another physical server, and deploying pending images.

Figure 6 – Image Management

Storage Provisioning

Hitachi Unified Compute Platform (UCP) Director is tightly integrated with Hitachi Virtual Storage Platform (VSP) Storage Array by way of the Hitachi Data Manager (HDM) and is able to use the Hitachi VSP features like Hitachi Dynamic Provisioning (HDP), Hitachi Dynamic Tiering (HDT) and Hitachi Universal Volume Manager (UVM). The Hitachi Device Manager (HDM) is used first to create the storage pools. These storage pools created from physical parity groups can be striped wide and enable thin provisioning to minimize over-provisioning. In addition, if a tiered storage approach is needed to prioritize performance characteristics, HDT can have SSD, SAS and SATA drives in the same storage pool. Then UCP Director uses the Hitachi Device Manager (HDvM) as a storage element to provision storage volumes. We observed a volume being created on the Hitachi VSP through this integrated storage management and then be presented in vCenter inventory as available space for the cluster. This demonstrated a storage provisioning workflow.

Once storage pools were created they were viewed via the Pools Table shown in figure 7 below. The pools table showed information like the status, the total physical capacity, the type of pool (HDP or HDT), physical utilization and ID. We drilled down further into the pool details and observed drive type, the available capacity (GB) and percent allocated. In addition the Volume tab showed us the volumes and each volume's detail in the selected pool. We not only observed the LDEV, name and the associated pool ID, but also the mapping information showing the physical server(s) that the volume is attached to and its utilization information. For additional mapping information we looked at the ports table. The port table showed the name of the array port, the WWN, the speed, the type (Fibre, iSCSI, or FCoE), and

the attributes (target, initiator, or external). To configure a host (ESXi server) or cluster storage we used the servers table to create, add and delete a host volume.
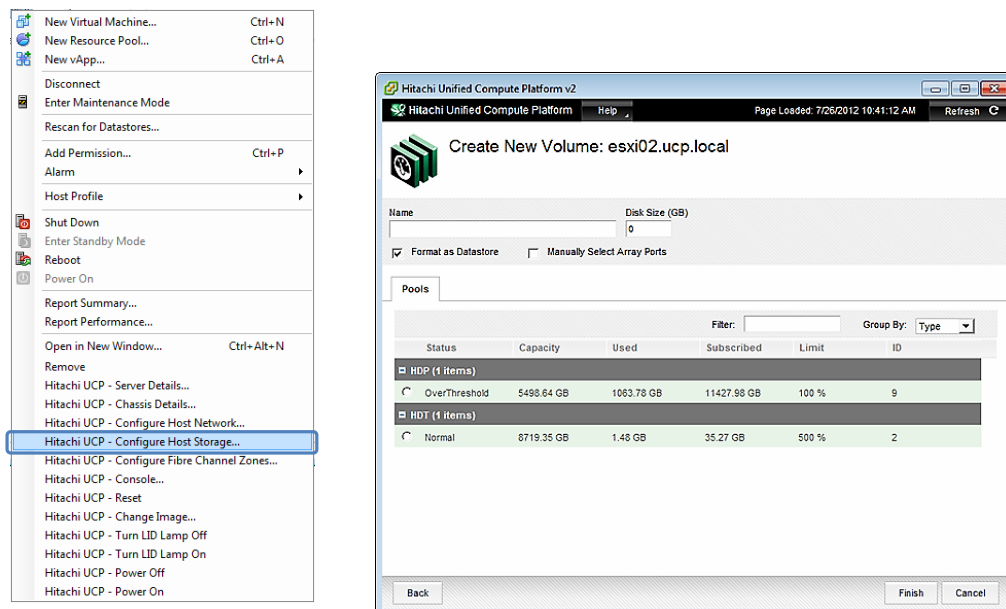
Storage Provisioning

Figure 7 – Create New Volumes

Configuring VLANs

Hitachi Unified Compute Platform (UCP) Director acts as an interface to the Ethernet switch inside vCenter and is able to report hardware events and automate VLAN configurations for any Ethernet switch. We observed that the two Ethernet switches used in the validation were already added to UCP Director inventory and were available to be configured. We observed this in the Ethernet Switches table which showed the switch names, the status of each switch, the serial number of each switch, switch type, make and model, firmware version, IP address and ID.

Once Ethernet switches have been added VLANs can be created for the virtual machine network. This is normally created manually within vCenter. Once VLANs on the ESXi servers have been defined through

vCenter, UCP Pro for VMware vCenter can configure them. The default VLANs were configured for all managed ports. We also observed that different VLANs were configured on individual hosts and/or clusters.
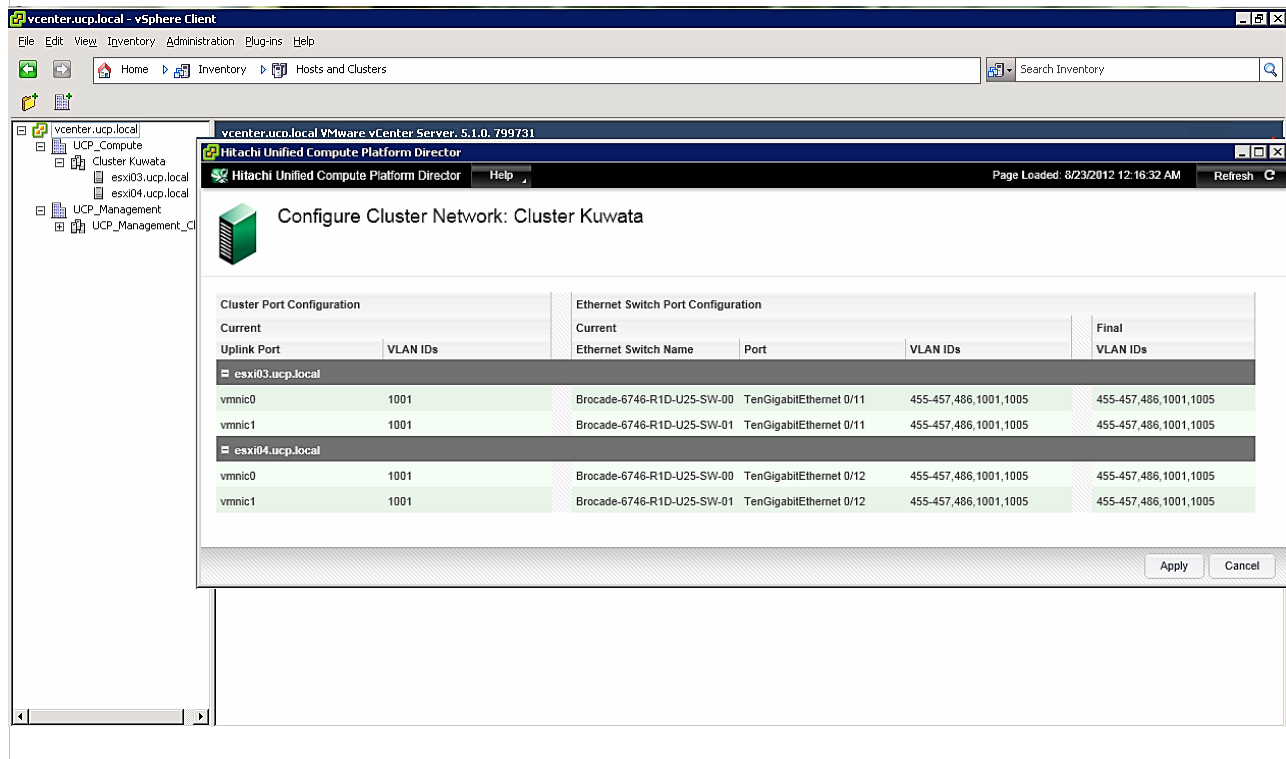

Figure 7 – Create a VLAN

Evaluation Summary

The Evaluator Group found that Hitachi Unified Compute Platform (UCP) Pro for VMware vSphere is an easy solution for IT organizations needing to rapidly deploy and manage a VMware vSphere infrastructure or deploy a private cloud. The unified management with the tight integration of the UCP Director within vCenter does give the administrator an end-to-end view from vCenter to orchestrate, monitor, and troubleshoot their infrastructure to meet and keep SLAs. This converged solution can maximize the use of an administrator's time and shows a high degree of flexibility in deploying and managing the environment. Days and sometimes weeks of installation time are saved since UCP Pro for

VMware vSphere is pre-installed, pre-integrated, pre-configured, and pre-tested specifically including customer requirements before delivery. With the combination of Intel Xeon based HDS servers, HDS storage, built-in networking and VMware vSphere, UCP Pro for VMware vSphere can reduce the initial investment (CAPEX) required to procure, integrate, and implement an infrastructure solution for virtualized environments. UCP Pro also reduces ongoing operational cost (OPEX) through a simplified management process and automation of tasks that might otherwise require the involvement of multiple departments and many manual steps.

References

Supported 3rd party storage - http://www.hds.com/products/storage-systems/specifications/supported-external-storage.html

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