

ESG Lab Review

Nutanix Complete Cluster

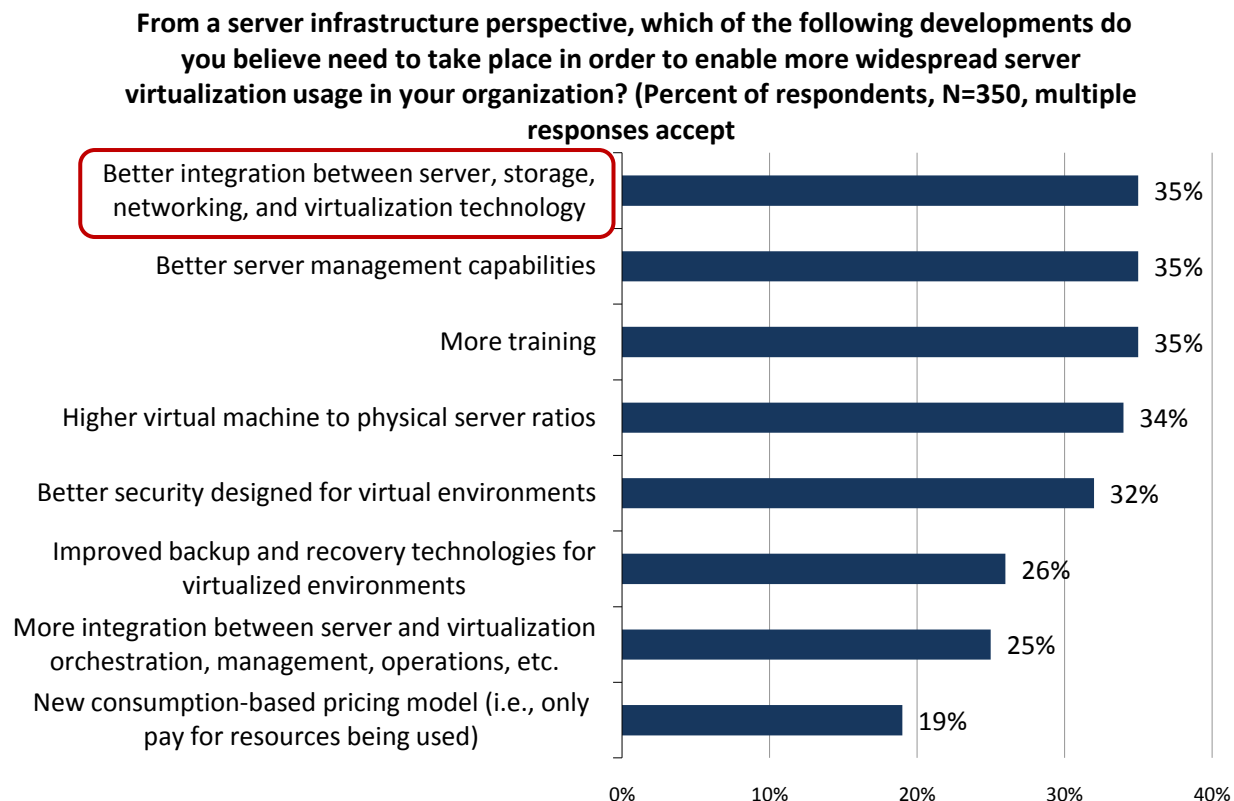
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Abstract: This ESG Lab review documents hands-on testing of the [Nutanix Complete Cluster](#), highlighting its ease of use and support for enterprise class data management in virtual environments.

Server Virtualization Challenges

Server virtualization is driving widespread and fundamental change. IT organizations struggle to meet exponentially increasing demand for network and storage resources in support of virtualized deployments. Network administrators struggle with hardware and tools that were not designed for virtual technology and find it challenging to map VLANs and other networking segmentation to a virtual infrastructure. Storage administrators cite the ever increasing storage requirements for an exploding virtual environment and challenges with managing growth to meet demand. ESG research discovered that better integration among server, storage, networking, and virtualization technologies is the key development required for the continued adoption of virtualization.¹

Figure 1. Infrastructure Requirements for Virtualization



Source: Enterprise Strategy Group, 2010.

¹ Source: ESG Research Report, [The Evolution of Server Virtualization](#), November 2010.

The goal of ESG Lab reports is to educate IT professionals about emerging technologies and products in the storage, data management and information security industries. ESG Lab reports are not meant to replace the evaluation process that should be conducted before making purchasing decisions, but rather to provide insight into these emerging technologies. Our objective is to go over some of the more valuable feature/functions of products, show how they can be used to solve real customer problems and identify any areas needing improvement. ESG Lab's expert third-party perspective is based on our own hands-on testing as well as on interviews with customers who use these products in production environments. This ESG Lab report was sponsored by Nutanix.

Clearly, networking and storage needs and integration are creating headaches for IT organizations as they look to provide cost effective solutions for virtual environments. Sizing the bandwidth required to support a virtual server environment is often an issue with 24% of networking professionals citing it as a primary concern with their organization's virtual usage. Additionally, storage administrators viewed capital costs of new storage infrastructure (36%) and scalability problems (25%) as top concerns in supporting virtualization.²

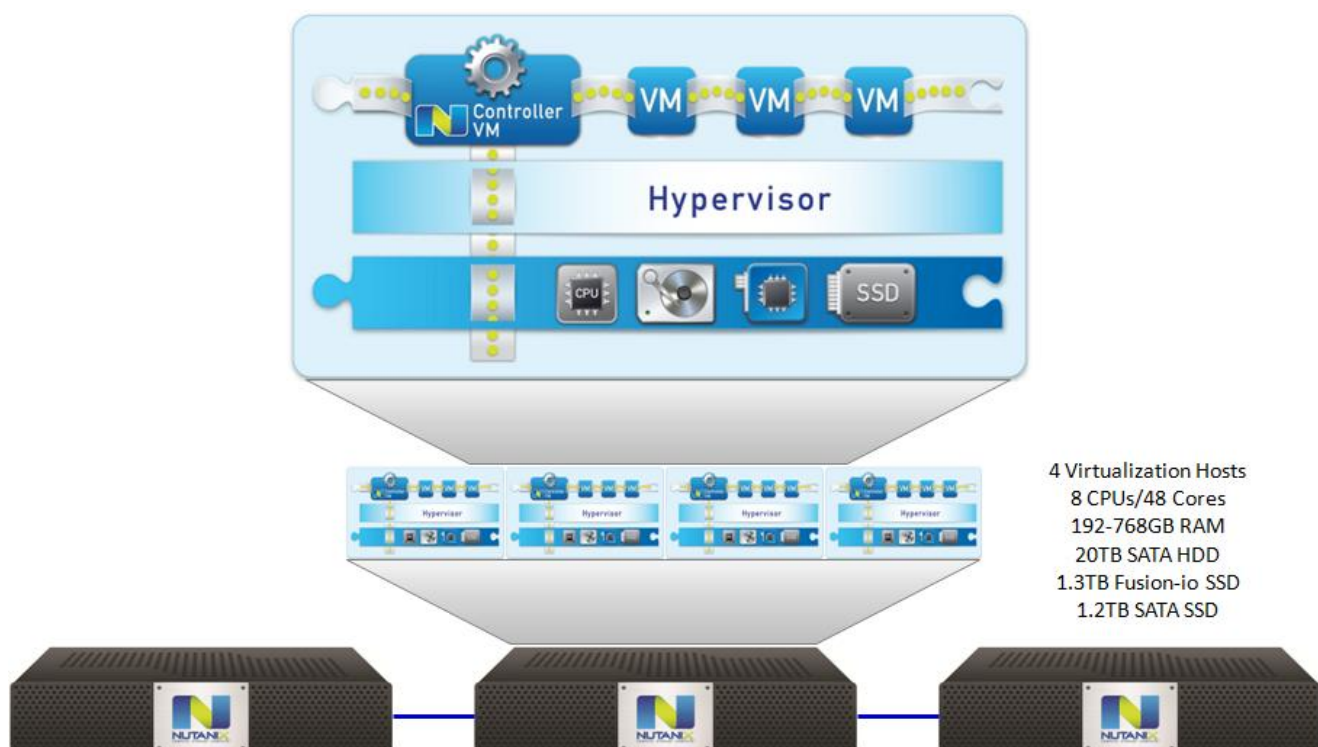
In response to these concerns, integrated computing platforms have garnered attention. These solutions promise to alleviate networking and storage challenges associated with virtualization by combining these services into one platform, eliminating the loosely coupled integration designs that exist today. While only 10% of organizations surveyed by ESG have already deployed integrated computing platforms, two-thirds expressed some level of interest in the technology, suggesting a new trend in the design and deployment of dynamic virtual environments.³

The Solution: Nutanix Complete Cluster

Nutanix introduces a new integrated, scale-out computing platform that delivers server, hypervisor, and storage components together in one system. It provides a building block, called Nutanix Complete Block, which brings compute and storage together. Complete Cluster is a seamless cluster of these blocks that enables organizations to scale out incrementally from a single block to as many as they need, but still manage a single, unified system. Four server nodes are included in each 2U block and are built to host and store virtual machines with a standard hypervisor running on each node. A Nutanix Controller Virtual Machine on each host manages storage for virtual machines on the host. Controller VMs work together to manage storage across the cluster as a seamless pool. Standard VMware features like vMotion, are supported by Nutanix Complete Cluster.

Each server in the cluster contains a mix of SSD (PCIe and SATA) and SATA hard drives that can be pooled as a single storage resource. Virtual disks (vDisks) can be created from available storage and then presented as a global iSCSI target to any virtual machine providing vMotion capability without the need for a SAN.

Figure 2. Nutanix Complete Cluster



² Source: ESG Research Report, [The Evolution of Server Virtualization](#), November 2010.

³ Source: ESG Research Brief, [Integrated Computing Trends](#), March 2011.

Nutanix delivers the following features in a simple to deploy, integrated appliance:

- Command Center, a web-based management console that provides enterprise class features for managing both compute and storage in a simple to use interface.
- Cluster capabilities and data replication to provide high availability for disk and node failover.
- Heat-Optimized Tiering with configurable metrics to age and migrate data to lower storage tiers for optimal disk IO performance.
- Support for snapshots to create point-in-time copies of data for quick recovery.
- Clone technology to provide rapid provisioning of virtual machines for multiple use cases such as virtual desktop deployment and production server copies for development environments.
- Support for VMware enterprise features such as vMotion, Dynamic Resource Scheduler (DRS), high availability failover, and server migration.

ESG Lab validated the Complete Cluster solution's ease of use and its support for virtual environments during two days of hands-on testing at Nutanix's headquarters in San Jose, California.

Ease of Use and Enterprise Class Data Management

Nutanix's Complete Cluster solution is built from Nutanix Complete Blocks, which are Intel-based appliances, each containing four nodes. Each of these nodes contains a combination of PCIe-SSD (Fusion-io), SATA SSD, and hard disk drives. The appliance tested by ESG Lab contained five SATA hard drives, one PCIe SSD drive, and one SATA SSD drive for each node. Initially, the appliance configuration contained three nodes in the cluster, with a fourth on standby to add later to test scalability. As shown in Figure 3, testing was conducted in an environment that consisted of one Nutanix appliance and a client laptop to connect to the appliance for management tasks.

Figure 3. ESG Lab Test Bed



ESG Lab Tested

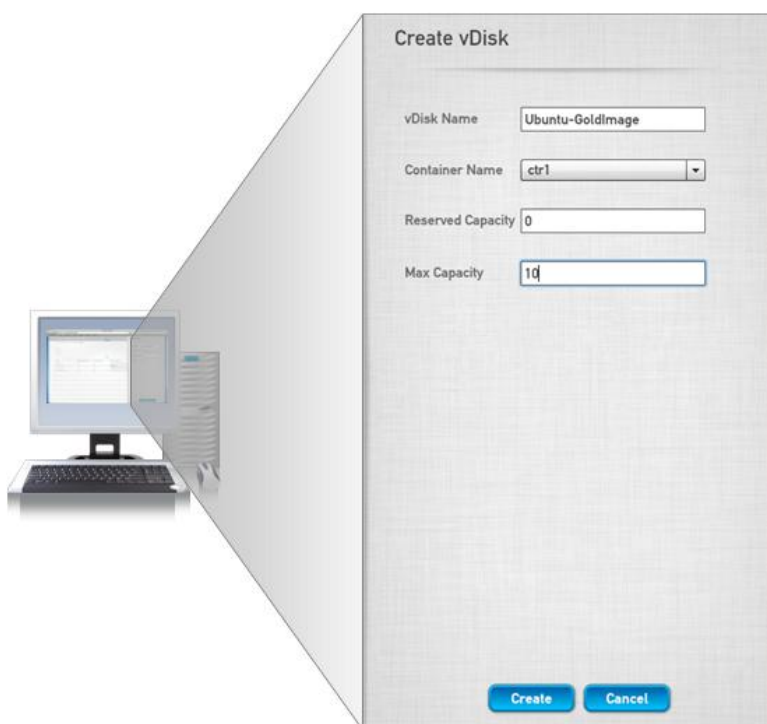
ESG Lab used a web browser to connect to the Command Center and examined the features available for the cluster. As shown in Figure 4, the dashboard presents a comprehensive picture of the Complete Cluster. Hosts are listed under both the storage and compute sections. With this configuration, ESG Lab was able to examine both the storage and virtual server resources associated with a host. In addition, multiple management tasks are available including creating and editing storage pools and containers for logical storage allocation.

Figure 4. Nutanix Command Center



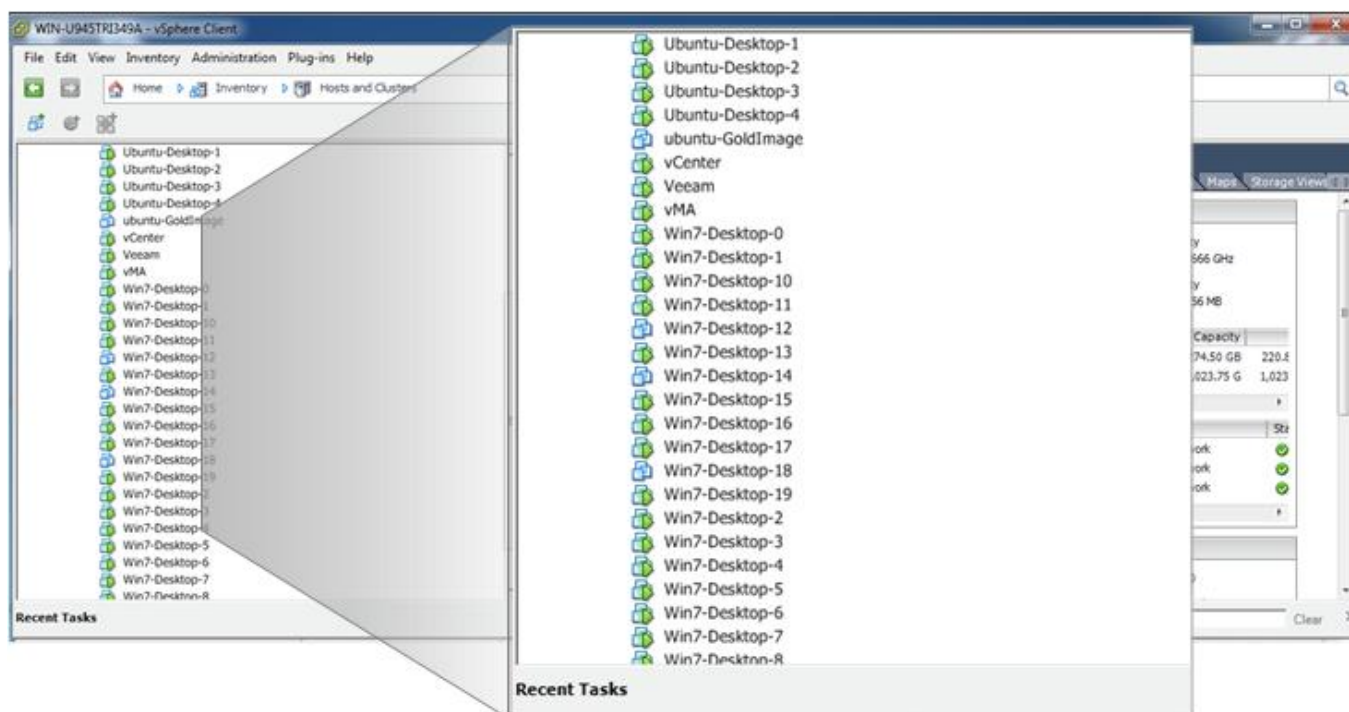
ESG Lab tested the ability to create a vDisk for use in a Linux virtual server installation. A vDisk is a subset of available storage within a container that is exported to VMs in the cluster. Figure 5 shows the parameters ESG Lab used to successfully create a vDisk for use by a new virtual machine. Using a vCenter management console, ESG Lab created a new virtual image for an Ubuntu Linux installation using the newly created vDisk.

Figure 5. Create vDisk for Linux Virtual Machine



Next, ESG Lab tested the clone functionality of the Complete Cluster. Cloning allows writable copies of virtual servers to be created to quickly provision new server resources when needed. One Windows 7 and one Ubuntu Linux virtual image were used to test cloning functionality. ESG Lab opened an SSH session to a vSphere management assistant (VMA) used to execute CLI commands for the cluster. Using the CLI command, ESG Lab was able to create 20 clones of the Windows 7 server and five clones of the Ubuntu Linux server. The cloning process included creating writable snapshots of the gold image, provisioning new clone VMs in ESXi, and connecting each clone VM to a vDisk snapshot. In the end, the user gets a fully functional virtual machine with a vDisk attached to it. ESG Lab confirmed that the entire copy process for both images lasted approximately 20 minutes. As Figure 6 shows, ESG Lab used the vCenter console to validate that all 25 clones were created.

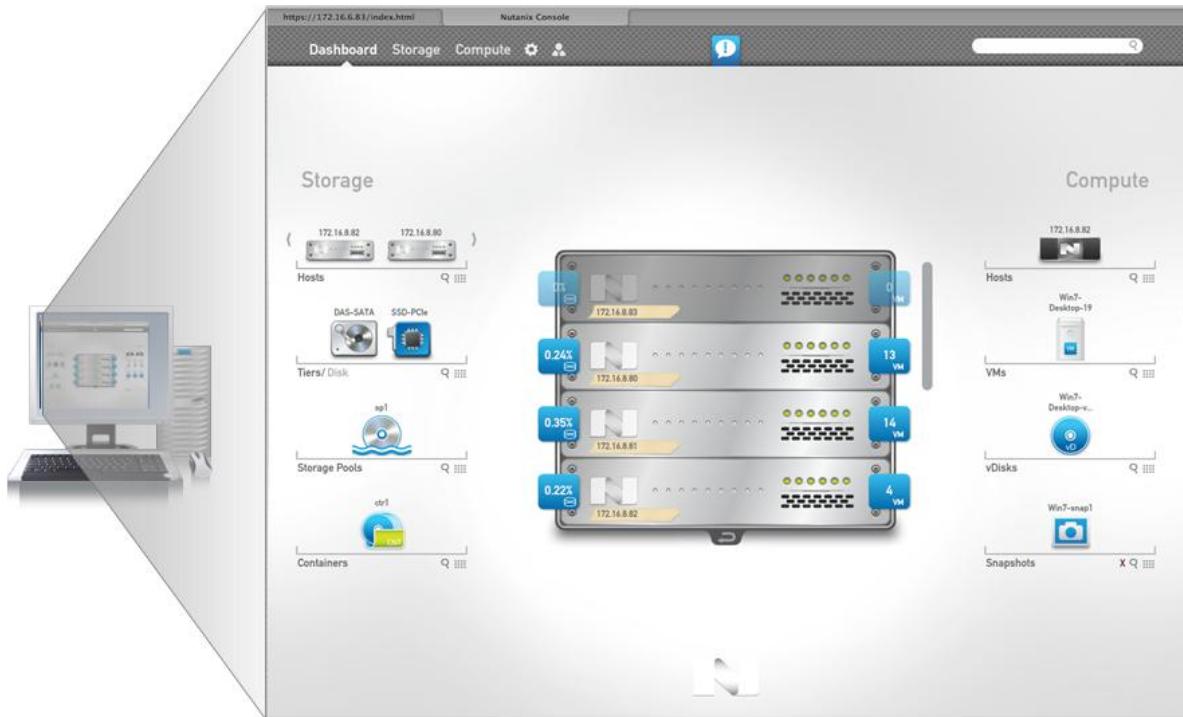
Figure 6. Create Windows and Linux Clones



ESG Lab next examined adding a node to the cluster. During the cloning process, ESG Lab created a new node in vCenter to be added to the cluster. After the clone test finished, ESG Lab stopped all running virtual server and cluster services to add the new node. Using the CLI on the VMA, ESG Lab used the command “host add svm-ip=172.16.8.87” to add the host to the cluster. Figure 7 shows the new node successfully added to the cluster.

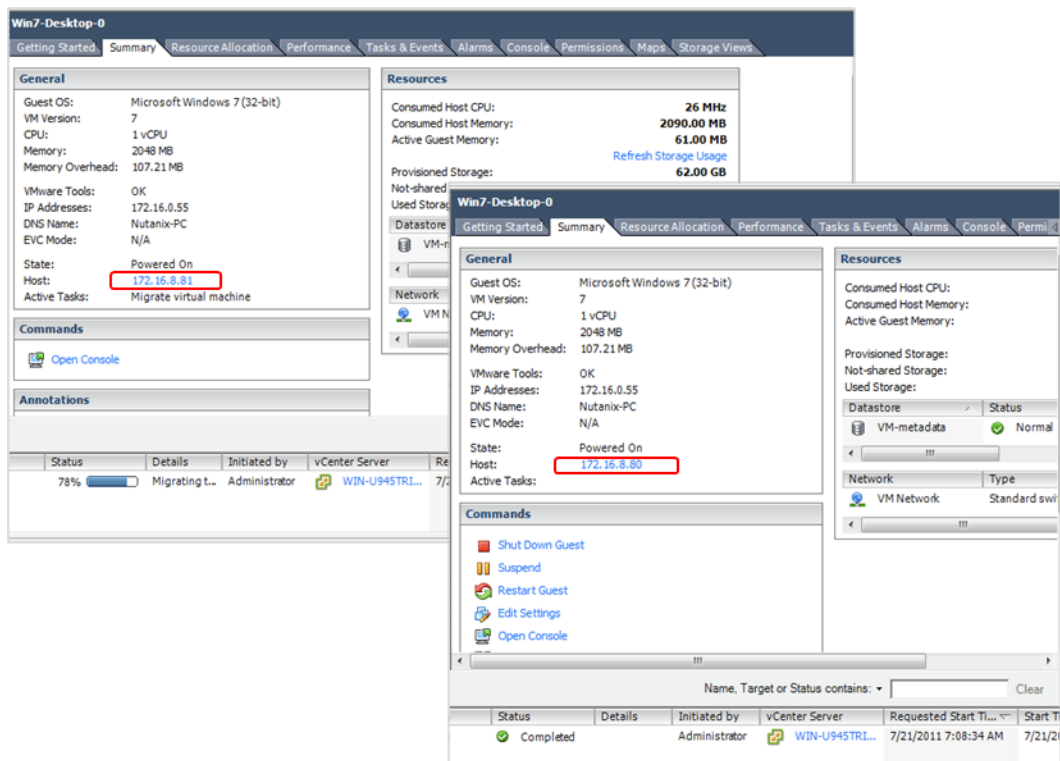
ESG Lab then used the Command Center GUI to verify creation of the new host and added its SSD and SATA drives to the existing storage pool.

Figure 7. Add Node to the Cluster



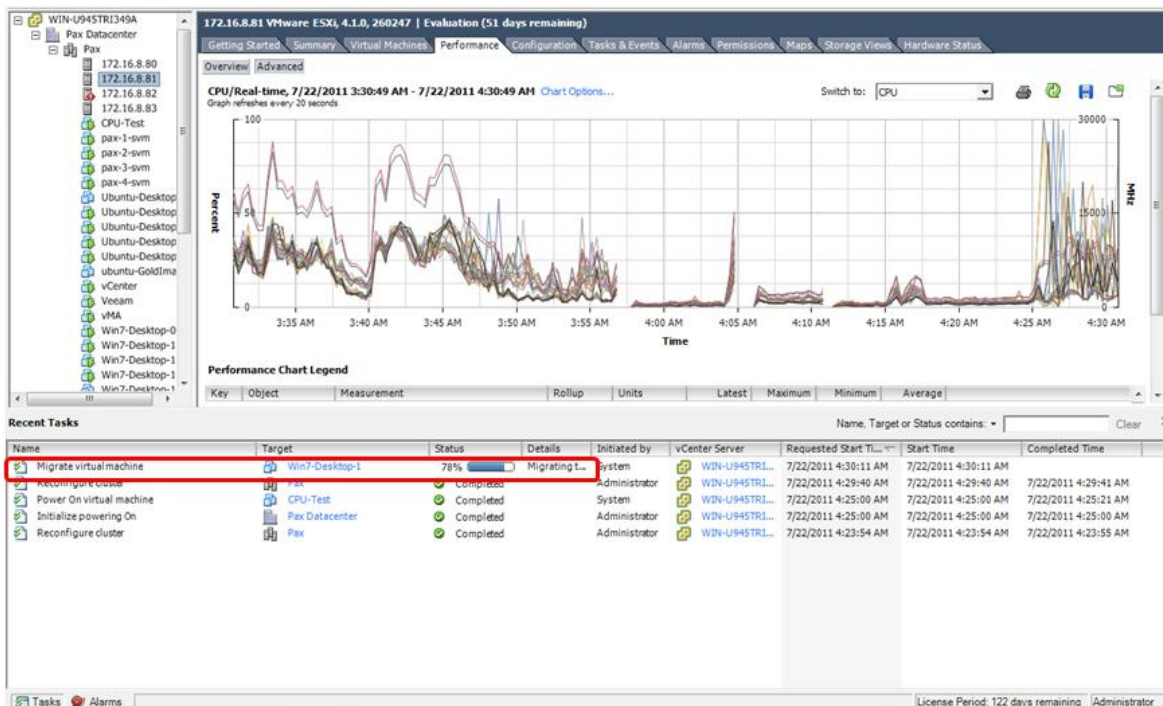
Migrating virtual machines from one host to another is a required function in VMware environments. Nutanix's Complete Cluster supports VMware's migration functions natively. ESG Lab tested migration of a Win7-Desktop-0 virtual image from node 172.16.8.81 to 172.16.8.80. As Figure 8 shows, the migration was successful and took less than a minute to complete. ESG Lab verified the migration with Command Center and observed that Win7-Desktop-0 was now listed as a compute resource on 172.16.8.80.

Figure 8. Migrate Virtual Machines



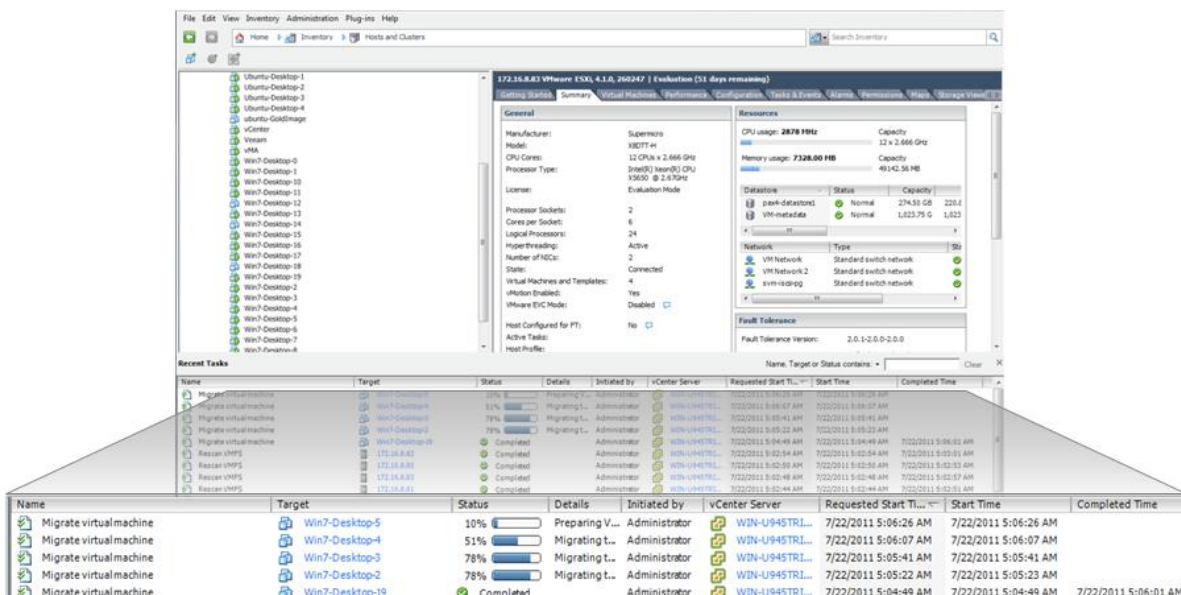
Another supported function for VMware is the Dynamic Resource Scheduler (DRS). DRS automates live migrations through vMotion when resources become overtaxed. Nutanix Complete Cluster supports DRS by supporting vMotion. ESG Lab tested DRS by using the virtual image CPU-Test. When powered up, CPU-Test started a program that created 100% load on host 172.16.8.81. Figure 9 shows the performance tab on the host illustrating the high workload. As the task windows shows, Win7-Desktop1 began to migrate as soon as CPU utilization was 100%.

Figure 9. Automatic Migration Using Dynamic Resource Scheduler



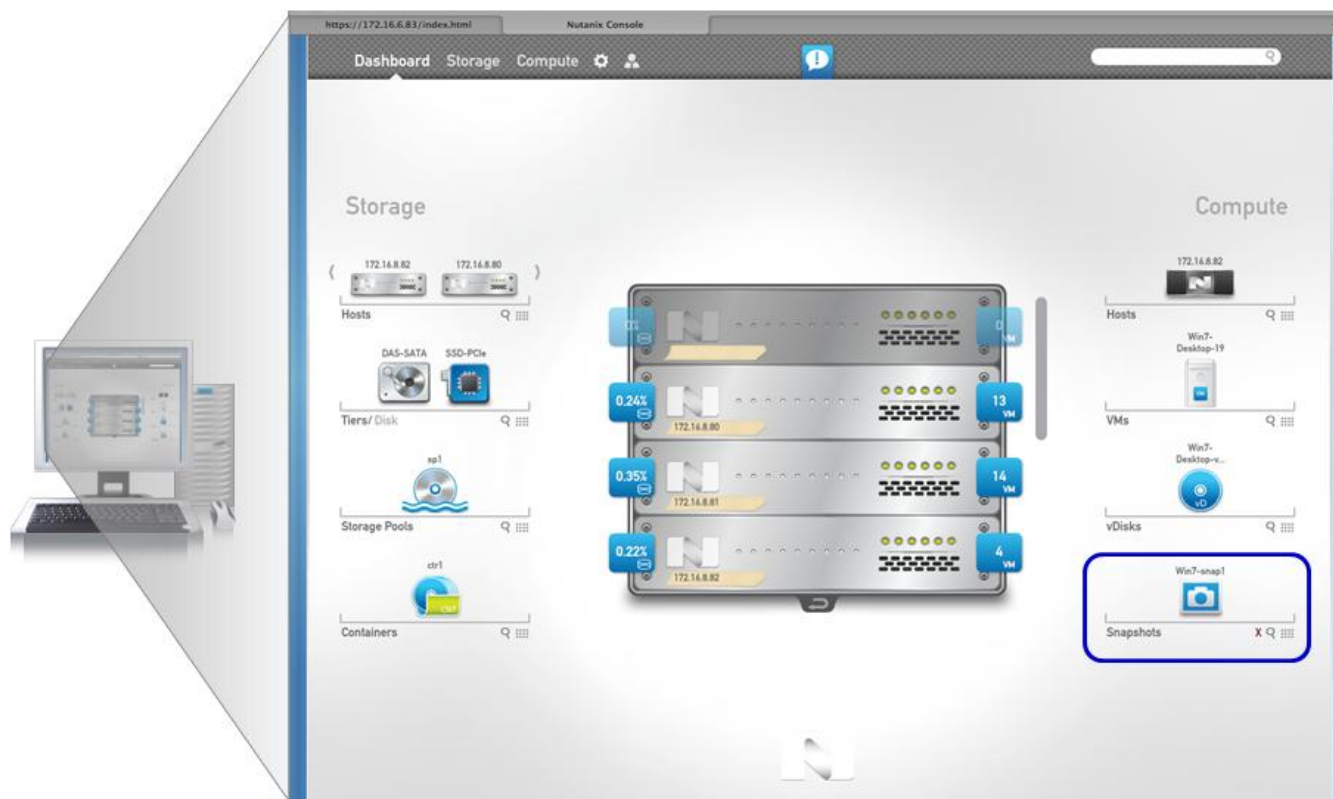
The Nutanix Complete Cluster is designed to respond to both disk and node failures. ESG Lab tested high availability by powering down node 172.16.8.83 in the appliance. The node was configured with five virtual images, which began to immediately migrate to other nodes in the cluster as shown in Figure 10. ESG Lab verified the images migrated successfully by opening the consoles in vCenter for the affected machines.

Figure 10. Server Migration After Failed Node



ESG Lab analyzed the snapshot capabilities of the Nutanix Complete Cluster. Snapshots preserve data at any point in time for virtual machines in the cluster. In vCenter, ESG Lab opened the console to the Win7-GoldImage virtual machine and created a text file on the desktop. Using the CLI on the VMA, ESG Lab created a snapshot of the virtual machine called Win7-snap1. As show in Figure 11, using the Command Center console, ESG Lab verified the successful completion of the snapshot. Next, ESG Lab deleted the text file on the Win7-GoldImage desktop. Returning to the CLI, ESG Lab restored the snapshot to a new clone name, which created a new iSCSI target disk. ESG Lab then opened the vCenter console, removed the current iSCSI target for Win7-GoldImage, and added the new iSCSI target disk created by the snapshot restore. Using the VMware console for the restored image ESG Lab verified that the restored snapshot contained the text file.

Figure 11. Snapshot Virtual Disk



Why This Matters

Integrated platforms offer the potential to greatly decrease the cost of deploying virtual technology. A scale-out design allows customers to pay as they go not only for server resources, but also for networking and storage equipment. Additionally, IT organizations can begin to realize true OPEX savings by simplifying and centralizing the management of disparate resources such as storage, networking, and servers.

The promise of integrated computing, however, can only be realized if these solutions support enterprise class data management functions. Nutanix's appliance enables virtualization without requiring network storage. In addition, it combines multiple enterprise functions such as cloning, snapshots, cluster management, HA failover, virtual machine migration, and support for VMware's hypervisor environment.

ESG Lab found the enterprise-class features quite effective in delivering a high performance and highly available virtual environment. ESG Lab also found the appliance easy to deploy with a very simple drop-in capability that had virtual machines installed and running within 30 minutes.

The Bigger Truth

The adoption of server virtualization requires significant changes to existing storage infrastructure. Storage groups are playing a game of catch up as they design new networked storage solutions to meet the demands that the high IO and throughput densities of virtualization creates. While virtualization promises to deliver savings in capital expenditures, these savings can be wiped out by the costs of upgrading to faster storage systems needed to respond to these requirements.

According to ESG research, simplified management, reduced deployment times, and a better economic model have all been identified as benefits of integrated platforms as users enjoy ease of management (44%), faster deployment times (37%), improved TCO (35%), and less time required for hardware and software integration (33%). Respondents also envision benefits associated with interoperability issues, application performance, and service and support.⁴

Nutanix delivers a solution for virtual environments that simplifies the deployment of scale-out compute and storage resources while providing enterprise class data management functions. ESG Lab was able to confirm effective implementation of cluster services, snapshot, and cloning in addition to support for multiple VMware functions such as vMotion, Dynamic Resource Scheduler, and HA failover.

ESG recommends that Nutanix continue to move more management features from command-line based functions to the graphical management interface. Support for additional virtual environments such as Citrix XenServer and Microsoft Hyper-V would also extend the reach of Nutanix's solution.

Virtualization will continue to be a disruptive force for IT, requiring new ways of thinking about compute and storage environments as scalability and elasticity become paramount. Nutanix sits at the forefront of this emerging trend with a solution that is both simple and versatile to deploy and manage. As companies start to look to new solutions for their growing and dynamic virtual environments, Nutanix stands to deliver a solution that can grow with them.

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⁴ Source: ESG Research Brief, [Integrated Computing Trends](#), March 2011.