

OmniStack Integrated Solution with Cisco Unified Computing System: Reference Architecture

July 2014

Overview

SimpliVity's fundamental mission is to simplify IT.

Specifically, SimpliVity's mission is to deliver customers the best of both worlds:

- x86 cloud economics
- Enterprise capabilities, protection, and performance

Enterprise customers today need more than what current cloud or web companies like Google and Amazon can deliver, and they need better consolidation and performance than what traditional infrastructure can provide. Enterprise customers want both x86 cloud economics and enterprise capabilities, protection, and performance.

The SimpliVity OmniStack Integrated Solution with Cisco Unified Computing System™ (Cisco UCS®) allows customers to experience and benefit from impressive cloud economics as well as enterprise-class capabilities, protection, and performance. The OmniStack solution provides a hyperconverged, all-in-one IT infrastructure platform that includes storage, computing, networking, hypervisor, real-time deduplication, compression, and optimization along with powerful data management, data protection, and disaster-recovery capabilities. The OmniStack Integrated Solution with Cisco UCS is a 2-rack-unit (2RU) building block based on x86, industry-standard systems that can be clustered in an efficient scale-out manner to deliver performance, capacity, availability, and enterprise-class functions. By combining these powerful capabilities in a scalable IT building block and using the shared pool of resources, SimpliVity and Cisco provide dramatic improvements in economics and IT simplification when compared to traditional solutions.

This solution is designed for high availability with no single point of failure. The elegant, scale-out design of the integrated solution also includes a data virtualization layer that provides inline, real-time global deduplication, compression, and optimization on all I/O operations that occur across the federation of systems. This virtualization layer dramatically simplifies the provisioning of native virtual machine-level data-protection and disaster-recovery services by reducing the size and therefore the IT resources needed to replicate, back up, and provide offsite protection for your enterprise workloads. The benefits delivered by this framework include performance acceleration through elimination of redundant I/O operations and capacity optimization and WAN optimization through elimination of redundant data sent between data centers and remote offices. The ultimate goal is to deliver lower cost, better performance, and more agility.

SimpliVity refers to this level of integration as hyperconvergence. The integrated solution can scale to handle a wide variety of business applications and IT workloads running on standard VMware solutions. Global management of the distributed systems is handled by a single administrator using VMware vCenter through a plug-in that reduces administrative complexity—providing simplicity to the modern data center.

Audience

This document describes the solution architecture and validation for SimpliVity OmniStack Integrated Solution with the Cisco UCS C240 M3 Rack Server. The intended audience for this document includes sales engineers, field consultants, professional services, IT managers, partner engineers, and customers who want to deploy the SimpliVity hyperconverged solution with Cisco UCS C-Series Rack Servers.

Business and Solution Value

SimpliVity OmniStack is the core technology that powers the new Cisco UCS solution.

SimpliVity Hyperconverged Infrastructure Benefits

SimpliVity delivers hyperconverged infrastructure for the software-defined data center.

A single software OmniStack platform combines the functions of up to 12 different products in one, running efficiently atop a single shared x86 resource pool and using enterprise-class Cisco UCS C-Series Rack Servers to deliver best-in-class IT. The solution condenses the entire traditional stack into one entity, including servers, storage, switch, deduplication, compression, backup, and WAN optimization functions on x86 resources with global scalability to deliver enterprise capabilities, protection, and performance. Customers benefit from savings of three times the total cost of ownership (TCO) for the acquisition cost of IT infrastructure and the cost of labor, space, and power. Additionally, a robust 10 Gigabit Ethernet network is sufficient to run high-performance, high-capability IT.

SimpliVity refers to this integrated level of consolidation as hyperconvergence. By making the shared resource pool a reality, OmniStack delivers global federated management and scalability. Through its unified data efficiency, policy-based data protection, and disaster recovery, OmniStack provides enterprises with the ease of mind needed for continual growth. With this disruptive technology, SimpliVity helps ensure data center market penetration in an era of rapid transformation.

The benefits delivered by this framework include performance acceleration by eliminating redundant I/O operations, capacity optimization, and WAN optimization through the deletion of redundant data sent between data centers and remote offices. The solution also delivers cloud economics with enterprise-class capabilities (performance, reliability, availability, security, data protection, and disaster recovery).

Cisco UCS C-Series Rack Server Benefits

Cisco UCS C-Series Rack Servers, which are designed to operate both in standalone environments and as part of the Cisco Unified Computing System, deliver a more efficient and scalable approach to your data center. With a standards-based unified network fabric, Cisco® Data Center Virtual Machine Fabric Extender (VM-FEX) virtualization support, and programmatic XML API integration, Cisco Nexus® products and Cisco UCS C-Series servers deliver a powerful combination that allows choice and flexibility while offering a straightforward migration path to unified computing.

The Cisco UCS C240 M3 Rack Server is designed for both performance and expandability over a wide range of storage-intensive infrastructure workloads.

Cisco UCS C-Series Rack Servers provide the following benefits:

- Form-factor-independent entry point into Cisco UCS
- Simplified and fast deployment of applications
- Operation in standalone environments and as part of Cisco UCS, extending of Cisco's unified computing innovations to help reduce customers' TCO and increase business agility
- Transformation of IT departments, as part of Cisco UCS managed operations, through policy-based automation and deep integration with familiar systems management and orchestration tools
- Increased customer choice with unique benefits in a familiar rack package
- Delivery of industry-leading performance and efficiency gains for IT infrastructure and enterprise applications

Combined Value

Cisco, as a networking equipment solutions provider, has proven capability to articulate and market its long-term data center vision, strong data center service organization and support, and robust channel and vendor alliances. In response to recent, rapid changes in the data center market, Cisco also recognizes the importance of a more concentrated focus in the storage market and IT infrastructure operation space and so is partnering with SimpliVity to achieve that vision.

According to Gartner, Cisco is well-aligned with major customer trends and has a definitive grasp on the server and integrated systems environment, but it can benefit from continuing to innovate to disrupt traditional computing and storage models and build on its large, loyal user base.¹ SimpliVity provides unique innovation for this opportunity. Cisco has a very impressive array of products, and SimpliVity offers a solution to help simplify its data center network portfolio for increased ease of manageability and future scalability. SimpliVity's flexible software stack and Data Virtualization Platform provide a streamlined solution to both create consistency and simplify modern data center architecture.² According to Gartner, Cisco has the vision to build on and, indeed, propel the trend toward convergence of servers, storage, and networking technologies in the data center.³ Working with SimpliVity will not only propel Cisco further into the data center market, but also solidify its position as a leader in data center and networking solutions.

The partnership with SimpliVity provides Cisco with storage capabilities that improve the overall Cisco UCS offering. It also delivers SimpliVity Data Virtualization Platform technology, which reduces the number of I/O operations per second (IOPS) to solid-state drives (SSDs), flash drives, and hard disk drives (HDDs); reduces capacity as well as associated space and power requirements; and enables global mobility of virtual machines and data at a fraction of the time and cost of traditional solutions. Coupled with integrated enterprise functions—including advanced virtual machine-centric disaster recovery and data protection and global federated management—in one powerful IT platform, the result is a robust package that combines the best of both companies.

¹ Gartner, G00262500, "Cisco, Data Center Business, Worldwide," Naresh Singh, June 17, 2014

² Ibid.

³ Ibid.

Solution Overview and Benefits

The SimpliVity Integrated Solution with Cisco UCS is a unified data center platform composed of Cisco UCS servers with integrated storage elements (HDD, SDD, and SimpliVity PCI Express [PCIe] accelerator card) and the SimpliVity OmniStack Data Virtualization Platform software. The combined hyperconverged solution delivers exceptional performance, capabilities, and integration to support a variety of applications and use cases, including data center consolidation, multisite data protection and disaster recovery, and business-critical applications.

Simplified IT: Cost Savings and Operation Efficiency

Customers have reported savings of three times lower TCO with OmniStack installed in their data centers. OmniStack eliminates redundancy in allocation of management resources to maintain individual virtual machines, reduces space and power expenses with fewer infrastructure racks to be cooled, and saves capital expenditures (CapEx) and operating expenses (OpEx) compared to traditional stacks, which each entailed separate costs to maintain.

With performance acceleration and resource efficiency in mind, SimpliVity developed its PCIe accelerator card with a field-programmable gate array (FPGA) and nonvolatile RAM (NVRAM) protected with supercapacitors to deliver powerful computing and processing capabilities. As data is written at inception, the OmniStack accelerator card deduplicates, compresses, and optimizes it inline, once and forever, everywhere. This architecture allows data processing at near-wire speed, delivering enterprise-class performance and reducing latency because of high-speed, high-availability NVRAM. The architecture is also extremely efficient because of high-performance FPGAs. This means that not only is the data not slowing down, it is accelerated through deduplication of IOPS and data as it is written.

Broad Scope of Capabilities

No longer are 12 different devices needed for WAN optimization, backup deduplication, or cloud gateways. OmniStack also requires fewer SSDs in the system than traditional devices because write operations will have already been deduplicated, compressed, and optimized. The SimpliVity Data Virtualization Platform design improves resource efficiency for all tiers (HDD and SDD) and across all phases of the data lifecycle (primary, backup, archive, WAN, and cloud). There are many additional protection capabilities, and additional systems can be implemented for even greater efficiency and availability. OmniStack combines, or hyperconverges, all the functions associated with storage, data, and data movement.

Use Cases

Some of the compelling use cases include:

- **Data center consolidation:** Customers use the OmniStack Integrated Solution with Cisco UCS to completely consolidate IT across two or more sites, all managed from a single pane, whereby all applications run on OmniStack with Cisco UCS: typically two or more per site. This use case is commonly a midmarket deployment.
- **Remote-office, branch-office, and multisite central management projects:** SimpliVity and Cisco enable unified remote-office management projects. The OmniStack Integrated Solution with Cisco UCS provides data mobility services and the capability to manage remote OmniStack with Cisco UCS from one location and interface, uniquely positioning the solution to address multisite management projects. Customers with this use case tend to be very large enterprises with numerous remote offices.

Other use cases include:

- All-in-one, IT modernization projects for a wide set of applications, including mission-critical applications
- Data center virtualization for small to large businesses
- Data-protection, disaster-recovery, and business-continuity projects
- Virtual desktop and end-user computing infrastructure projects
- Development, testing, and quality assurance (QA) projects
- Technology refresh projects
- Data migration and merger and acquisition projects
- Public, private, and hybrid cloud infrastructure

Cisco Unified Computing System

Cisco UCS is the fastest growing next-generation data center computing solution, unifying computing, networking, management, virtualization, and storage access resources in a cohesive system. By converging data center silos into a single unified system, Cisco UCS increases business agility and improves business continuity, thereby lowering TCO and providing the following benefits:

- **Less infrastructure and more intelligent servers:** This unique architecture enables end-to-end server visibility, management, and control in both bare-metal and virtual environments and facilitates the move to cloud computing and IT-as-a-service (ITaaS) with fabric-based infrastructure.
- **Consolidated resources with Cisco UCS servers:** Cisco UCS servers allow dramatic reduction in the number of devices an organization must purchase, cable, configure, power, cool, and secure. Cisco UCS servers optimize virtualized environments across the entire system. Cisco UCS servers can support traditional operating systems and application stacks in physical environments.
- **Accelerated server deployment:** The smart, programmable infrastructure of Cisco UCS simplifies and accelerates enterprise-class application and service deployment in bare-metal, virtualized, and cloud computing environments. With Cisco UCS unified model-based management, administrators can configure hundreds of servers as quickly as they can configure a single server.
- **Simplified management:** Cisco UCS offers simplified and open management with a large partner ecosystem using Cisco UCS Manager.

Cisco UCS represents a radical simplification compared to the way that servers and networks are deployed today. It integrates computing resources on a unified I/O fabric that supports standard IP protocols as well as Fibre Channel through Fibre Channel over Ethernet (FCoE) encapsulation. The system eliminates the limitations of fixed I/O configurations with an I/O architecture that can be changed through software on a per-server basis to provide needed connectivity using a just-in-time deployment model.

The unified management capabilities provided by Cisco UCS Manager, integrated into Cisco UCS, offer administrators flexibility and simplicity. Administrators can manage physical infrastructure similar to the way that they manage virtual infrastructure. Cisco UCS applies familiar, critical virtualization concepts such as templates, policies, and stateless computing to the physical infrastructure. The result is a model-based management system that simplifies and automates administration, accelerates deployment and scaling, and reduces the likelihood of

configuration errors that can cause downtime and long troubleshooting efforts in physical network, computing, and storage infrastructure.

Building on the success of the Cisco UCS portfolio, the enterprise-class Cisco UCS C240 M3 Rack Server further extends the capabilities of the Cisco UCS portfolio in a 2RU form factor. The addition of the Intel® Xeon® processor E5-2600 and E5-2600 v2 product families delivers an optimal combination of performance, flexibility, and efficiency gains. The Cisco UCS C240 M3 Rack Server offers up to 768 GB of RAM, 24 drives, and four 1 Gigabit Ethernet LAN interfaces built into the motherboard to provide outstanding levels of internal memory and storage expandability along with exceptional performance (Figure 2).

Figure 1. Cisco UCS C240 M3 Server



Cisco UCS C-Series features and capabilities include:

- Suitable for nearly all storage-intensive, 2-socket applications
- Unique Cisco UCS Virtual Interface Card (VIC) 1225: two 10 Gigabit Ethernet PCIe cards that can support up to 256 PCIe virtual interfaces
- Exceptional building block and entry point for Cisco UCS
- Continual innovations from Cisco in server technology and at all levels of Cisco UCS
- Cisco UCS Manager integration for improved operation efficiency, enhance visibility and control, and increased agility

The specifications for the Cisco UCS C-Series are:

- Up to two Intel Xeon processor E5-2600 or E5-2600 v2 CPUs
- Up to 768 GB of RAM with 24 DIMM slots
- 24 (small form factor [SFF]) SAS drives, SATA drives, and SSDs for workloads demanding large internal storage capacity
- Five PCIe Generation 3 slots and four 1 Gigabit Ethernet LAN interfaces on the motherboard
- Trusted Platform Module (TPM) for authentication and tool-free access

Solution Validation

Configuration and Topology

The goal of this reference architecture solution validation is to set up an OmniStack Integrated Solution with Cisco UCS and replicate the real-world environment for an administrator from deployment to full production use.

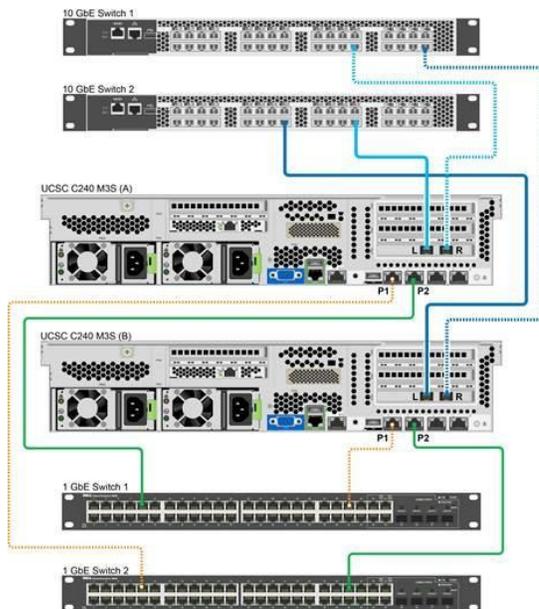
According to one review, “SimpliVity has the most innovative, advanced, converged infrastructure system available,”⁴ and another review stated, “OmniCube’s hardware acceleration comes courtesy of the OmniCube Accelerator, a PCIe card that works with the Data Virtualization Platform to deduplicate, compress, and optimize data inline, with no performance degradation, as well as to accelerate replication capabilities. SimpliVity reduced the complexity of our virtualized environment. We were able to reduce our capital expense, operational expense, and DC footprint.”⁵

The OmniStack Integrated Solution with Cisco UCS is designed to be simple to deploy and to decrease OpEx by reducing the knowledge it takes to run your cloud. The reference architecture specifically validates the steps performed by a customer deploying the unique hyperconverged solution. Operation tasks are validated, including virtual machine–centric data migration, virtual machine setup, application backup and recovery with various failure scenarios, and processing of application workloads. The solution validates a 2+2 federation, with one production cluster composed of two Cisco UCS C240 M3 servers in one data center, and one cluster composed of two Cisco UCS C240 M3 servers used for backup and disaster recovery in a second data center.

Topology

Figures 2 and 3 illustrate the solution topology.

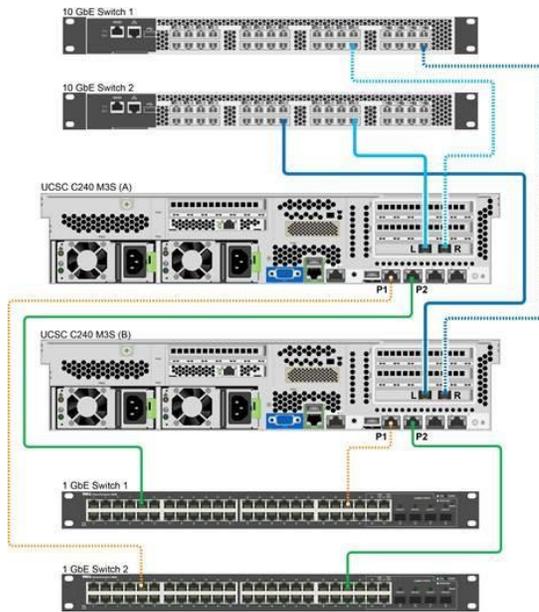
Figure 2. Data Center 1 with Two 2RU Cisco UCS C240 M3 Nodes



⁴ Rich Castagna, “The Best Storage Products of 2013,” *Storage Magazine*, February 2014

⁵ Alex Barrett, “Impact Awards: Best Converged Infrastructure Product,” *Modern Infrastructure*, December 2013

Figure 3. Data Center 2 with Two 2RU Cisco UCS C240 M3 Nodes



Components

Table 1 lists the hardware component details per data center.

Table 1. Hardware Components

| Layer | Component | Quantity |
|------------------------------|--|----------|
| Computing and storage | Cisco UCS C240 M3 servers with Cisco 1225 VIC 2 x 10 Gigabit Ethernet interfaces | 2 |
| | OmniStack PCIe accelerator card | 2 |
| Network | Cisco Nexus 3048 Switches | 2 |

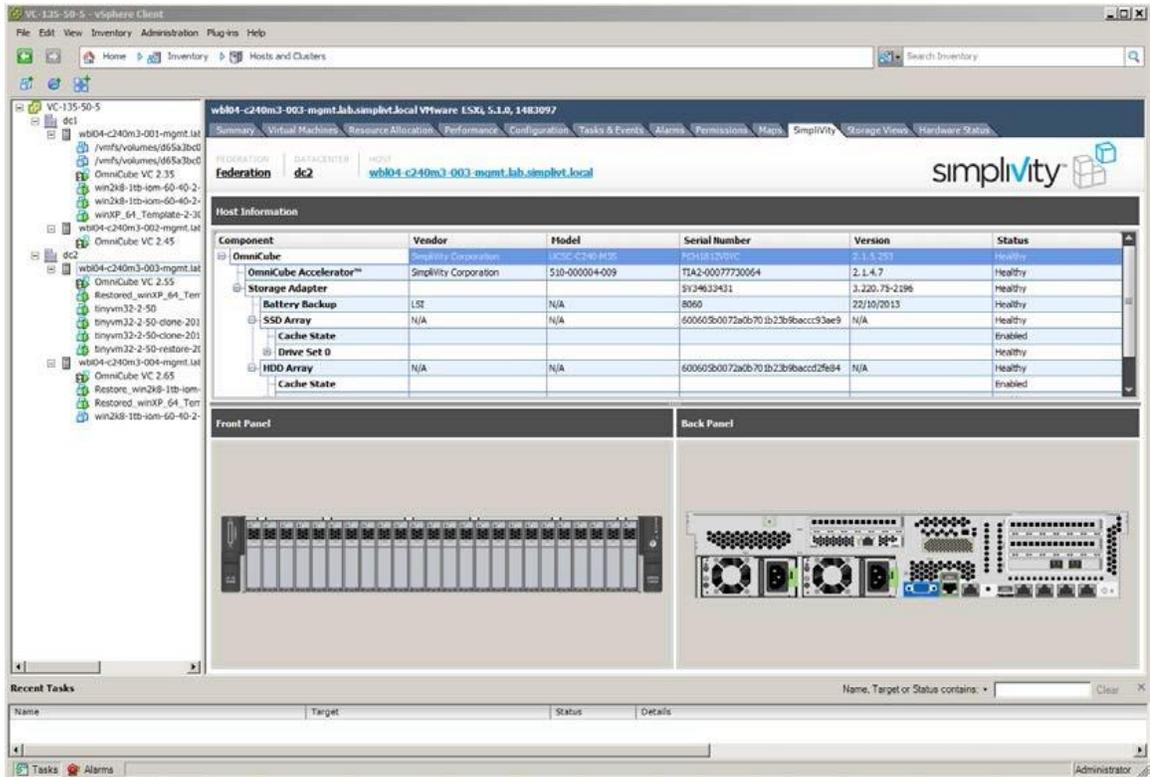
Table 2 lists the software component details.

Table 2. Software Components

| Layer | Device | Vision or Release | Details |
|------------------------------|---------------------------|--|--------------------------|
| Computing and storage | Cisco UCS C240 M3 | Release 1.5.3(d) | Software bundle release |
| | SimpliVity OmniStack | Release 2.1.5 | Software bundle release |
| Network | Cisco Nexus 3048 | Release 6.1(2)J2(0.177) | Operating system version |
| Software | Cisco UCS host | VMware vSphere ESXi 5.1 Update 1 and ESX 5.5 | |
| | Microsoft .NET Framework | Release 3.5.1 | |
| | Microsoft Windows 2008 R2 | Build 7601 SP1 | Virtual machines |

This reference architecture performed validation testing of enterprise applications with a two- node Cisco UCS C240 M3 server optimized system (2+0 federation) and with a four-node system (2+2 federation). Figure 5 shows the 2+2 federation with two data centers composed of two Cisco UCS C240 M3 servers per data center. The view is fully integrated into the VMware vCenter interface, enabling exceptional ease of use and centralized management in a converged solution.

Figure 4. Host View Within VMware vCenter



Federation View Within VMware vCenter

The VMware vCenter view in Figure 5 shows the federation view of the integrated solution.

Figure 5. Federation View Within VMware vCenter

The screenshot displays the VMware vCenter interface in Federation View. The left sidebar shows a tree view of the inventory, including datacenters (dc1, dc2) and various virtual machines. The main content area is titled "FEDERATION" and "simpliVity". It features a "Datacenters" table, a "Throughput (15 second average)" graph, and a "Policies" list.

| Datacenter Name | Free | Used | Capacity | Time Zone | Version | Upgrade Status |
|-----------------|----------|-----------|----------|------------------|-----------|----------------|
| dc2 | 21.98 TB | 303.65 GB | 22.27 TB | America/New_York | 2.1.5.253 | |
| dc1 | 22.03 TB | 252.96 GB | 22.27 TB | America/New_York | 2.1.5.253 | |

The "Throughput (15 second average)" graph shows two datacenters, dc1 and dc2, connected by a line, indicating data flow between them.

The "Policies" list shows the following entries:

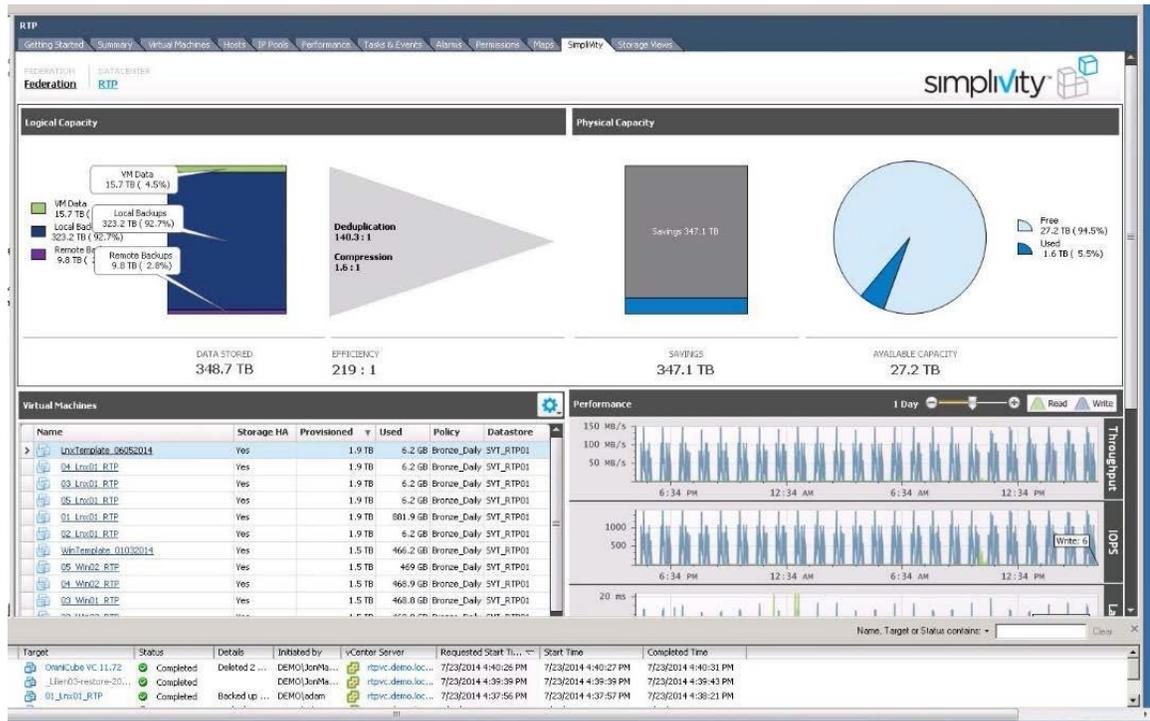
- ds1_bkp
- Policy-1

At the bottom, the "Recent Tasks" table is visible, with columns for Name, Target, Status, and Details. The user is logged in as Administrator.

Data Center View Within VMware vCenter

The view in Figure 6 illustrates the data efficiency and IOPS savings achieved across all virtual machines.

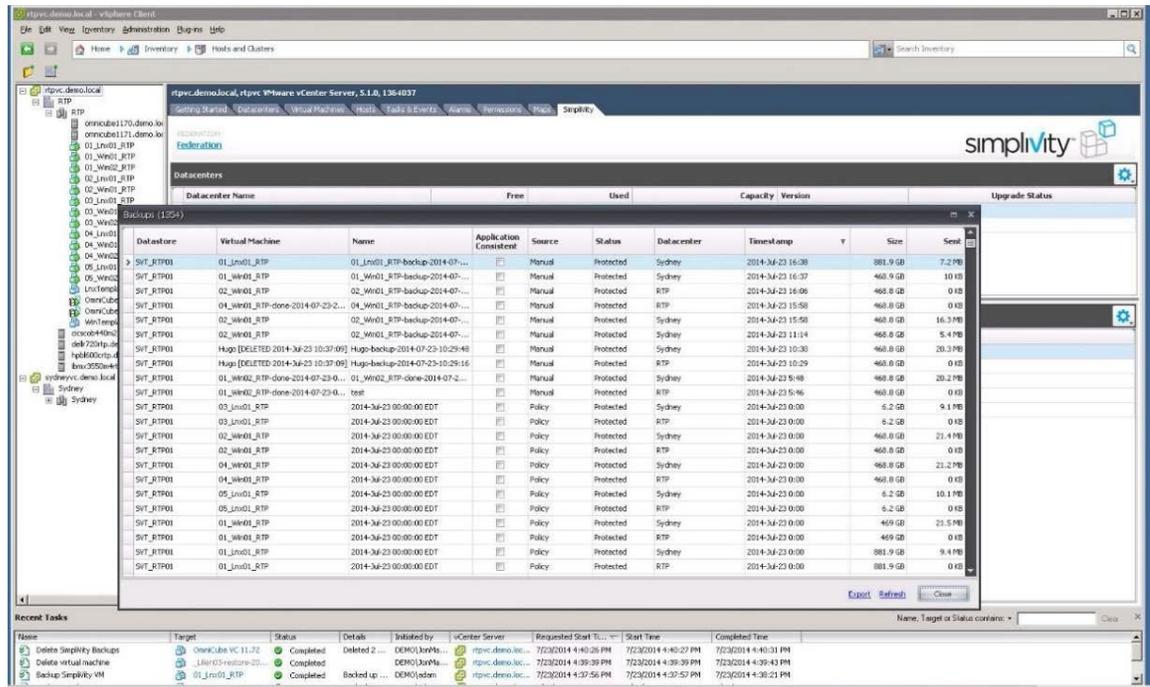
Figure 6. Data Center View Within VMware vCenter



Backup View Within VMware vCenter Showing Thousands of Virtual Machine Backup Operations

Any of the discrete virtual machine backup operations can be selected and used to perform rapid restoration to meet demanding recovery time objectives (RTOs) and data-recovery service-level agreements (SLAs; Figure 7).

Figure 7. Data Center Backup View Within VMware vCenter



Functional Validation

The OmniStack Integrated Solution with Cisco UCS platform validation includes testing of the functions summarized here.

Operations (Simple Setup) and Installation Test

SimpliVity followed a procedure using the documentation to set up a complete federation, create virtual machines, simulate application use, and perform virtual machine–centric backup operations. This phase of the testing validated the documentation, and installations steps were easy and could be performed quickly without the need for escalations or delays. The setup of the first node in the federation was complete in about 1.5 hours, with each additional node taking another 25 minutes. The process was very straightforward and simple.

GUI Test

A variety of typical management and operation tasks were performed using the GUI. Note that all management is performed using the VMware vCenter interface. Operations to create datastores using storage resources built in to the Cisco UCS C240 M3 nodes, add new virtual machines, move existing virtual machines, creating virtual machine backups, define backup and disaster-recovery policy rules, and perform automation across the multisite topology are all performed from the VMware vCenter interface. No other external resources or interfaces are needed. In addition, all management tasks and alarms are tracked and displayed in the task view built in to VMware vCenter. This capability and global management is truly unique in a converged solution and greatly simplifies management.

Component Failure Test

SimpliVity verified the error logging capability. A procedure was followed to cause error conditions on the OmniStack solution (cable pulls, power pulls, etc.). Sufficient logging mechanisms were in place to support the system. Because of the transparent integration with VMware vCenter alarms, the verification is very easy for VMware administrators to use.

Performance Test

A mix of workloads were tested with the reference architecture. These workloads represent a wide variety of enterprise applications, including database, email, collaboration, and web applications. Standard workloads were deployed using Iometer. The workload ran continuously to validate functions and failure scenarios. A Microsoft Exchange Server was also deployed with mail load because a check of the database files with `eseutil.exe` could uncover file-level corruption. The Microsoft Exchange tests ran without problems. The performance testing covered sample workloads including Microsoft Exchange, Microsoft SQL Server, Oracle Data Warehouse, maximum IOPS, and maximum throughput tests.

The Iometer setup included one master and four slaves to perform read and write operations on the datastore. This workload generated significant I/O traffic in the cluster. The amount of traffic varied depending on the load generated by the Iometer virtual machines and was tracked by verifying the consistency of the IOPS counter at the Iometer master. The exact setup of Iometer is beyond the scope of this document, but the setup details is summarized here:

- Step 1. Deploy Iometer virtual machines on the infrastructure volume `infra_datastore_1`.
- Step 2. Create a new 500-GB datastore on the cluster.
- Step 3. On each of the Iometer slave virtual machines, add a 20-GB second HDD (independent and persistent) hosted on IOM-Agg1. Do not use Microsoft Windows Disk Manager to mount this HDD in Microsoft Windows. Iometer needs to use this raw disk for its testing.
- Step 4. Use script (VMware VIX or similar) or manually invoke `dynamo.exe` (`<lometer home dir>\dynamo.exe -i <server_ip> -m <slave_ip>`) on the slave to register the slave at the master.
- Step 5. Use a single worker for all the slaves with the traffic profile of 4000 operations: 75 percent read and 0 percent random. Although the number of outstanding I/O operations can be increased to 10 for higher IOPS (to stress the system), for normal testing this value was left at the default.

Table 3 summarizes representative workloads.

Table 3. Representative Workloads

| Use Sample | Transfer Request Size | Percent Random Distribution | Percent Read and Write |
|-------------------------|-----------------------|-----------------------------|------------------------|
| Microsoft Exchange 2007 | 4,000 | 80% | 60% |
| Microsoft SQL Server | 16,000 | 100% | 66% |
| Oracle Data Warehouse | 32,000 | 20% | 90% |
| Maximum IOPS | 4,000 | 0% | 100% |
| Maximum throughput | 32,000 | 0% | 100% |

Test of Phone Home for Remote Support Monitoring and Proactive Response

Autosupport logs were generated and debug logs checked to verify that there was enough data to understand and resolve a problem.

High-Availability Cluster Test Including Node Failures and Network Link Failures

With 50 virtual machines running on a federation (2+0), one node was brought down with all virtual machines hosted on the node to test the failure response. All virtual machines were transparently failed over to a peer node in the federation without customer involvement or interruption in service. The failover was transparent and completed in minutes for all virtual machines. Cluster interconnect and networking links failures were also tested and verified.

User Experience

Basic Operations

There was no learning curve associated with general setup and daily monitoring of critical information. The VMware vSphere interface facilitates quick I/O and network pattern checks. An Iometer was set up with one master and four slaves to perform read and write operations on the Network File System (NFS) datastore, generating significant I/O traffic in the cluster. The workload ran continuously to validate functions and failure scenarios, and the resulting traffic was tracked through verification of the consistency of the IOPS counter at the Iometer master. Tests were run to check for performance degradation while performing virtual machine backup operations; there was no limitation or deterioration of performance, and multiple VMware vMotion and storage vMotion operations ran quickly and were error free.

Virtual Machine Additions, Moves, and Changes

Transparent movement of 10 virtual machines by copying was verified from traditional infrastructure hosting VMware and virtual machines to the OmniStack solution. Virtual machine migration to the OmniStack Integrated Solution with Cisco UCS C240 M3 occurred transparently.

More important, after the virtual machines were transparently moved to the OmniStack with Cisco UCS solution, the data in the virtual machines was deduplicated, compressed, and optimized inline. Virtual machine–centric backup operations were performed both locally within a data center and across data centers.

Also, multiple operations were performed using VMware Distributed Resource Scheduler (DRS) rules to move virtual machines around in the cluster (20 at a time) while running the load.

Subsequent SimpliVity move operations were run to perform virtual machine–centric moves of the virtual machines between data centers 1 and 2. These virtual machine–centric moves were very fast because of the global deduplication, compression, and optimization. A 20-GB virtual machine took less than a minute to migrate between data centers.

Backup and Restore

Comprehensive testing was performed to verify that rapid virtual machine backup operations could be successfully completed while the systems are under load. A 20-GB virtual machine was restored from an archived backup to another data center in less than a minute.

Automation and Policy

A variety of data-protection policies were created to perform virtual machine–centric backup operations in and across data centers using a simple rule engine that defined when a backup occurs, how long the virtual machines backup copies are retained, and in which data center location the virtual machine–centric backup copies are maintained. All configuration and monitoring was performed in VMware vCenter and was straightforward and easy to configure.

Cloning of Virtual Machines

SimpliVity verified that cloning, or creation of virtual machine templates, was very fast using the OmniStack solution by cloning 50 virtual machines created from a template. The cloning process was very fast: about 10 seconds per virtual machine.

High-Availability Failover and Performance Workloads

One of the Cisco UCS servers running more than 50 virtual machines in the cluster was brought down. All virtual machines failed over to the peer Cisco UCS server running in the cluster. The failover was transparent and simple and required no manual intervention.

Maintenance Operations

The following maintenance operations were tested:

- System upgrades
- Creation and expansion of datastores: Tests were performed to create, grow, and shrink datastores on the system.
- Nondisruptive migration (within data center and across data center): Transparent movement of 10 virtual machines by copying was verified from alternate infrastructure to the OmniStack solution, and reverse migrations were performed. Virtual machines migrated transparently onto and off the OmniStack Integrated Solution with Cisco UCS C240 M3.

Conclusion

Data centers have become increasingly complex and expensive. To respond to new technologies and business demands, companies have added layers of complexity. Computing, storage, networking, hypervisor, backup, replication, deduplication, compression, and WAN optimization appliances are often sourced from single vendors and dropped into existing infrastructure, creating a maze of cabling and complexity. Each technology requires support, maintenance, licensing, power, and cooling, plus a set of dedicated resources capable of administrating and maintaining those elements. Additionally, the risk in the system increases as a function of the growing complexity.

The consolidation of technologies into a single unit reduces both CapEx and OpEx. The use of such a data architecture also improves data efficiency (inline deduplication, compression, and optimization once and forever, across all media), which is very compelling for an agile data center. With the SimpliVity Data Virtualization Platform, customers can consolidate the functions of the traditional stack into Cisco UCS C-Series Rack Servers, and the Data Virtualization Platform deduplicates, compresses, and optimizes all I/O, in real time, once and forever. By controlling data at inception, SimpliVity is able to provide the capabilities of all the data management services from the traditional stack within the consolidated Cisco UCS C-Series servers. Organizations adopting a solution like SimpliVity's with these attributes will require less hardware, incur fewer idle resources, and consume less bandwidth and storage resources for data. The combination of SimpliVity and Cisco UCS delivers a unique,

hyperconverged solution for enterprises and service providers. Moreover, organizations adopting this solution save valuable administrative time, resulting in greater productivity and faster response to business needs.

The combined benefits of the SimpliVity OmniStack Integrated Solution with Cisco UCS include the following:

- Simplified IT
- Enterprise performance, reliability, and availability running on x86 rack-optimized, enterprise-class Cisco UCS servers
- Cloud economics with enterprise capabilities delivered to the organization
- Enterprise capabilities with integrated, virtual machine–centric data protection, multisite disaster recovery, and business continuity
- Global, centralized management and automation
- Three times less costly TCO

Through infrastructure consolidation, increased effectiveness of both physical and human resources, and decreased complexity, SimpliVity with Cisco UCS solutions help organizations increase efficiency, reduce costs, and simplify IT.



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