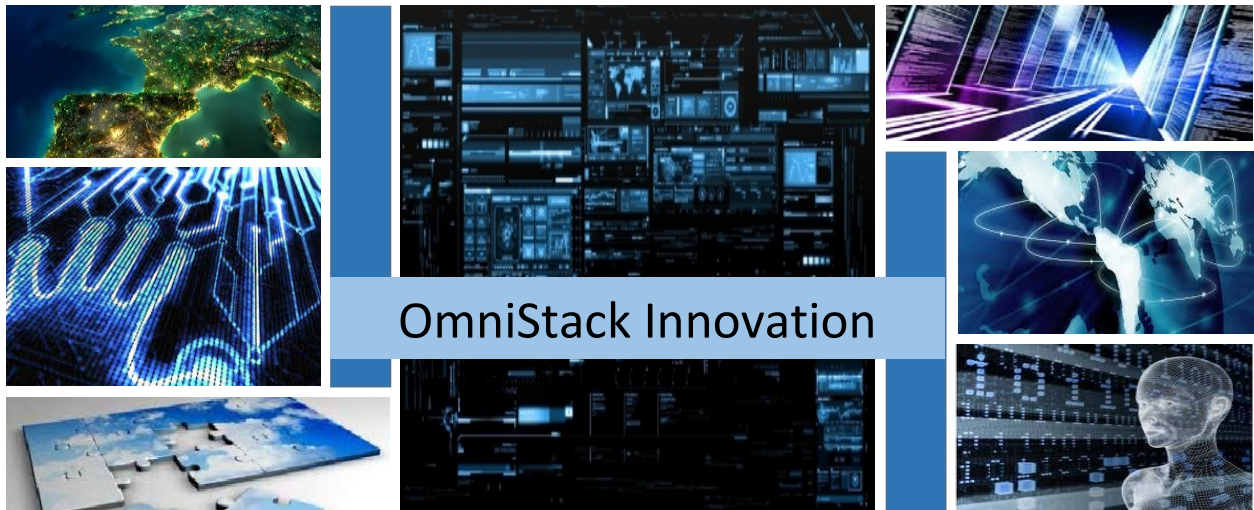


Reference Architecture for OmniStack™ Integrated Solution with Cisco UCS C240

April 2015



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1 Executive Summary

SimpliVity's humble mission is to simplify IT.

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

- x86 Cloud Economics
- Enterprise functionality, protection, data efficiency, performance, and management

Enterprise customers today need more than what current cloud or web companies like Google and Amazon can deliver, and need better consolidation and performance than what legacy infrastructures can provide. Enterprise customers want x86 cloud economics as well as enterprise functionality, protection, and performance.

SimpliVity's OmniStack™ integrated solution with Cisco Unified Computing System allows customers to enjoy and benefit from impressive cloud economics as well as enterprise-class functionality, protection, and performance. The OmniStack solution provides a hyperconverged, all-in-one IT infrastructure platform that includes storage, compute, 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 Unified Computing System is a 2U 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 functionality. By combining these powerful capabilities in a scalable IT building block and leveraging the shared pool of resources, SimpliVity and Cisco provide dramatic improvements in economics and IT simplification when compared to legacy solutions (Figure 1).

SimpliVity Offers the Best of Both Worlds



Figure 1 – SimpliVity for Cisco UCS Simplified Solution

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 includes inline, real-time global deduplication, compression, and optimization on all IOs that occur across the Federation of systems. This virtualization layer dramatically simplifies the provisioning of

native VM-level data protection and DR services by reducing the size and therefore the IT resources necessary to replicate, backup, and provide off-site protection for your enterprise workloads. The benefits delivered by this framework include performance acceleration by eliminating redundant IOPS as well as capacity optimization and WAN optimization by eliminating redundant data sent between data centers and remote offices. The ultimate goal is to deliver lower costs, better performance, and more agility.

SimpliVity refers to this level integration as *Hyperconvergence*. Our integrated solution can scale to handle a wide variety of business applications and IT workloads running on standard VMware. Global management of the distributed systems is managed by a single admin from VMware vCenter through a plug-in that reduces administrative complexity—all to provide simplicity to the modern data center.

2 Audience

This document describes the solution architecture and validation for the SimpliVity OmniStack integrated solution with Cisco UCS C240 M4SX Series Rack-Mount Server. The intended audience for this document includes, but is not limited to, sales engineers, field consultants, professional services, IT managers, partner engineering, and customers who want to deploy the SimpliVity hyperconverged solution with Cisco UCS C-Series Systems.

3 Business and Solution Value

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

3.1 SimpliVity – Hyperconverged Infrastructure Benefits

SimpliVity delivers hyperconverged infrastructure for the Software-Defined Data Center.

A single software OmniStack combines the functionality of up to 12 different products in one, running efficiently atop a single shared x86 resource pool and leveraging the enterprise-class Cisco UCS server platform to deliver best-in-class IT. The solution condenses the whole of the legacy stack into one box, including servers, storage, switch, deduplication, compression, backup, and WAN optimization functions on x86 resources with global scalability to deliver enterprise functionality, protection, and performance. Customers benefit from 3x TCO savings based on acquisition cost of IT infrastructure, cost of labor, space, and power. Additionally, a robust 10GE network is sufficient in order to run high performance, high functionality IT.

SimpliVity refers to this integrated level of consolidation as *Hyperconvergence*. By making the shared resource pool a reality, the OmniStack delivers global unified management and scalability. Through its unified data efficiency, policy-based native data protection, and DR, the 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 IOPS, 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 functionality (performance, reliability, availability, security, native data protection, and disaster recovery).

3.2 Cisco UCS C-Series Rack-Mount Server Benefits

Cisco UCS C-Series 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.

Cisco UCS C240 M4SX Rack-Mount 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-agnostic entry point into Cisco Unified Computing System
- Simplified and fast deployment of applications
- Operation in standalone environments and as part of the Cisco Unified Computing System, extension of Cisco's unified computing innovations to help reduce customers' total cost of ownership (TCO) and increase business agility.
- Transform IT organizations, 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
- Deliver industry-leading performance and efficiency gains for IT infrastructure and enterprise applications

3.3 Combination Value

Cisco Systems, Inc. (Cisco), as a networking equipment solutions provider, has historically leveraged its ability to articulate and market its long-term data center vision, strong data center service organization and support, and its robust channel and vendor alliances to its advantage. However, in lieu of recent, rapid changes in the data center market, Cisco has recognized the importance of a more concentrated focus in the storage market and IT infrastructure operation space—and is partnering with SimpliVity to realize that vision.

According to Gartner, while Cisco is well-aligned to major customer trends and has a definitive grasp on the server and integrated systems environment, it can benefit from continuing to innovate to disrupt legacy compute and storage models and leverage its large, loyal user base.¹ SimpliVity provides unique innovation for this opportunity. Because Cisco has a very impressive array of products, there is a need for simplifying its data center network portfolio for increased ease of manageability and future scalability; SimpliVity's flexible software stack and Data Virtualization Platform is the perfect streamlined solution to create consistency as well as simplify modern data

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

center architectures.² According to Gartner, Cisco has the vision to leverage and indeed, drive, the trend toward convergence of servers, storage, and networking technologies in the data center.³ Working with SimpliVity's visionary spirit will not only propel Cisco further into the data center market, but also foment its position as a leader in data center and networking solutions.

The partnership with SimpliVity provides Cisco with storage capabilities that improves the overall Cisco Unified Computing System offering, as well as delivers SimpliVity's Data Virtualization Platform technology that reduces IOPS to SSD/flash and HDD, reduces capacity as well as associated space and power, and enables global mobility of VMs and data, all at a fraction of the time and cost. Coupled with native enterprise functionality—including advanced VM-centric DR and data protection and global unified management—in one powerful IT platform, the result is a robust package that combines the best of both companies.

4 Solution Overview and Benefits

4.1 SimpliVity and Cisco Overview

The SimpliVity integrated solution with Cisco Unified Computing System is a unified data center platform composed of Cisco UCS servers with integrated storage elements (HDD, SDD, and SimpliVity PCIe Accelerator Card) and the SimpliVity OmniStack Data Virtualization Platform software. The combined hyperconverged solution delivers unprecedented performance, functionality, and integration to support a variety of applications and use cases, including data center consolidation, multi-site data protection and DR, and business critical applications.

4.2 Simplify IT (CAPEX, OPEX, Operational Efficiency)

Customers have reported 3x TCO savings from installing OmniStack in their data centers. The OmniStack eliminates redundancy in terms of allocating management resources to maintain individual VMs, space and power expenses related to cooling numerous infrastructure racks, and CAPEX and OPEX expenses in regards to legacy stacks that each required separate costs to maintain.

With performance acceleration and resource efficiency in mind, SimpliVity developed its Accelerator Card, a PCIe card with FPGA and NVRAM protected with supercapacitors to deliver powerful compute and processing capabilities. As data is written at inception, the OmniStack Accelerator Card deduplicates, compresses, and optimizes it inline, at inception, once and forever, across the entire data lifecycle. This architecture allows data processing at near-wire speeds, delivering enterprise-class performance and reducing latency because of high speed, high availability NVRAM. The architecture is also extremely



² Ibid.

³ Ibid.

efficient because of high-performance FGPA's. This means that not only is the data *not* slowing down, it is accelerated through deduplication of IOPS and data as it is written.

4.3 Broad Scope of Functionality

There is no longer a need for 12 different devices for WAN optimization, backup deduplication, or cloud gateways. OmniStack also requires fewer SSDs in the system than legacy devices as writes will have already been deduplicated, compressed, and optimized. The Data Virtualization Platform design improves resource efficiency for all tiers (HDD, SDD) and across all phases of data lifecycle (primary, backup, archive, WAN, cloud). There are many native data protection capabilities, and additional systems can be implemented for even higher efficiency and availability. The OmniStack combines, or hyperconverges, all the functionalities associated with storage, data, and data movement.

4.4 Use Cases

Some of the compelling use cases include:

Data Center Consolidation

Customers use the OmniStack integrated solution with Cisco Unified Computing System to completely consolidate IT across two or more sites, all managed from a single pane of glass, whereby all applications run on OmniStack with Cisco Unified Computing System—typically two or more per site. This use case is commonly deployed at the mid-market.

Remote Office, Branch Office, Multi-site Central Management Projects

SimpliVity and Cisco enable unified Remote Office Management projects. The OmniStack integrated solution with Cisco Unified Computing System provides data mobility services and the ability to manage remote OmniStack with Cisco Unified Computing System from one location and interface, uniquely positioning the solution to address multi-site management projects. This use case also addresses customers' desire to improve their disaster recovery posture and improve data protection and data availability. Customers with this use case tend to be very large enterprises with numerous remote offices and midmarket customers with multiple locations.

Other Use Cases

- All-in-one, IT modernization projects for 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/end user computing infrastructure projects
- Non-production, Development, Test, and QA projects
- Technology refresh projects
- Data migration as well as merger and acquisition projects
- Public, private, and hybrid cloud infrastructure and more

5 Cisco Unified Computing System

Cisco Unified Computing System is the fastest growing next-generation data center computing solution that unifies computing, networking, management, virtualization, and storage access into a cohesive system. By converging data center silos into a single unified system, Cisco Unified Computing System 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 Unified Computing System 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 Unified Computing System offers simplified and open management with a large partner ecosystem using Cisco UCS Manager and Cisco UCS Director.

The Cisco Unified Computing System represents a radical simplification compared to the way that servers and networks are deployed today. It integrates compute resources on a unified IO 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 IO configurations with an IO 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 and UCS Director, integrated into Cisco Unified Computing System, offer administrators flexibility and simplicity. Administrators can manage physical infrastructure similar to the way that they manage virtual infrastructure. Cisco Unified Computing System 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.

The enterprise-class UCS C240 M4 SFF server extends the capabilities of Cisco's Unified Computing System portfolio in a 2U form factor with the addition of the Intel® Xeon E5-2600 v3 series processor family that delivers the best combination of performance, flexibility, and efficiency



Figure 2 – Cisco UCS C-Series C240 M4SX System

gains. In addition, the UCS C240 M4 SFF server provides 24 DIMM slots, up to 6 PCI Express (PCIe) 3.0 slots, up to 24 front-loading drives plus two internal drives for a total of 26 internal drives.

The C240 M4 server includes a modular LAN on motherboard (mLOM) slot for installation of a Cisco Virtual Interface Card (VIC) or third-party network interface card (NIC) without consuming a PCI slot in addition to 2 x 1 GbE embedded (on the motherboard) LOM ports. These features combine to provide outstanding levels of internal memory and storage expandability along with exceptional performance.

The Cisco UCS C240 M4 server can be used standalone, or as part of the Cisco Unified Computing System, which unifies computing, networking, management, virtualization, and storage access into a single integrated architecture enabling end-to-end server visibility, management, and control in virtualized environments.

Cisco UCS C-Series Features and Capabilities:

- Suitable for nearly all storage-intensive, 2-socket applications
- Unique Cisco UCS Virtual Interface Card 1225 (VIC): 2 x 10GE PCIe that can support up to 256 PCIe virtual interfaces
- Exceptional building block and entry point for the Cisco Unified Computing System
- Continual innovations from Cisco in server technology and at all levels of the Cisco Unified Computing System
- Cisco UCS Manager and UCS Director support for improved operational efficiency, enhance visibility and control, and increased agility.
- Specifications at-a-glance:
 - Either 1 or 2 Intel® Xeon® processor E5-2600 v3 product family CPUs
 - Up to 24 DDR4 DIMMs for improved performance and lower power consumption
 - Up to 6 PCI Express (PCIe) Generation 3.0 slots (4 full-height, full-length)
 - Up to 24 2.5-inch small form factor (SFF) drives, plus two internal Enterprise Value SSD SATA drives
 - Two redundant 64GB Cisco FlexFlash SD cards for booting embedded hypervisor
 - Support for 12-Gbps SAS drives
 - A modular LAN-on-motherboard (mLOM) slot for installing a next-generation Cisco virtual interface card (VIC 1227) with 10GbE support without consuming a PCIe slot
 - 2 x 1 Gigabit Ethernet embedded LOM ports
 - Trusted Platform Module (TPM) for authentication and tool-less access

6 Solution Validation

6.1 Specific Details on the Configuration and Topology

The goal of this reference architecture solution validation is to setup an OmniStack integrated solution with the Cisco Unified Computing System and replicate the real world environment for an admin 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 Unified Computing System is designed to be simple to deploy and decrease OPEX by reducing the knowledge it takes to run your cloud. The reference architecture specifically validates the steps performed by a customer deploying our unique hyperconverged solution. Operational tasks are validated including performing VM-centric data migration, setting up VM and application backups and recovery, dealing with various failure scenarios, and running application workloads. The solution validates a 2+2 Federation with one production cluster comprised of two Cisco UCS C240 Series systems in a primary data center and one cluster comprised of two Cisco UCS C240 Series systems used for a remote office / branch office (ROBO) location.

Topology

The following diagram illustrates the solution topology.

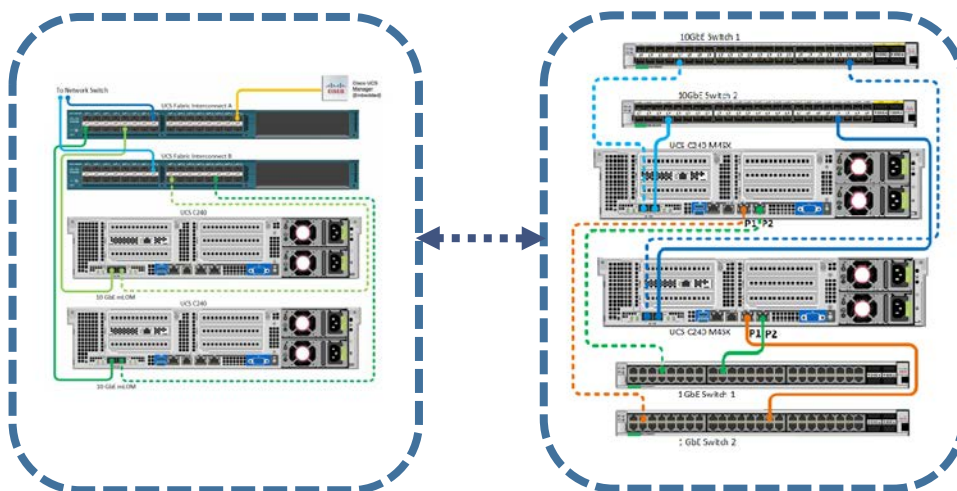


Figure 3 – Central Site Data Center with two 2U UCS C240 M4 nodes with UCS Manager and Fabric Interconnect

ROBO Data center with two 2U UCS C240 M4 nodes with 1GbE and 10GbE switches.

⁴ Rich Castagna, “The Best Storage Products of 2013”, *Storage Magazine*, February 2014, 23.

⁵ Alex Barrett, “Impact Awards: Best Converged Infrastructure Product”, *Modern Infrastructure*, December 2013, 4.

Components

The following table lists the hardware component details.

Table 1 - Central Site Data Center

| Layer | Component | Quantity |
|-----------------|-------------------------------------------------------------------------------|--------------------|
| Compute/Storage | Cisco UCS C-Series C240 M4 servers with two 3.2Ghz E5-2667v3 and 512GB memory | 2 |
| | 400GB 2.5 inch Enterprise SSD | 8 (4 per server) |
| | 1TB SAS 7.2K RPM 2.5 inch HDD | 40 (20 per server) |
| | Cisco 12G SAS Modular Raid Controller on motherboard | 2 (1 per server) |
| | OmniStack PCIe Accelerator Card | 2 (1 per server) |
| | Cisco 1227 VIC 2 x 10GE interfaces (mLOM) | 2 (1 per server) |
| | 1200 W power supply | 4 (2 per server) |
| Network | Cisco Fabric Interconnect | 2 |

Table 2- ROBO Data Center

| Layer | Component | Quantity |
|-----------------|-------------------------------------------------------------------------------|-------------------|
| Compute/Storage | Cisco UCS C-Series C240 M4 servers with two 2.6 GHz E5- 2640 and 256GB memory | 2 |
| | 400GB 2.5 inch Enterprise SSD | 4 (2 per server) |
| | 1TB SAS 7.2K RPM 2.5 inch HDD | 16 (8 per server) |
| | Cisco 12G SAS Modular Raid Controller on motherboard | 4 (2 per server) |
| | OmniStack PCIe Accelerator Card | 2 (1 per server) |
| | Cisco 1227 VIC 2 x 10GE interfaces (mLOM) | 2 (1 per server) |
| | 1200 W power supply | 4 (2 per server) |
| Network | Cisco Nexus 1GbE switches | 2 |
| | Cisco Nexus 10GbE switches | 2 |

*Note: This particular testing was conducted on Cisco UCS C240 M4SX systems with the configuration listed above.

There are a variety of other CPU and Memory options available:

Two CPU Sockets with one of the following configurations:

| | CPU Model | CPU GHz | Socket | Total Cores per socket | Total Cores per system |
|---|------------|---------|--------|------------------------|------------------------|
| 1 | E5-2640 v3 | 2.6 | 1 or 2 | 8 | 8 or 16 |
| 2 | E5-2643 v3 | 3.4 | 2 | 8 | 16 |
| 3 | E5-2660 v3 | 2.6 | 2 | 10 | 20 |
| 4 | E5-2667 v3 | 3.2 | 2 | 8 | 16 |
| 5 | E5-2680 v3 | 2.5 | 2 | 12 | 24 |
| 6 | E5-2690 v3 | 2.6 | 2 | 12 | 24 |
| 7 | E5-2697 v3 | 2.6 | 2 | 14 | 28 |

Customers will choose from a list of memory options available with the minimum of 128GB and maximum of 768GB per system.

The following table lists the software component details.

| Layer | Device | Version or Release | Details |
|-----------------|---------------------------|-------------------------------------------------------|-------------------------|
| Compute/Storage | Cisco UCS C240 M4SX | 1.5.3(d) | Software bundle release |
| | SimpliVity OmniStack | 2.1.11 | Software bundle release |
| Network | Cisco Nexus 3048 | 6.1(2)I2(0.177) | OS version |
| Software | Cisco UCS Host | VMware vSphere ESXi™ 5.1 Update 1 and ESX5.5 Update 0 | |
| | Microsoft® .NET Framework | 3.5.1 | |
| | Microsoft Windows 2008R2 | Build 7601 SP1 | VMs |

This reference architecture performed validation testing of enterprise applications with a two-node Cisco UCS C240 Series Rack-Mount Servers optimized system (2+0 Federation) and with a four-node system (2+2 Federation). The illustration of the 2+2 Federation is shown below with two data centers comprised of two Cisco USC C240 platforms per data center. As you can see, the view is fully integrated into VMware vCenter interface enabling unprecedented ease of use and centralized management in a converged solution.

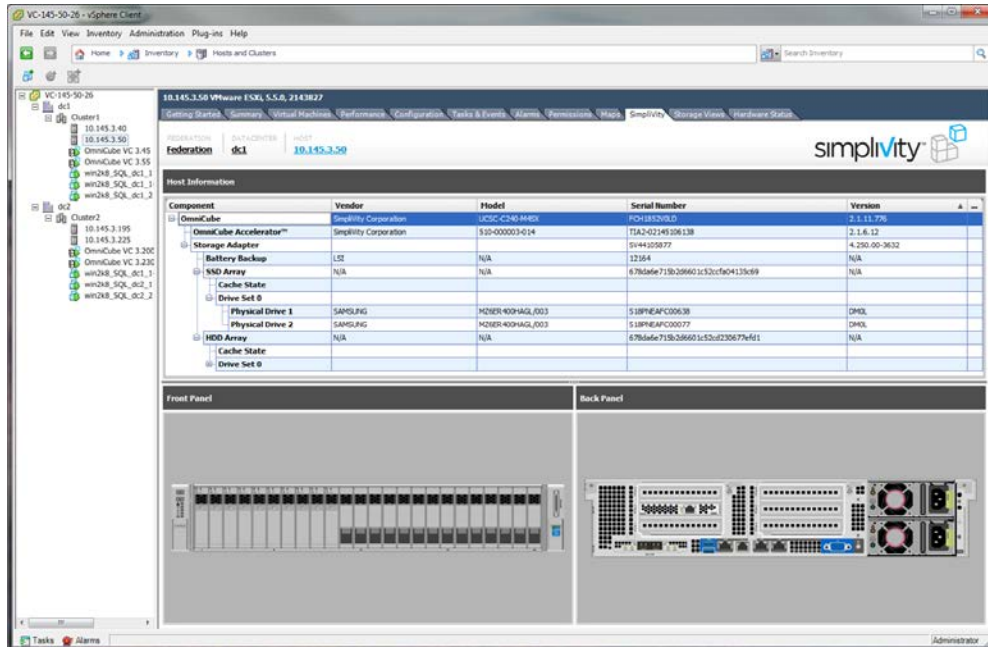


Figure 4 – Host View within VMware vCenter

Federation View within VMware vCenter

The vCenter view below shows the federation view on the integrated solution:

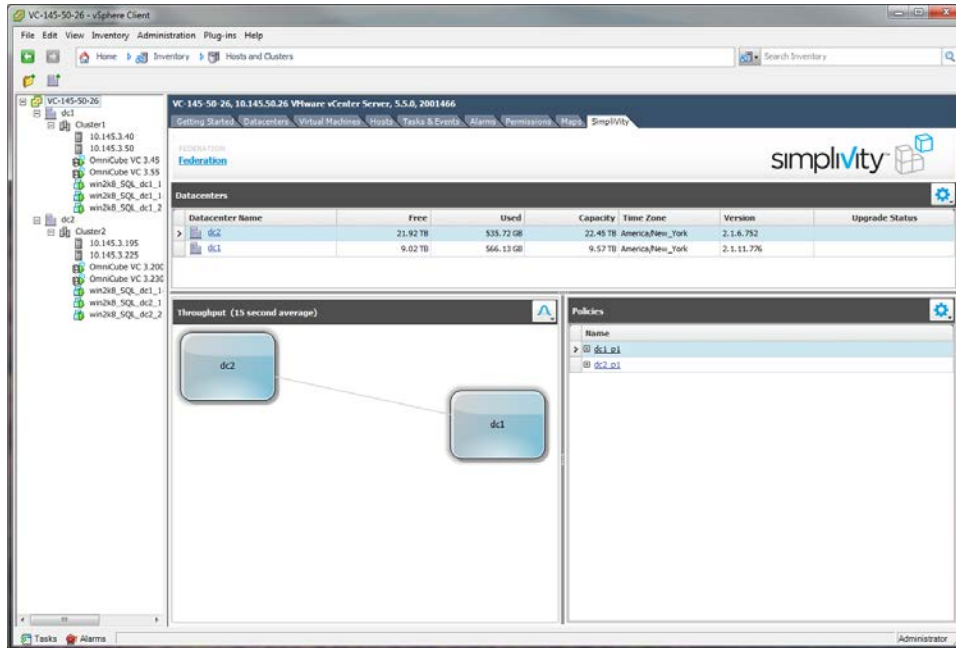


Figure 5 – Federation View within VMware vCenter

Data center view within VMware vCenter

The view illustrates the data efficiency and IOP savings achieved across all VMs.

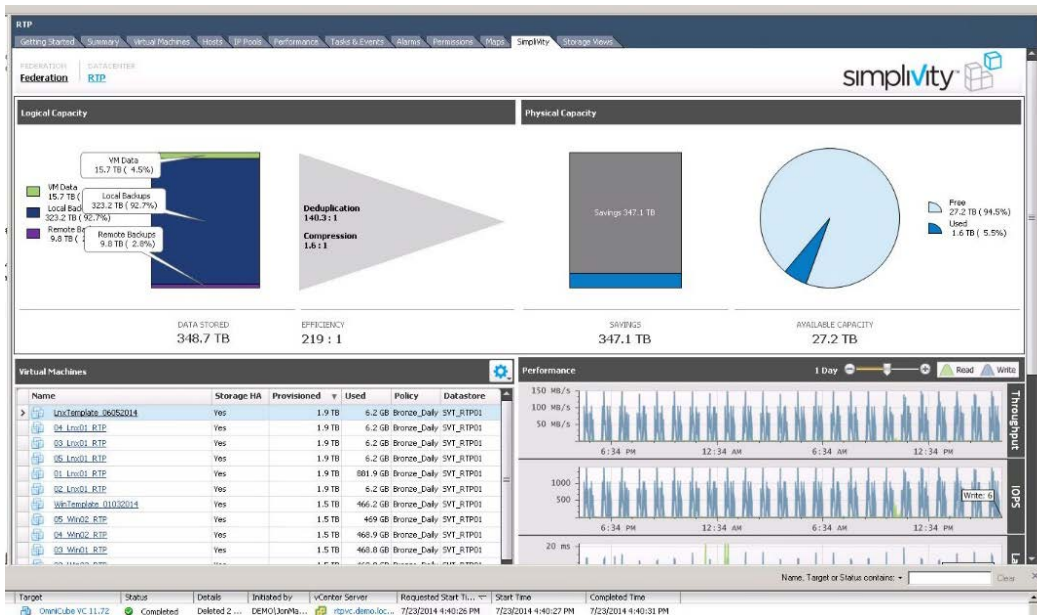


Figure 6 – Data center view within VMware vCenter

Backup view within vCenter showing thousands of VM backups

Note, any of the discrete VM backups can be selected and used to perform a rapid restore to enable unprecedented RTOs and data recovery SLAs.

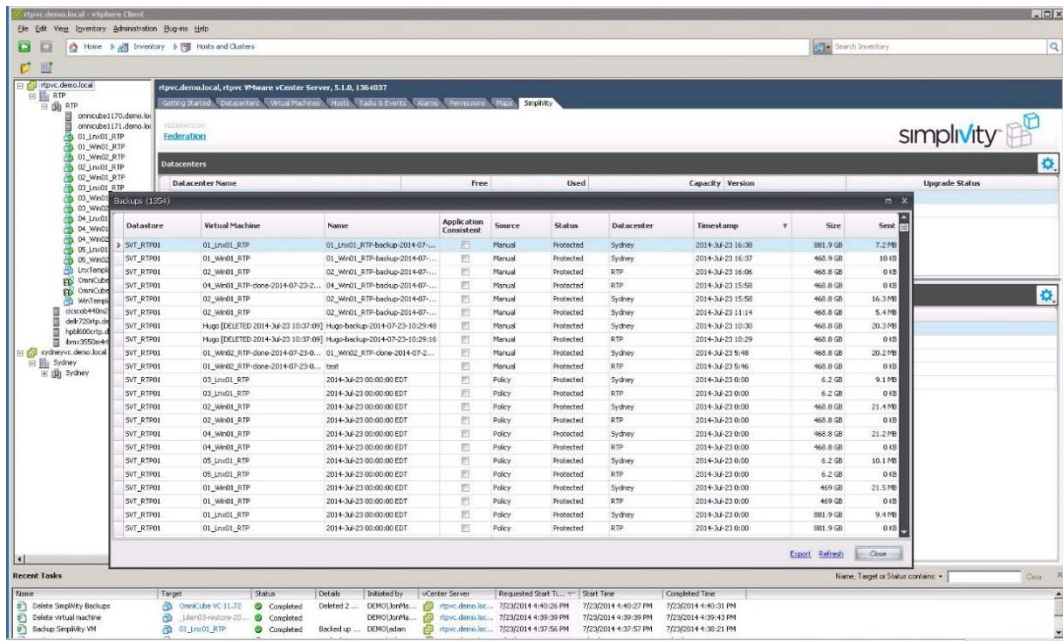


Figure 7 – Data center Backup View within VMware vCenter

6.2 Functional Validation

The OmniStack integrated solution with Cisco UCS platform validation includes testing of the following functionalities:

a. Operations (Simple Setup) and Installation Test

SimpliVity followed a procedure using the documentation to setup a complete Federation, create VMs, simulate application usage, and take VM-centric backups. 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.

b. GUI Testing

A variety of typical management and operations tasks were performed using the GUI interface. It is worth noting that all management is performed using the VMware vCenter interface. Operations such as creating datastores using storage resources built-in to the Cisco UCS C240 nodes, adding new VMs, moving existing VMs, creating VM backups, defining backup and DR policy rules, and automation across the multi-site topology are all performed from the vCenter interface. No other external resources or interfaces are needed. As well, all management tasks and alarms are tracked and displayed within the task view built-in to vCenter. This capability and global management is truly unique in a converged solution and greatly simplifies management.

c. Component Failure

SimpliVity verified the error logging capability. Procedure was followed to cause error conditions on the OmniStack solution (i.e., cable pulls, power pulls, etc.). There were sufficient logging mechanisms to support the system. Because of the seamless integration with VMware vCenter alarms, the verification was very easy to use for a VMware Admin.

d. Performance Testing

The following section discusses the mix of workloads that were tested with the reference architecture. These workloads represent a wide variety of Enterprise applications including data base, email, collaboration, web application, etc. Standard workloads were deployed using IOMeter. The workload ran continuously to validate any functionality or failure scenarios. A Microsoft Exchange server was also deployed with mail load since checking the database files with eseutil.exe could uncover file level corruption. The Exchange tests ran without issue. The performance testing covered sample workloads including Microsoft Exchange, SQL Server, Oracle Data Warehouse, maximum IOPS, and maximum throughput tests.

An IOMeter setup included one master and four slaves to perform read and write operations on the datastore. This workload generated significant IO traffic in the cluster. The amount of traffic varied depending on the load generated by the IOMeter VMs and was tracked by verifying the consistency of the IOPs counter at the IOMeter master. While exact setup of IOMeter is beyond the scope of this document, the setup details are covered below.

1. IOMeter VMs can be deployed on the infrastructure volume, "infra_datastore_1"
2. Create a new 500GB datastore on the cluster
3. On each of the IOMeter slave VMs, add a 20GB second HDD (independent-persistent) hosted on IOM-Agg1. Do not use window's disk manager to mount this HDD in windows. IOMeter needs to use this "raw" disk for its testing
4. Script (VMware VIX or similar) or manually invoke dynamo.exe (<IOMeter home dir>\dynamo.exe -i <server_ip> -m <slave_ip>) on the slave to register the slave at the master
5. Use a single worker for all the slaves with the traffic profile of "4K, 75% Read.0%Random." While the number of outstanding IO can be increased to 10 for higher IOPs (for stressing the system), for normal testing this value was left at the default.

Representative workloads included the following:

| Usage Samples | Transfer Request Size | Percent Random Distribution | % Read Write |
|-----------------------|-----------------------|-----------------------------|--------------|
| Exchange 2007 | 4k | 80% | 60% |
| SQL Server | 16k | 100% | 66% |
| Oracle Data Warehouse | 32k | 20% | 90% |
| Max IOPS | 4k | 0% | 100% |
| Max Throughput | 32k | 0% | 100% |

e. Phone Home for Remote Support Monitoring and Proactive Response

Auto support logs were generated and debug logs checked to verify there was enough data to understand and resolve and issue.

f. High Availability Cluster Testing Including Node Failures and Network Link Failures

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

6.3 User Experience

a. Basic Operations

There was no learning curve associated with general setup and daily monitoring of critical information. The vSphere interface facilitates quick IO and network pattern checks. An IOMeter setup was set up with one master and four slaves to perform read and write operations on the NFS datastore, generating significant IO traffic in the cluster. The workload ran continuously to validate functionality or failure scenarios, and the resulting traffic was tracked through verification of the consistency of the IOPS counter at the IOMeter master. Tests were run regarding performance degradation while taking VM backups; there were no limits or deterioration on performance and running multiple vMotion and storage vMotion operations were fast and error free.

b. VM Adds/Moves/Changes

Seamless moving of 10 VMs by copying was verified from legacy infrastructure hosting VMware and VMs to the OmniStack solution. There was frictionless VM migration on to the OmniStack integrated solution with Cisco UCS C240 Series.

More importantly, once the VMs were seamlessly moved to the OmniStack with Cisco UCS solution, the data within the VMs were inline deduplicated, compressed, and optimized. VM-centric backups were performed both locally within a data center and across data centers. It is important to note, that all operations are performed on the virtual machine, not on the datastore or other complicated storage layer. By provisioning at the VM, administration is dramatically simplified.

Also, multiple operations were performed using DRS rules to move VMs around in the cluster (20 at a time) while running load.

Subsequent “SimpliVity Move” operations were run to perform VM-centric moves of the VMs between Data Center One and Data Center Two. These VM-centric moves were very fast due to the global deduplication, compression, and optimization. A 20GB VM took less than a minute to migrate between data centers.

c. Backup/Restore

Comprehensive testing was performed to verify rapid VM backups could be successfully completed while the systems are under load. A 20GB VM was restored from an archived backup to another data center in under a minute.

d. Automation and Policy

A variety of data protection policies were created to perform VM-centric backups in and across data centers using the simple rule engine that was defined when a backup occurred, how long the VM backups were retained, and in which data center location the VM-centric backup was maintained. All configuration and monitoring was performed in vCenter and was straightforward and easy to configure.

e. Cloning VMs

SimpliVity verified cloning, or creating VM templates, was very fast using the OmniStack solution by cloning 50 VMs created from a template. The cloning process was very fast at about 10 seconds per VM.

f. HA Failover and Performance Workloads

One of the Cisco UCS systems running over 50 VMs in the cluster was brought down. All VMs failed over to the peer Cisco UCS system running in the cluster. The failover was seamless, simple, and required no manual intervention.

6.4 Operations (Maintenance)

a. System Upgrades

b. Creating and Expanding Datastores

Tests were performed to create, grow, and shrink datastores on the system.

c. Non-disruptive Migration (in data center/across data center)

Seamless moving of 10 VMs by copying was verified from alternate infrastructure to the OmniStack solution and reverse migrations were performed. There was frictionless VM migration on to and off of the OmniStack integrated solution with Cisco UCS C240 Series.

7 Summary

Data centers have become too complex and too expensive. In order to respond to new technologies and business demands, companies have added layers of complexity. Compute, storage, networking, hypervisor, backup, replication, deduplication, compression, and WAN optimization appliances are often sourced from single vendors and dropped into existing infrastructures creating a maze of cabling and complexity. Each technology requires support, maintenance, licensing, power, and cooling—not to mention a set of dedicated resources capable of administrating and maintaining those elements. Additionally, the risk of the system grows as a function of the growing complexity.

It is clear that the consolidation of technologies into a single unit minimizes both capital and operational expenses. Also of note is that the use of such a data architecture provides data efficiency (inline deduplication, compression, and optimization once and forever, across all media), which is very compelling for an agile data center. As a result of SimpliVity's Data Virtualization Platform, customers can consolidate the functionality of the legacy stack into the Cisco UCS C-Series systems, and the Data Virtualization Platform deduplicates, compresses, and optimizes all IOs, in real time, once and forever. As a result of controlling data at inception, SimpliVity is able to provide the functionality of all the data management services from the legacy stack within the consolidated Cisco UCS C-Series systems. Organizations adopting a solution like SimpliVity's with these attributes will require less hardware, incur fewer idle resources, and consume less bandwidth and storage for data. The combination of SimpliVity with Cisco Unified Computing System delivers a unique, hyperconverged solution for enterprises and service providers. Moreover, organizations adopting this solution will save valuable administrative time resulting in greater productivity and faster responses to business needs.

The net benefits of the SimpliVity OmniStack integrated solution with Cisco Unified Computing System include the following:

- Simplified IT
- Enterprise performance, reliability, and availability running on x86 rack-optimized, enterprise-class Cisco UCS systems
- Delivering the promise of Cloud Economics with Enterprise Functionality, Data Protection, Data Efficiency, Performance, and Global Unified Management to the Enterprise
- Provides a single pool of shared x86 resources that seamlessly combines all IT services “below the hypervisor”
- Enterprise functionality with native data protection, multi-site DR, and business continuity
- Global, centralized management, and automation
- 3X TCO Savings

Through infrastructure consolidation, increased effectiveness of both physical and human resources, and decreased complexity, SimpliVity with Cisco UCS solutions help organizations take on the challenges of maximizing efficiency to reduce costs and simplify IT.

To learn more about SimpliVity, please see [OmniStack with Cisco UCS in the Cisco Marketplace](#) or at [SimpliVity and Hyperconvergence](#).