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Cisco HyperFlex Hyperconverged System with up to 2400 VMware Horizon 7 Users

Design and Deployment of Cisco HyperFlex for Virtual Desktop Infrastructure with VMware Horizon 7

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validated Design

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Table of Contents

Executive Summary	6
Solution Overview	7
Introduction	7
Audience	7
Purpose of this Document	7
What's New?	7
Solution Summary	9
Cisco Desktop Virtualization Solutions: Data Center	11
The Evolving Workplace	11
Cisco Desktop Virtualization Focus	12
Use Cases	14
Physical Topology	15
Fabric Interconnects	17
Cisco UCS B-Series Blade Servers	18
Logical Network Design	19
Configuration Guidelines	22
Solution Design	23
Cisco Unified Computing System	23
Cisco Unified Computing System Components	23
Cisco VIC1340 Converged Network Adapter	31
Cisco UCS 5108 Blade Chassis	32
VMware vSphere 6.0	39
VMware ESXi 6.0 Hypervisor	39
VMware Horizon	41
Advantages of Using VMware Horizon	41
What are VMware RDS Hosted Sessions?	44
Farms, RDS Hosts, Desktop and Application Pools	46
Cisco HyperFlex Data Platform	47
Architecture and Design of VMware Horizon on Cisco Unified Computing System and Cisco HyperFlex Storage Design Fundamentals	49
Understanding Applications and Data	50
Project Planning and Solution Sizing Sample Questions	50
Desktop Virtualization Design Fundamentals	51
VMware Horizon Design Fundamentals	51

Horizon VDI Pool and RDSH Servers Pool	
Designing a VMware Horizon Environment for Various Workload Types	55
Deployment Hardware and Software	57
Products Deployed	
Hardware Deployed	
Software Deployed	
Logical Architecture	60
VLANs	61
Jumbo Frames	62
VMware Clusters	62
ESXi Host Design	63
Solution Configuration	71
Cisco UCS Compute Platform	71
Physical Infrastructure	71
Cisco Unified Computing System Configuration	75
Deploy and Configure HyperFlex Data Platform	
Prerequisites	76
Deploy Cisco HyperFlex Data Platform Installer VM	80
Cisco HyperFlex Cluster Configuration	
Cisco HyperFlex Cluster Expansion	
Building the Virtual Machines and Environment for Workload Testing	
Horizon 7 Infrastructure Components Installation	
Install VMware Horizon Composer Server	
Install Horizon Connection/Replica Servers	144
Create a Microsoft Management Console Certificate Request	
Configure the Horizon 7 Environment	
Configure Event Database	
Configure Horizon 7 Licenses	
Configure vCenter	
Master Image Creation for Tested Horizon Deployment Types	
Prepare Microsoft Windows 10 and Server 2012 R2 with Microsoft Office 2016	
Optimization of Base Windows 10 or Server 2012 R2 Guest OS	
Virtual Desktop Agent Software Installation for Horizon	
Install Additional Software	
Create a Native Snapshot for Automated Desktop Pool Creation	

Create Customization Specification for Virtual Desktops	171
VMware Horizon Farm and Pool Creation	181
RDSH Farm Creation	181
Create the Horizon 7 RDS Published Desktop Pool	192
VMware Horizon Linked-Clone Windows 10 Desktop Pool Creation	198
VMware Horizon Instant-Clone Windows 10 Desktop Pool Creation	211
VMware Horizon Persistent Windows 10 Desktop Pool Creation	222
Test Setup and Configurations	235
Testing Methodology and Success Criteria	236
Testing Procedure	237
Pre-Test Setup for Testing	237
Test Run Protocol	237
Success Criteria	238
Test Results	244
Boot Storms	244
Recommended Maximum Workload and Configuration Guidelines	245
Eight Node HX240c-M4SX Rack Server and Eight Node Cisco UCS B200 M4 HyperFlex Cluster	245
RDSH Server Pool Testing on Sixteen Node Cisco HyperFlex Cluster	246
2000 Windows 10 Instant-clone Desktop Pool testing on Sixteen Node Cisco HyperFlex Cluster	250
2000 Windows 10 Full Clone Desktop Pool Testing on Sixteen Node Cisco HyperFlex Cluster	254
Summary	258
About the Authors	259
Acknowledgements	259
Appendix A – Cisco Nexus 9372 Switch Configuration	260
Switch A Configuration	260
Switch B Configuration	271
Appendix B – Cisco HyperFlex HX240c-M4SX and Cisco UCS B200 M4 16-Node Cluster Horizon 7 Instant Clone In-Flight Performance Metrics	: 284
Appendix C – Cisco HyperFlex HX240c-M4SX and Cisco UCS B200 M4 16-Node Cluster Horizon 7 Full Clone In-Flight Performance Metrics	289
Appendix D – Cisco HyperFlex HX240c-M4SX and Cisco UCS B200 M4 16-Node Cluster Horizon 7 RDSH Sessions In-Flig Performance Metrics	ght 294



Executive Summary

To keep pace with the market, you need systems that support rapid, agile development processes. Cisco **HyperFlex™ Systems let you unlock the full potential of hyper**-convergence and adapt IT to the needs of your workloads. The systems use an end-to-end software-defined infrastructure approach, combining software-defined computing in the form of Cisco HyperFlex HX-Series Nodes, software-defined storage with the powerful Cisco HyperFlex HX Data Platform, and software-defined networking with the Cisco UCS fabric that integrates smoothly with Cisco® Application Centric Infrastructure (Cisco ACI™).

Together with a single point of connectivity and management, these technologies deliver a pre-integrated and adaptable cluster with a unified pool of resources that you can quickly deploy, adapt, scale, and manage to efficiently power your applications and your business

This document provides an architectural reference and design guide for up to a 2400 user workload on a 16-node (8 Cisco HyperFlex HX240c-M4SX servers plus 8 Cisco UCS B200 M4 blade servers) Cisco HyperFlex system. We provide deployment guidance and performance data for VMware Horizon 7 deployed Microsoft Windows 10 with Office 2016 Linked-Clone, Instant-Clone and Persistent virtual desktops as well as Windows Server 2012 R2 RDS server-based sessions on vSphere 6. The solution is a pre-integrated, best-practice data center architecture built on the Cisco Unified Computing System (UCS), the Cisco Nexus® 9000 family of switches and Cisco HyperFlex Data Platform software version 1.8.1c.

The solution payload is 100 percent virtualized on Cisco HyperFlex HX240c-M4SX rack server and Cisco UCS B200 M4 blade server booting via on-board Flex-Flash controller SD cards running VMware vSphere 6.0 U2 patch03 hypervisor. The virtual desktops are configured with VMware Horizon 7, which incorporates both traditional persistent and non-persistent virtual Windows 7/8/10 desktops, hosted applications and remote desktop service (RDS) server 2008 R2 or server 2012 R2 based desktops. The solution provides unparalleled scale and management simplicity. VMware Horizon instant-clone floating assignment Windows 10 desktops (2000,) full clone desktops (2000) or RDSH server based desktops (2400) can be provisioned on a sixteen node Cisco HyperFlex cluster. Where applicable, this document provides best practice recommendations and sizing guidelines for customer deployment of this solution.

The solution boots 2000 virtual desktops or the RDSH virtual server machines in 11 minutes or less, insuring that users will not experience delays in accessing their virtual workspace on HyperFlex.

The solution provides outstanding virtual desktop end user experience as measured by the Login VSI 4.1 Knowledge Worker workload running in benchmark mode. Average end-user response times for all tested delivery methods is under 1 second, representing the best performance in the industry.

Solution Overview

Introduction

A current industry trend in data center design is towards small, granularly expandable hyperconverged infrastructures. By using virtualization along with pre-validated IT platforms, customers of all sizes have embarked on the journey to **"just in time capacity" using this new technology.** The Cisco Hyper Converged Solution can be quickly deployed, thereby increasing agility and reducing costs. Cisco HyperFlex uses best of breed storage, server and network components to serve as the foundation for desktop virtualization workloads, enabling efficient architectural designs that can be quickly and confidently deployed and scaled out.

Audience

The audience for this document includes, but is not limited to; sales engineers, field consultants, professional services, IT managers, partner engineers, and customers who want to take advantage of an infrastructure built to deliver IT efficiency and enable IT innovation.

Purpose of this Document

This document provides a step by step design, configuration and implementation guide for the Cisco Validated Design for a Cisco HyperFlex system running four different VMware Horizon 7 workloads with Cisco UCS 6248UP Fabric Interconnects and Cisco Nexus 9300 series switches.

What's New?

This is the first Cisco Validated Design with Cisco HyperFlex system running Virtual Desktop Infrastructure with compute only nodes included. It incorporates the following features:

- Validation of Cisco Nexus 9000 with Cisco HyperFlex
- Support for the Cisco UCS 3.1(2) release and Cisco HyperFlex v1.8.1
- VMware vSphere 6.0 U2 Hypervisor
- VMware Horizon 7 Instant Clones, Persistent Desktops and RDSH shared server sessions

The data center market segment is shifting toward heavily virtualized private, hybrid and public cloud computing models running on industry-standard systems. These environments require uniform design points that can be repeated for ease if management and scalability.

These factors have led to the need predesigned computing, networking and storage building blocks optimized to lower the initial design cost, simply management, and enable horizontal scalability and high levels of utilization.

The use cases include:

• Enterprise Data Center (small failure domains)

- Service Provider Data Center (small failure domains)
- Commercial Data Center
- Remote Office/Branch Office
- SMB Standalone Deployments

Solution Summary

This Cisco Validated Design prescribes a defined set of hardware and software that serves as an integrated foundation for both Horizon Microsoft Windows 10 virtual desktops and Horizon RDSH server desktop sessions based on Microsoft Server 2012 R2. The mixed workload solution includes Cisco HyperFlex hardware and Data Platform software, Cisco Nexus® switches, the Cisco Unified Computing System (Cisco UCS®), VMware Horizon and VMware vSphere software in a single package. The design is efficient enough that the networking, computing, and storage can fit in a 26-rack unit footprint in a single rack. Port density on the Cisco Nexus switches and Cisco UCS Fabric Interconnects enables the networking components to accommodate multiple HyperFlex clusters in a single Cisco UCS domain.

A key benefit of the Cisco Validated Design architecture is the ability to customize the environment to suit a customer's requirements. A Cisco Validated Design can be easily scaled as requirements and demand change. The unit can be scaled both up (adding resources to a Cisco Validated Design unit) and out (adding more Cisco Validated Design units).

The reference architecture detailed in this document highlights the resiliency, cost benefit, and ease of deployment of a hyper-converged desktop virtualization solution. A solution capable of consuming multiple protocols across a single interface allows for customer choice and investment protection because it truly is a wire-once architecture.

The combination of technologies from Cisco Systems, Inc. and VMware Inc. produced a highly efficient, robust and affordable desktop virtualization solution for a virtual desktop, hosted shared desktop or mixed deployment supporting different use cases. Key components of the solution include the following:

- More power, same size. Cisco HX-series rack server and Cisco UCS blade server with dual 14-core 2.6 GHz Intel Xeon (E5-2690v4) processors and 512GB of memory for VMware Horizon supports more virtual desktop workloads than the previously released generation processors on the same hardware. The Intel Xeon E5-2690 v4 14-core processors used in this study provided a balance between increased per-server capacity and cost.
- Fault-tolerance with high availability built into the design. The various designs are based on multiple Cisco HX-Series rack server and Cisco UCS blade server for virtualized desktop and infrastructure workloads. The design provides N+1 server fault tolerance for virtual desktops, hosted shared desktops and infrastructure services.
- Stress-tested to the limits during aggressive boot scenario. The 2000 user mixed hosted virtual desktop and 2400 user hosted shared desktop environment booted and registered with the Horizon 7 in under 11 minutes, providing our customers with an extremely fast, reliable cold-start desktop virtualization system.
- Stress-tested to the limits during simulated login storms. All 2000 or 2400 users logged in and started running workloads up to steady state in 48-minutes without overwhelming the processors, exhausting memory or exhausting the storage subsystems, providing customers with a desktop virtualization system that can easily handle the most demanding login and startup storms.
- Ultra-condensed computing for the datacenter. The rack space required to support the initial 2000 or 2400 user system is 26 rack units, including Cisco Nexus Switching and Cisco Fabric interconnects.

Incremental Cisco HyperFlex clusters can be added in 22 rack unit groups to add additional 2000 user capability, conserving valuable data center floor space.

- 100 percent virtualized: This CVD presents a validated design that is 100 percent virtualized on VMware ESXi 6.0. All of the virtual desktops, user data, profiles, and supporting infrastructure components, including Active Directory, SQL Servers, VMware Horizon components, Horizon VDI desktops and RDSH servers were hosted as virtual machines. This provides customers with complete flexibility for maintenance and capacity additions because the entire system runs on the Cisco HyperFlex hyper-converged infrastructure with stateless Cisco UCS HX-series servers. (Infrastructure VMs were hosted on two Cisco UCS C220 M4 Rack Servers outside of the HX cluster to deliver the highest capacity and best economics for the solution.)
- Cisco datacenter management: Cisco maintains industry leadership with the new Cisco UCS Manager 3.1(2) software that simplifies scaling, guarantees consistency, and eases maintenance. **Cisco's** ongoing development efforts with Cisco UCS Manager, Cisco UCS Central, and Cisco UCS Director insure that customer environments are consistent locally, across Cisco UCS Domains and across the globe, our software suite offers increasingly simplified operational and deployment management, and it **continues to widen the span of control for customer organizations' subject matter experts in compute,** storage and network.
- Cisco 10G Fabric: Our 10G unified fabric story gets additional validation on 6200 Series Fabric Interconnects as Cisco runs more challenging workload testing, while maintaining unsurpassed user response times.
- Cisco HyperFlex storage performance: Cisco HyperFlex provides industry-leading hyper converged storage performance that efficiently handles the most demanding I/O bursts (for example, login storms), high write throughput at low latency, delivers simple and flexible business continuity and helps reduce storage cost per desktop.
- Cisco HyperFlex agility: Cisco HyperFlex System enables users to seamlessly add, upgrade or remove storage from the infrastructure to meet the needs of the virtual desktops.
- Cisco HyperFlex vCenter integration: Cisco HyperFlex plugin for VMware vSphere provides easybutton automation for key storage tasks such as storage provisioning and storage resize, cluster health status and performance monitoring directly from the VCenter web client in a single pane of glass. Experienced vCenter administrators have a near zero learning curve when HyperFlex is introduced into the environment.
- VMware Horizon 7 advantage: VMware Horizon 7 follows a new unified product architecture that supports both hosted-shared desktops and applications (RDS) and complete virtual desktops (VDI). This new Horizon release simplifies tasks associated with large-scale VDI management. This modular solution supports seamless delivery of Windows apps and desktops as the number of user increase. In addition, PCoIP and Blast extreme enhancements help to optimize performance and improve the user experience across a variety of endpoint device types, from workstations to mobile devices including laptops, tablets, and smartphones.
- Optimized for performance and scale. For hosted shared desktop sessions, the best performance was achieved when the number of vCPUs assigned to the Horizon 7 RDSH virtual machines did not exceed the number of hyper-threaded (logical) cores available on the server. In other words, maximum

performance is obtained when not overcommitting the CPU resources for the virtual machines running virtualized RDS systems.

 Provisioning desktop machines made easy: VMware Horizon 7 provisions hosted virtual desktops as well as hosted shared desktop virtual machines for this solution using a single method for both, the "Automated floating assignment desktop pool". Persistent desktops were handled in same the unified Horizon 7 administrative console. Horizon 7 introduces a new provisioning technique for non-persistent virtual desktops called "Instant-clone." The new method greatly reduces the amount of life-cycle spend and the maintenance windows for the guest OS.

Cisco Desktop Virtualization Solutions: Data Center

The Evolving Workplace

Today's IT departments are facing a rapidly evolving workplace environment. The workforce is becoming increasingly diverse and geographically dispersed, including offshore contractors, distributed call center operations, knowledge and task workers, partners, consultants, and executives connecting from locations around the world at all times.

This workforce is also increasingly mobile, conducting business in traditional offices, conference rooms across the enterprise campus, home offices, on the road, in hotels, and at the local coffee shop. This workforce wants to use a growing array of client computing and mobile devices that they can choose based on personal preference. These trends are increasing pressure on IT to ensure protection of corporate data and prevent data leakage or loss through any combination of user, endpoint device, and desktop access scenarios (Figure 1).

These challenges are compounded by desktop refresh cycles to accommodate aging PCs and bounded local storage and migration to new operating systems, specifically Microsoft Windows 10 and productivity tools, specifically Microsoft Office 2016.



Figure 1 Cisco Data Center Partner Collaboration

Some of the key drivers for desktop virtualization are increased data security and reduced TCO through increased control and reduced management costs.

Cisco Desktop Virtualization Focus

Cisco focuses on three key elements to deliver the best desktop virtualization data center infrastructure: simplification, security, and scalability. The software combined with platform modularity provides a simplified, secure, and scalable desktop virtualization platform.

Simplified

Cisco UCS provides a radical new approach to industry-standard computing and provides the core of the data center infrastructure for desktop virtualization. Among the many features and benefits of Cisco UCS are the drastic reduction in the number of servers needed and in the number of cables used per server, and the capability to rapidly deploy or re-provision servers through Cisco UCS service profiles. With fewer servers and cables to manage and with streamlined server and virtual desktop provisioning, operations are significantly simplified. Thousands of desktops can be provisioned in minutes with Cisco UCS Manager service profiles and Cisco storage partners' storage-based cloning. This approach accelerates the time to productivity for end users, improves business agility, and allows IT resources to be allocated to other tasks.

Cisco UCS Manager automates many mundane, error-prone data center operations such as configuration and provisioning of server, network, and storage access infrastructure. In addition, Cisco UCS B-Series Blade Servers, C-Series and HX-Series Rack Servers with large memory footprints enable high desktop density that helps reduce server infrastructure requirements.

Simplification also leads to more successful desktop virtualization implementation. Cisco and its technology partners like VMware Technologies have developed integrated, validated architectures, including predefined hyper-converged architecture infrastructure packages such as HyperFlex. Cisco Desktop Virtualization Solutions have been tested with VMware vSphere.

Secure

Although virtual desktops are inherently more secure than their physical predecessors, they introduce new security challenges. Mission-critical web and application servers using a common infrastructure such as virtual desktops are now at a higher risk for security threats. Inter-virtual machine traffic now poses an important security consideration that IT managers need to address, especially in dynamic environments in which virtual machines, using VMware vMotion, move across the server infrastructure.

Desktop virtualization, therefore, significantly increases the need for virtual machine-level awareness of policy and security, especially given the dynamic and fluid nature of virtual machine mobility across an extended computing infrastructure. The ease with which new virtual desktops can proliferate magnifies the importance of a virtualization-aware network and security infrastructure. Cisco data center infrastructure (Cisco UCS and Cisco Nexus Family solutions) for desktop virtualization provides strong data center, network, and desktop security, with comprehensive security from the desktop to the hypervisor. Security is enhanced with segmentation of virtual desktops, virtual machine-aware policies and administration, and network security across the LAN and WAN infrastructure.

Scalable

Growth of a desktop virtualization solution is all but inevitable, so a solution must be able to scale, and scale predictably, with that growth. The Cisco Desktop Virtualization Solutions support high virtual-desktop density

(desktops per server), and additional servers scale with near-linear performance. Cisco data center infrastructure provides a flexible platform for growth and improves business agility. Cisco UCS Manager service profiles allow on-demand desktop provisioning and make it just as easy to deploy dozens of desktops as it is to deploy thousands of desktops.

Cisco HyperFlex servers provide near-linear performance and scale. Cisco UCS implements the patented Cisco Extended Memory Technology to offer large memory footprints with fewer sockets (with scalability to up to 1 terabyte (TB) of memory with 2- and 4-socket servers). Using unified fabric technology as a building block, Cisco UCS server aggregate bandwidth can scale to up to 80 Gbps per server, and the northbound Cisco UCS fabric interconnect can output 2 terabits per second (Tbps) at line rate, helping prevent desktop virtualization I/O and memory bottlenecks. Cisco UCS, with its high-performance, low-latency unified fabric-based networking architecture, supports high volumes of virtual desktop traffic, including high-resolution video and communications traffic. In addition, Cisco HyperFlex helps maintain data availability and optimal performance during boot and login storms as part of the Cisco Desktop Virtualization Solutions. Recent Cisco Validated Designs based on VMware Horizon, Cisco HyperFlex solutions have demonstrated scalability and performance, with up to 2000 hosted virtual desktops or 2400 hosted shared desktops up and running in 11 minutes.

Cisco UCS and Cisco Nexus data center infrastructure provides an excellent platform for growth, with transparent scaling of server, network, and storage resources to support desktop virtualization, data center applications, and cloud computing.

Savings and Success

The simplified, secure, scalable Cisco data center infrastructure for desktop virtualization solutions saves time and money compared to alternative approaches. Cisco UCS enables faster payback and ongoing **savings (better ROI and lower TCO) and provides the industry's greatest virtual desktop density per server,** reducing both capital expenditures (CapEx) and operating expenses (OpEx). The Cisco UCS architecture and Cisco Unified Fabric also enables much lower network infrastructure costs, with fewer cables per server and fewer ports required. In addition, storage tiering and deduplication technologies decrease storage costs, reducing desktop storage needs by up to 50 percent.

The simplified deployment of Cisco HyperFlex for desktop virtualization accelerates the time to productivity and enhances business agility. IT staff and end users are more productive more quickly, and the business can respond to new opportunities quickly by deploying virtual desktops whenever and wherever they are needed. The high-performance Cisco systems and network deliver a near-native end-user experience, allowing users to be productive anytime and anywhere.

The ultimate measure of desktop virtualization for any organization is its efficiency and effectiveness in both the near term and the long term. The Cisco Desktop Virtualization Solutions are very efficient, allowing rapid deployment, requiring fewer devices and cables, and reducing costs. The solutions are also extremely effective, providing the services that end users need on their devices of choice while improving IT operations, control, and data security. Success is bolstered **through Cisco's best**-in-class partnerships with leaders in virtualization and through tested and validated designs and services to help customers throughout the solution lifecycle. Long-**term success is enabled through the use of Cisco's scalable, flexible,** and secure architecture as the platform for desktop virtualization.

The ultimate measure of desktop virtualization for any end user is a great experience. Cisco HyperFlex delivers class-leading performance with sub-second base line response times and index average response times at full load of just over one second.

Use Cases

- Healthcare: Mobility between desktops and terminals, compliance, and cost
- Federal government: Teleworking initiatives, business continuance, continuity of operations (COOP), and training centers
- Financial: Retail banks reducing IT costs, insurance agents, compliance, and privacy
- Education: K-12 student access, higher education, and remote learning
- State and local governments: IT and service consolidation across agencies and interagency security
- Retail: Branch-office IT cost reduction and remote vendors
- Manufacturing: Task and knowledge workers and offshore contractors
- Microsoft Windows 10 migration
- Graphic intense applications
- Security and compliance initiatives
- Opening of remote and branch offices or offshore facilities
- Mergers and acquisitions

Figure 2 shows the VMware Horizon 7 on vSphere 6 built on Cisco Validated Design components and the network connections. The reference architecture reinforces the "wire-once" strategy, because as additional storage is added to the architecture, no re-cabling is required from the hosts to the Cisco UCS fabric interconnect.

Figure 2 Architecture



Physical Topology

The Cisco HyperFlex system is composed of a pair of Cisco UCS 6248UP Fabric Interconnects, along with up to 8 HX-Series rack mount servers per cluster. In addition, up to 8 compute only servers can also be added per cluster. Adding Cisco UCS 5108 Blade chassis allows use of Cisco UCS B200-M4 blade servers for additional compute resources in a hybrid cluster design. Cisco UCS C240 and C220 servers can also be used for additional compute resources. Up to 8 separate HX clusters can be installed under a single pair of Fabric Interconnects. The Fabric Interconnects both connect to every HX-Series rack mount server, and both connect to every Cisco UCS 5108 blade chassis. Upstream network connections, also referred to as

"northbound" network connections are made from the Fabric Interconnects to the customer datacenter network at the time of installation.

For this study, we uplinked the Cisco 6248UP Fabric Interconnects to Cisco Nexus 9372PX switches.

The Figure 3 and Figure 4 illustrate the hyperconverged and hybrid hyperconverged, plus compute only topologies.







Figure 4 HyperFlex Hyperconverged plus Compute Only Node Topology

Fabric Interconnects

Fabric Interconnects (FI) are deployed in pairs, wherein the two units operate as a management cluster, while forming two separate network fabrics, referred to as the A side and B side fabrics. Therefore, many design elements will refer to FI A or FI B, alternatively called fabric A or fabric B. Both Fabric Interconnects are active at all times, passing data on both network fabrics for a redundant and highly available configuration. Management services, including Cisco UCS Manager, are also provided by the two FIs but in a clustered manner, where one FI is the primary, and one is secondary, with a roaming clustered IP address. This primary/secondary relationship is only for the management cluster, and has no effect on data transmission.

Fabric Interconnects have the following ports, which must be connected for proper management of the Cisco UCS domain:

- Mgmt: A 10/100/1000 Mbps port for managing the Fabric Interconnect and the Cisco UCS domain via GUI and CLI tools. Also used by remote KVM, IPMI and SoL sessions to the managed servers within the domain. This is typically connected to the customer management network.
- L1: A cross connect port for forming the Cisco UCS management cluster. This is connected directly to the L1 port of the paired Fabric Interconnect using a standard CAT5 or CAT6 Ethernet cable with RJ45 plugs. It is not necessary to connect this to a switch or hub.
- L2: A cross connect port for forming the Cisco UCS management cluster. This is connected directly to the L2 port of the paired Fabric Interconnect using a standard CAT5 or CAT6 Ethernet cable with RJ45 plugs. It is not necessary to connect this to a switch or hub.
- Console: An RJ45 serial port for direct console access to the Fabric Interconnect. Typically used during the initial FI setup process with the included serial to RJ45 adapter cable. This can also be plugged into a terminal aggregator or remote console server device.

HX-Series Rack Mount Servers

The HX-Series converged servers are connected directly to the Cisco UCS Fabric Interconnects in Direct Connect mode. This option enables Cisco UCS Manager to manage the HX-Series rack-mount Servers using a single cable for both management traffic and data traffic. Both the HX220c-M4S and HX240c-M4SX servers are configured with the Cisco VIC 1227 network interface card (NIC) installed in a modular LAN on motherboard (MLOM) slot, which has dual 10 Gigabit Ethernet (GbE) ports. The standard and redundant connection practice is to connect port 1 of the VIC 1227 to a port on FI A, and port 2 of the VIC 1227 to a port on FI B (Figure 5). Failure to follow this cabling practice can lead to errors, discovery failures, and loss of redundant connectivity.



Figure 5 HX-Series Server Connectivity

Cisco UCS B-Series Blade Servers

Hybrid HyperFlex clusters also incorporate 1-8 Cisco UCS B200-M4 blade servers for additional compute capacity. Like all other Cisco UCS B-series blade servers, the Cisco UCS B200-M4 must be installed within a Cisco UCS 5108 blade chassis. The blade chassis comes populated with 1-4 power supplies, and 8 modular cooling fans. In the rear of the chassis are two bays for installation of Cisco Fabric Extenders. The Fabric Extenders (also commonly called IO Modules, or IOMs) connect the chassis to the Fabric Interconnects. Internally, the Fabric Extenders connect to the Cisco VIC 1340 card installed in each blade server across the chassis backplane. The standard connection practice is to connect 1-4 10 GbE links from the left side IOM, or IOM 1, to FI A, and to connect the same number of 10 GbE links from the right side IOM,

or IOM 2, to FI B (Figure 6). All other cabling configurations are invalid, and can lead to errors, discovery failures, and loss of redundant connectivity.



Figure 6 Cisco UCS 5108 Chassis Connectivity

Logical Network Design

The Cisco HyperFlex system has communication pathways that fall into four defined zones (Error! Reference source not found.):

- Management Zone: This zone comprises the connections needed to manage the physical hardware, the hypervisor hosts, and the storage platform controller virtual machines (SCVM). These interfaces and IP addresses need to be available to all staff who will administer the HX system, throughout the LAN/WAN. This zone must provide access to Domain Name System (DNS) and Network Time Protocol (NTP) services, and allow Secure Shell (SSH) communication. In this zone are multiple physical and virtual components:
 - Fabric Interconnect management ports.
 - Cisco UCS external management interfaces used by the servers and blades, which answer through the FI management ports.
 - ESXi host management interfaces.

- Storage Controller VM management interfaces.
- A roaming HX cluster management interface.
- VM Zone: This zone comprises the connections needed to service network IO to the guest VMs that will
 run inside the HyperFlex hyperconverged system. This zone typically contains multiple VLANs, that are
 trunked to the Cisco UCS Fabric Interconnects via the network uplinks, and tagged with 802.10 VLAN
 IDs. These interfaces and IP addresses need to be available to all staff and other computer endpoints
 which need to communicate with the guest VMs in the HX system, throughout the LAN/WAN.
- Storage Zone: This zone comprises the connections used by the Cisco HX Data Platform software, ESXi hosts, and the storage controller VMs to service the HX Distributed Data Filesystem. These interfaces and IP addresses need to be able to communicate with each other at all times for proper operation. During normal operation, this traffic all occurs within the Cisco UCS domain, however there are hardware failure scenarios where this traffic would need to traverse the network northbound of the Cisco UCS domain. For that reason, the VLAN used for HX storage traffic must be able to traverse the network uplinks from the Cisco UCS domain, reaching FI A from FI B, and vice-versa. This zone is primarily jumbo frame traffic therefore jumbo frames must be enabled on the Cisco UCS uplinks. In this zone are multiple components:
 - A vmkernel interface used for storage traffic for each ESXi host in the HX cluster.
 - Storage Controller VM storage interfaces.
 - A roaming HX cluster storage interface.
- VMotion Zone: This zone comprises the connections used by the ESXi hosts to enable vMotion of the guest VMs from host to host. During normal operation, this traffic all occurs within the Cisco UCS domain, however there are hardware failure scenarios where this traffic would need to traverse the network northbound of the Cisco UCS domain. For that reason, the VLAN used for HX storage traffic must be able to traverse the network uplinks from the Cisco UCS domain, reaching FI A from FI B, and vice-versa.

Figure 7 illustrates the logical network design.

Figure 7 Logical Network Design



The reference hardware configuration includes:

- Two Cisco Nexus 9372PX switches
- Two Cisco UCS 6248UP fabric interconnects
- Eight Cisco HX-series Rack server running HyperFlex data platform version 1.8.1c
- Eight Cisco UCS B200 M4 blade server running HyperFlex data platform version 1.8.1c as computeonly nodes.

For desktop virtualization, the deployment includes VMware Horizon 7 running on VMware vSphere 6. The design is intended to provide a large scale building block for both RDSH and persistent/non-persistent desktops with following density per sixteen node configuration:

- 2400 Horizon 7 RDSH server desktop sessions
- 2000 Horizon 7 Windows 10 non-persistent virtual desktops
- 2000 Horizon 7 Windows 10 persistent virtual desktops



Data provided here will allow customers to run RDSH server sessions and VDI desktops to suit their environment. For example, additional Cisco HX server can be deployed in compute-only manner to increase

compute capacity or additional drives can be added in existing server to improve I/O capability and throughput, and special hardware or software features can be added to introduce new features. This document guides you through the low-level steps for deploying the base architecture, as shown in Figure 12. These procedures covers everything from physical cabling to network, compute and storage device configurations.

Configuration Guidelines

This document provides details for configuring a fully redundant, highly available configuration for a Cisco Validated Design for various type of Virtual Desktop workloads on Cisco HyperFlex. Configuration guidelines are provided that refer to which redundant component is being configured with each step. For example, Cisco Nexus A or Cisco Nexus B identifies a member in the pair of Cisco Nexus switches that are configured. Cisco UCS 6248UP Fabric Interconnects are similarly identified. Additionally, this document details the steps for provisioning multiple Cisco UCS and HyperFlex hosts, and these are identified sequentially: VM-Host-Infra-01, VM-Host-Infra-02, VM-Host-RDSH-01, VM-Host-VDI-01 and so on. Finally, to indicate that you should include information pertinent to your environment in a given step, <text> appears as part of the command structure.

Solution Design

This section describes the infrastructure components used in the solution outlined in this study.

Cisco Unified Computing System

Cisco UCS Manager (UCSM) provides unified, embedded management of all software and hardware **components of the Cisco Unified Computing System™ (Cisco UCS)** and Cisco HyperFlex through an intuitive GUI, a command-line interface (CLI), and an XML API. The manager provides a unified management domain with centralized management capabilities and can control multiple chassis and thousands of virtual machines.

Cisco UCS is a next-generation data center platform that unites computing, networking, and storage access. The platform, optimized for virtual environments, is designed using open industry-standard technologies and aims to reduce total cost of ownership (TCO) and increase business agility. The system integrates a low-latency; lossless 10 Gigabit Ethernet unified network fabric with enterprise-class, x86-architecture servers. It is an integrated, scalable, multi-chassis platform in which all resources participate in a unified management domain.

Cisco Unified Computing System Components

The main components of Cisco UCS are:

- Compute: The system is based on an entirely new class of computing system that incorporates blade, rack and hyperconverged servers based on Intel[®] Xeon[®] processor E5-2600/4600 v4 and E7-2800 v4 family CPUs.
- Network: The system is integrated on a low-latency, lossless, 10-Gbps unified network fabric. This network foundation consolidates LANs, SANs, and high-performance computing (HPC) networks, which are separate networks today. The unified fabric lowers costs by reducing the number of network adapters, switches, and cables needed, and by decreasing the power and cooling requirements.
- Virtualization: The system unleashes the full potential of virtualization by enhancing the scalability, performance, and operational control of virtual environments. Cisco security, policy enforcement, and diagnostic features are now extended into virtualized environments to better support changing business and IT requirements.
- Storage: The Cisco HyperFlex rack servers provide high performance, resilient storage using the powerful HX Data Platform software. Customers can deploy as few as three nodes (replication factor 2/3,) depending on their fault tolerance requirements. These nodes form a HyperFlex storage and compute cluster. The onboard storage of each node is aggregated at the cluster level and automatically shared with all of the nodes. Storage resources are managed from the familiar VMware vCenter web client, extending the capability of vCenter administrators.
- Management: Cisco UCS uniquely integrates all system components, enabling the entire solution to be managed as a single entity by Cisco UCS Manager. The manager has an intuitive GUI, a CLI, and a robust API for managing all system configuration processes and operations.

Solution Design



Figure 8 Cisco HyperFlex Family Overview

Cisco UCS is designed to deliver:

- Reduced TCO and increased business agility.
- Increased IT staff productivity through just-in-time provisioning and mobility support.
- A cohesive, integrated system that unifies the technology in the data center; the system is managed, serviced, and tested as a whole.
- Scalability through a design for hundreds of discrete servers and thousands of virtual machines and the capability to scale I/O bandwidth to match demand.
- Industry standards supported by a partner ecosystem of industry leaders.

Cisco UCS Manager provides unified, embedded management of all software and hardware components of the Cisco Unified Computing System across multiple chassis, rack servers, and thousands of virtual machines. Cisco UCS Manager manages Cisco UCS as a single entity through an intuitive GUI, a command-line interface (CLI), or an XML API for comprehensive access to all Cisco UCS Manager Functions.

The Cisco HyperFlex system provides a fully contained virtual server platform, with compute and memory resources, integrated networking connectivity, a distributed high performance log-based filesystem for VM storage, and the hypervisor software for running the virtualized servers, all within a single Cisco UCS management domain.

Figure 9 HyperFlex System Overview



Cisco UCS Fabric Interconnect

The Cisco UCS 6200 Series Fabric Interconnects are a core part of Cisco UCS, providing both network connectivity and management capabilities for the system. The Cisco UCS 6200 Series offers line-rate, low-latency, lossless 10 Gigabit Ethernet, FCoE, and Fibre Channel functions.

The fabric interconnects provide the management and communication backbone for the Cisco UCS B-Series Blade Servers, Cisco UCS C-Series and HX-Series rack servers and Cisco UCS 5100 Series Blade Server Chassis. All servers, attached to the fabric interconnects become part of a single, highly available management domain. In addition, by supporting unified fabric, the Cisco UCS 6200 Series provides both LAN and SAN connectivity for all blades in the domain.

For networking, the Cisco UCS 6200 Series uses a cut-through architecture, supporting deterministic, lowlatency, line-rate 10 Gigabit Ethernet on all ports, 1-terabit (Tb) switching capacity, and 160 Gbps of bandwidth per chassis, independent of packet size and enabled services. The product series supports Cisco low-latency, lossless, 10 Gigabit Ethernet unified network fabric capabilities, increasing the reliability, efficiency, and scalability of Ethernet networks. The fabric interconnects support multiple traffic classes over a lossless Ethernet fabric, from the blade server through the interconnect. Significant TCO savings come from an FCoE-optimized server design in which network interface cards (NICs), host bus adapters (HBAs), cables, and switches can be consolidated.

Figure 10 Cisco UCS 6200 Series Fabric Interconnect



Cisco HyperFlex HX-Series Nodes

A HyperFlex cluster requires a minimum of three HX-Series nodes (with disk storage). Data is replicated across at least two of these nodes, and a third node is required for continuous operation in the event of a single-node failure. Each node that has disk storage is equipped with at least one high-performance SSD drive for data caching and rapid acknowledgment of write requests. Each node also is equipped with up to **the platform's physical capacity of spinning disks for maximum data capacity. At first release, we offer three** tested cluster configurations:

Cisco UCS HX220c-M4S Rack Server

The Cisco UCS HX220c-M4S Rack Server (Figure 11 and Figure 12) is a density-optimized, half-width blade server that supports two CPU sockets for Intel Xeon processor E5-2600 v4 series CPUs and up to 24 DDR4 DIMMs. It supports one modular LAN-on-motherboard (LOM) dedicated slot for a Cisco virtual interface card (VIC) and one mezzanine adapter. In additions, the Cisco UCS B200 M4 supports an optional storage module that accommodates up to two SAS or SATA hard disk drives (HDDs) or solid-state disk (SSD) drives. You can configure up to eight Cisco UCS HX220c-M4S Rack Server in a single HX cluster.

http://www.cisco.com/c/dam/en/us/products/collateral/hyperconverged-infrastructure/hyperflex-hxseries/datasheet-c78-736817.pdf



Figure 11 Cisco UCS HX220c-M4S Rack Server Front View



1	Drives	7	Fan status LED
	 Up to 6 x 1.2 TB SAS HDDs (for data) Drives 03 through 08 		
	 1 x 120 GB SATA SSD drive (for SDS logs) Drive 01 		
	 1 x 480 GB SATA SSD drive (for caching) Drive 02 		
2	Pull-out asset tag	8	Temperature status LED
3	Operations panel buttons and LEDs	9	Power supply status LED
4	Power button/Power status LED	10	Network link activity LED
5	Unit identification button/LED	11	KVM connector (used with KVM cable that provides two USB 2.0, one VGA, and one serial connector) ¹
6	System status LED	-	-

Figure 12 Cisco UCS HX220c-M4S Rack Server Rear View





1	PCIe riser 1/slot 1	7	Serial port (RJ-45 connector) ¹
2	PCIe riser 2/slot 2	8	Two embedded (on the motherboard) Intel i350 GbE Ethernet controller ports (LAN1, LAN2)
3	Modular LAN-on-motherboard (mLOM) card slot	9	VGA video port (DB-15)
4	Grounding-lug hole (for DC power supplies)	10	Rear unit identification button/LED
5	USB 3.0 ports (two)	11	Power supplies (up to two, redundant as 1+1)
6	1-Gb Ethernet dedicated management port	-	-

Cisco UCS combines Cisco UCS B-Series Blade Servers and C-Series Rack Servers with networking and storage access into a single converged system with simplified management, greater cost efficiency and agility, and increased visibility and control. The Cisco UCS HX-Series Rack Servers are one of the newest servers in the Cisco UCS portfolio.

The Cisco UCS HX220c-M4S delivers performance, flexibility, and optimization for data centers and remote sites. This enterprise-class server offers market-leading performance, versatility, and density without compromise for workloads ranging from web infrastructure to distributed databases. The Cisco UCS HX220c-M4S can quickly deploy stateless physical and virtual workloads with the programmable ease of use of the Cisco UCS Manager software and simplified server access with Cisco® Single Connect technology. Based on the Intel Xeon processor E5-2600 v4 product family, it offers up to 768 GB of memory using 32-GB DIMMs, up to eight disk drives, and up to 20 Gbps of I/O throughput. The Cisco UCS HX220c-M4S offers exceptional levels of performance, flexibility, and I/O throughput to run your most demanding applications.

The Cisco UCS HX220c-M4S provides:

- Up to two multicore Intel Xeon processor E5-2600 v4 series CPUs for up to 44 processing cores
- 24 DIMM slots for industry-standard DDR4 memory at speeds up to 2400 MHz, and up to 768 GB of total memory when using 32-GB DIMMs
- Eight hot-pluggable SAS and SATA HDDs or SSDs

- Cisco UCS VIC 1227, a 2-port, 20 Gigabit Ethernet and FCoE-capable modular (mLOM) mezzanine adapter
- Cisco FlexStorage local drive storage subsystem, with flexible boot and local storage capabilities that allow you to install and boot Hypervisor from.
- Enterprise-class pass-through RAID controller
- Easily add, change, and remove Cisco FlexStorage modules

Cisco HyperFlex HX240c-M4SX Nodes

This capacity optimized configuration contains a minimum of three nodes, a minimum of fifteen and up to twenty-three 1.2 TB SAS drives that contribute to cluster storage, a single 120 GB SSD housekeeping drive, a single 1.6 TB SSD caching drive, and two FlexFlash SD cards that act as the boot drives.

Figure 13 HX240c-M4SX Node



Cisco VIC 1227 MLOM Interface Card

The Cisco UCS Virtual Interface Card (VIC) 1227 is a dual-port Enhanced Small Form-Factor Pluggable (SFP+) 10-Gbps Ethernet and Fibre Channel over Ethernet (FCoE)-capable PCI Express (PCIe) modular LANon-motherboard (mLOM) adapter installed in the Cisco UCS HX-Series Rack Servers (Error! Reference source not found.). The mLOM slot can be used to install a Cisco VIC without consuming a PCIe slot, which provides greater I/O expandability. It incorporates next-generation converged network adapter (CNA) technology from Cisco, providing investment protection for future feature releases. The card enables a policy-based, stateless, agile server infrastructure that can present up to 256 PCIe standards-compliant interfaces to the host that can be dynamically configured as either network interface cards (NICs) or host bus adapters (HBAs). The personality of the card is determined dynamically at boot time using the service profile associated with the server. The number, type (NIC or HBA), identity (MAC address and World Wide Name [WWN]), failover policy, bandwidth, and quality-of-service (QoS) policies of the PCIe interfaces are all determined using the service profile.

Figure 14 Cisco VIC 1227 mLOM Card



Cisco UCS B200-M4 Nodes

For workloads that require additional computing and memory resources, but not additional storage capacity, a compute-intensive hybrid cluster configuration is allowed. This configuration contains a minimum of three HX240c-M4SX Nodes with up to four Cisco UCS B200-M4 Blade Servers for additional computing capacity. The HX240c-M4SX Nodes are configured as described previously, and the Cisco UCS B200-M4 servers are equipped with boot drives. Use of the Cisco UCS B200-M4 compute nodes also requires the Cisco UCS 5108 blade server chassis, and a pair of Cisco UCS 2204XP Fabric Extenders.

Figure 15 Cisco UCS B200 M4 Node



Cisco VIC1340 Converged Network Adapter

The Cisco UCS Virtual Interface Card (VIC) 1340 (Figure 16) is a 2-port 40-Gbps Ethernet or dual 4 x 10-Gbps Ethernet, Fibre Channel over Ethernet (FCoE)-capable modular LAN on motherboard (mLOM) designed exclusively for the M4 generation of Cisco UCS B-Series Blade Servers. When used in combination with an optional port expander, the Cisco UCS VIC 1340 capabilities is enabled for two ports of 40-Gbps Ethernet.

The Cisco UCS VIC 1340 enables a policy-based, stateless, agile server infrastructure that can present over 256 PCIe standards-compliant interfaces to the host that can be dynamically configured as either network interface cards (NICs) or host bus adapters (HBAs). In addition, the Cisco UCS VIC 1340 supports Cisco[®] Data Center Virtual Machine Fabric Extender (VM-FEX) technology, which extends the Cisco UCS fabric interconnect ports to virtual machines, simplifying server virtualization deployment and management.

Figure 16 Cisco UCS VIC 1340



Figure 17 illustrates the Cisco UCS VIC 1340 Virtual Interface Cards Deployed in the Cisco UCS B-Series B200 M4 Blade Servers.



Figure 17 Cisco UCS VIC 1340 deployed in the Cisco UCS B200 M4

Cisco UCS 5108 Blade Chassis

The Cisco UCS 5100 Series Blade Server Chassis is a crucial building block of the Cisco Unified Computing System, delivering a scalable and flexible blade server chassis. The Cisco UCS 5108 Blade Server Chassis, is six rack units (6RU) high and can mount in an industry-standard 19-inch rack. A single chassis can house up to eight half-width Cisco UCS B-Series Blade Servers and can accommodate both half-width and full-width blade form factors.

Four single-phase, hot-swappable power supplies are accessible from the front of the chassis. These power supplies are 92 percent efficient and can be configured to support non-redundant, N+1 redundant, and grid redundant configurations. The rear of the chassis contains eight hot-swappable fans, four power connectors (one per power supply), and two I/O bays for Cisco UCS Fabric Extenders. A passive mid-plane provides up to 40 Gbps of I/O bandwidth per server slot from each Fabric Extender. The chassis is capable of supporting 40 Gigabit Ethernet standards.

Figure 18 Cisco UCS 5108 Blade Chassis Front and Rear Views



Cisco UCS 2204XP Fabric Extender

The Cisco UCS 2200 Series Fabric Extenders multiplex and forward all traffic from blade servers in a chassis to a parent Cisco UCS fabric interconnect over from 10-Gbps unified fabric links. All traffic, even traffic between blades on the same chassis or virtual machines on the same blade, is forwarded to the parent interconnect, where network profiles are managed efficiently and effectively by the fabric interconnect. At the core of the Cisco UCS fabric extender are application-specific integrated circuit (ASIC) processors developed by Cisco that multiplex all traffic.

The Cisco UCS 2204XP Fabric Extender has four 10 Gigabit Ethernet, FCoE-capable, SFP+ ports that connect the blade chassis to the fabric interconnect. Each Cisco UCS 2204XP has sixteen 10 Gigabit Ethernet ports connected through the midplane to each half-width slot in the chassis. Typically configured in pairs for redundancy, two fabric extenders provide up to 80 Gbps of I/O to the chassis.

Figure 19 Cisco UCS 2204XP Fabric Extender



Cisco HyperFlex Converged Data Platform Software

The Cisco HyperFlex HX Data Platform is a purpose-built, high-performance, distributed file system with a wide array of enterprise-class data management services. The data platform's innovations redefine distributed storage technology, exceeding the boundaries of first-generation hyperconverged infrastructures. The data platform has all the features that you would expect of an enterprise shared storage system, eliminating the need to configure and maintain complex Fibre Channel storage networks and devices. The platform simplifies operations and helps ensure data availability. Enterprise-class storage features include the following:

- Replication replicates data across the cluster so that data availability is not affected if single or multiple components fail (depending on the replication factor configured).
- Deduplication is always on, helping reduce storage requirements in virtualization clusters in which multiple operating system instances in client virtual machines result in large amounts of replicated data.
- Compression further reduces storage requirements, reducing costs, and the log- structured file system is designed to store variable-sized blocks, reducing internal fragmentation.

- Thin provisioning allows large volumes to be created without requiring storage to support them until the need arises, simplifying data volume growth and making storage a "pay as you grow" proposition.
- Fast, space-efficient clones rapidly replicate storage volumes so that virtual machines can be replicated simply through metadata operations, with actual data copied only for write operations.
- Snapshots help facilitate backup and remote-replication operations: needed in enterprises that require always-on data availability.

Cisco HyperFlex HX Data Platform Administration Plug-in

The Cisco HyperFlex HX Data Platform is administered through a VMware vSphere web client plug-in. Through this centralized point of control for the cluster, administrators can create volumes, monitor the data platform health, and manage resource use. Administrators can also use this data to predict when the cluster will need to be scaled. For customers that prefer a light weight web interface there is a tech preview URL management interface available by opening a browser to the IP address of the HX cluster interface. Additionally, there is an interface to assist in running cli commands through a web browser.



Figure 20 HyperFlex Web Client Plug-in

For Tech Preview Web UI connect to HX controller cluster IP:

http://hx controller cluster ip/ui

Figure 21 HyperFlex Tech Preview UI

dialo cisco HyperFlex	E Search.,	٩		Teld at Out
Dashboard Datastores	1107			HOME > DASHBOARD
Servers	Operational Status	Storage	Optimization	Resiliency Status 0
MONITOR Derformance Alarms DATA SERVICES DATA SERVICES D' Virtual Machines		98.98% Free	46.38 % Total Savings	Healthy
VM Folders Resource Pools	Online Cluster Status	15.9 TB 167.4 GB Free Used	42.58% 6.62% Compression De-duplication	2 Node failure tolerance
ADMINISTRATION System Services Upgrade Web CLI	IOPS Read 0.70 Write	35.70 O X Throughput (MBps)	Read 0.01 Write 0.17 O	sec) Read 5.00 Write 1.06 🔿 💥
https://10.20.151.190//#.m	03.50 09.33.30	10:03 03:50 09:33	3.30 10.03 03.50	09:33:30 10:03 Read Latency Write Latency

To run CLI commands via HTTP, connect to HX controller cluster IP:

Figure 22 Web CLI

the HyperFlex	E Search	٩	Terri Preve
 Dashboard Datastores 	Web CLI Command Line Interface		HOME > WEB CLI
Servers H MONITOR D Performance	Command leg. stcli cluster info		
 Alarms Events 	Output		
Virtual Machines VM Folders			
Resource Pools			
System services Upgrade Meb CLI			

Cisco HyperFlex HX Data Platform Controller

A Cisco HyperFlex HX Data Platform controller resides on each node and implements the distributed file system. The controller runs in user space within a virtual machine and intercepts and handles all I/O from guest virtual machines. The platform controller VM uses the VMDirectPath I/O feature to provide PCI passthrough control of the physical server's SAS disk controller. This method gives the controller VM full control of the physical disk resources, utilizing the SSD drives as a read/write caching layer, and the HDDs as a capacity layer for distributed storage. The controller integrates the data platform into VMware software through the use of two preinstalled VMware ESXi vSphere Installation Bundles (VIBs):

- IO Visor: This VIB provides a network file system (NFS) mount point so that the ESXi hypervisor can access the virtual disks that are attached to individual virtual machines. From the hypervisor's perspective, it is simply attached to a network file system.
- VMware API for Array Integration (VAAI): This storage offload API allows vSphere to request advanced file system operations such as snapshots and cloning. The controller implements these operations through manipulation of metadata rather than actual data copying, providing rapid response, and thus rapid deployment of new environments.

Data Operations and Distribution

The Cisco HyperFlex HX Data Platform controllers handle all read and write operation requests from the guest VMs to their virtual disks (VMDK) stored in the distributed datastores in the cluster. The data platform distributes the data across multiple nodes of the cluster, and also across multiple capacity disks of each node, according to the replication level policy selected during the cluster setup. This method avoids storage hotspots on specific nodes, and on specific disks of the nodes, and thereby also avoids networking hotspots or congestion from accessing more data on some nodes versus others.

Replication Factor

The policy for the number of duplicate copies of each storage block is chosen during cluster setup, and is referred to as the replication factor (RF). The default setting for the Cisco HyperFlex HX Data Platform is replication factor 3 (RF=3).

- Replication Factor 3: For every I/O write committed to the storage layer, 2 additional copies of the blocks written will be created and stored in separate locations, for a total of 3 copies of the blocks. Blocks are distributed in such a way as to ensure multiple copies of the blocks are not stored on the same disks, nor on the same nodes of the cluster. This setting can tolerate simultaneous failures 2 entire nodes without losing data and resorting to restore from backup or other recovery processes.
- Replication Factor 2: For every I/O write committed to the storage layer, 1 additional copy of the blocks written will be created and stored in separate locations, for a total of 2 copies of the blocks. Blocks are distributed in such a way as to ensure multiple copies of the blocks are not stored on the same disks, nor on the same nodes of the cluster. This setting can tolerate a failure 1 entire node without losing data and resorting to restore from backup or other recovery processes.

Data Write Operations

For each write operation, data is written to the SSD of the node designated as it's primary, and replica copies of that write are written to the caching SSD of the remote nodes in the cluster, according to the replication factor setting. For example, at RF=3 a write will be written locally where the VM originated the write, and two additional writes will be committed in parallel on two other nodes. The write operation will not be acknowledged until all three copies are written to the caching layer SSDs. Written data is also cached in a write log area resident in memory in the controller VM, along with the write log on the caching SSDs (Figure 15). This process speeds up read requests when reads are requested of data that has recently been written.

Data Destaging, Deduplication and Compression

The Cisco HyperFlex HX Data Platform constructs multiple write caching segments on the caching SSDs of each node in the distributed cluster. As write cache segments become full, and based on policies accounting for I/O load and access patterns, those write cache segments are locked and new writes roll
over to a new write cache segment. The data in the now locked cache segment is destaged to the HDD capacity layer of the node. During the destaging process, data is deduplicated and compressed before being written to the HDD capacity layer. The resulting data after deduplication and compression can now be written in a single sequential operation to the HDDs of the server, avoiding disk head seek thrashing and accomplishing the task in the minimal amount of time (Figure 23). Since the data is already deduplicated and compressed before being written, the platform avoids additional I/O overhead often seen on competing systems, which must later do a read/dedupe/compress/write cycle. Deduplication, compression and destaging take place with no delays or I/O penalties to the guest VMs making requests to read or write data.



Figure 23 HyperFlex HX Data Platform Data Movement

Data Read Operations

For data read operations, data may be read from multiple locations. For data that was very recently written, the data is likely to still exist in the write log of the local platform controller memory, or the write log of the local caching SSD. If local write logs do not contain the data, the distributed filesystem metadata will be queried to see if the data is cached elsewhere, either in write logs of remote nodes, or in the dedicated read cache area of the local and remote SSDs. Finally, if the data has not been accessed in a significant amount of time, the filesystem will retrieve the data requested from the HDD capacity layer. As requests for reads are made to the distributed filesystem and the data is retrieved from the HDD capacity layer, the caching SSDs populate their dedicated read cache area to speed up subsequent requests for the same data. This multi-tiered distributed system with several layers of caching techniques, insures that data is served at the highest possible speed, leveraging the caching SSDs of the nodes fully and equally.

Cisco Nexus 9372PX Switches

The Cisco Nexus 9372PX/9372PX-E Switches has 48 1/10-Gbps Small Form Pluggable Plus (SFP+) ports and 6 Quad SFP+ (QSFP+) uplink ports. All the ports are line rate, delivering 1.44 Tbps of throughput in a 1-rack-unit (1RU) form factor. Cisco Nexus 9372PX benefits are listed below.

Architectural Flexibility

- Includes top-of-rack or middle-of-row fiber-based server access connectivity for traditional and leafspine architectures
- Leaf node support for Cisco ACI architecture is provided in the roadmap
- Increase scale and simplify management through Cisco Nexus 2000 Fabric Extender support

Feature Rich

- Enhanced Cisco NX-OS Software is designed for performance, resiliency, scalability, manageability, and programmability
- ACI-ready infrastructure helps users take advantage of automated policy-based systems management
- Virtual Extensible LAN (VXLAN) routing provides network services
- Cisco Nexus 9372PX-E supports IP-based endpoint group (EPG) classification in ACI mode

Highly Available and Efficient Design

- High-density, non-blocking architecture
- Easily deployed into either a hot-aisle and cold-aisle configuration
- Redundant, hot-swappable power supplies and fan trays

Simplified Operations

- Power-On Auto Provisioning (POAP) support allows for simplified software upgrades and configuration file installation
- An intelligent API offers switch management through remote procedure calls (RPCs, JSON, or XML) over a HTTP/HTTPS infrastructure

- Python Scripting for programmatic access to the switch command-line interface (CLI)
- Hot and cold patching, and online diagnostics

Investment Protection

A Cisco 40 Gb bidirectional transceiver allows reuse of an existing 10 Gigabit Ethernet multimode cabling plant for 40 Gigabit Ethernet Support for 1 Gb and 10 Gb access connectivity for data centers migrating access switching infrastructure to faster speed. The following is supported:

- 1.44 Tbps of bandwidth in a 1 RU form factor
- 48 fixed 1/10-Gbps SFP+ ports
- 6 fixed 40-Gbps QSFP+ for uplink connectivity that can be turned into 10 Gb ports through a QSFP to SFP or SFP+ Adapter (QSA)
- Latency of 1 to 2 microseconds
- Front-to-back or back-to-front airflow configurations
- 1+1 redundant hot-swappable 80 Plus Platinum-certified power supplies
- Hot swappable 2+1 redundant fan tray

Figure 24 Cisco Nexus 9372PX Switch



VMware vSphere 6.0

VMware provides virtualization software. VMware's enterprise software hypervisors for servers–VMware vSphere ESX, vSphere ESXi, and VSphere–are bare-metal hypervisors that run directly on server hardware without requiring an additional underlying operating system. VMware vCenter Server for vSphere provides central management and complete control and visibility into clusters, hosts, virtual machines, storage, networking, and other critical elements of your virtual infrastructure.

VMware vSphere 6.0 introduces many enhancements to vSphere Hypervisor, VMware virtual machines, vCenter Server, virtual storage, and virtual networking, further extending the core capabilities of the vSphere platform.

VMware ESXi 6.0 Hypervisor

vSphere 6.0 introduces a number of new features in the hypervisor:

• Scalability Improvements

ESXi 6.0 dramatically increases the scalability of the platform. With vSphere Hypervisor 6.0, clusters can scale to as many as 64 hosts, up from 32 in previous releases. With 64 hosts in a cluster, vSphere

6.0 can support 8000 virtual machines in a single cluster. This capability enables greater consolidation ratios, more efficient use of VMware vSphere Distributed Resource Scheduler (DRS), and fewer clusters that must be separately managed. Each vSphere Hypervisor 6.0 instance can support up to 480 logical CPUs, 12 terabytes (TB) of RAM, and 1024 virtual machines. By using the newest hardware advances, ESXi 6.0 enables the virtualization of applications that previously had been thought to be non-virtualizable.

- Security Enhancements
 - ESXi 6.0 offers these security enhancements:
 - Account management: ESXi 6.0 enables management of local accounts on the ESXi server using new ESXi CLI commands. The capability to add, list, remove, and modify accounts across all hosts in a cluster can be centrally managed using a vCenter Server system. Previously, the account and permission management functions for ESXi hosts were available only for direct host connections. The setup, removal, and listing of local permissions on ESXi servers can also be centrally managed.
 - Account lockout: ESXi Host Advanced System Settings have two new options for the management of failed local account login attempts and account lockout duration. These parameters affect Secure Shell (SSH) and vSphere Web Services connections, but not ESXi direct console user interface (DCUI) or console shell access.
 - Password complexity rules: In previous versions of ESXi, password complexity changes had to be made by manually editing the /etc/pam.d/passwd file on each ESXi host. In vSphere 6.0, an entry in Host Advanced System Settings enables changes to be centrally managed for all hosts in a cluster.
 - Improved auditability of ESXi administrator actions: Prior to vSphere 6.0, actions at the vCenter Server level by a named user appeared in ESXi logs with the vpxuser username: for example, [user=vpxuser]. In vSphere 6.0, all actions at the vCenter Server level for an ESXi server appear in the ESXi logs with the vCenter Server username: for example, [us-er=vpxuser: DOMAIN\User]. This approach provides a better audit trail for actions run on a vCenter Server instance that conducted corresponding tasks on the ESXi hosts.
 - Flexible lockdown modes: Prior to vSphere 6.0, only one lockdown mode was available.
 Feedback from customers indicated that this lockdown mode was inflexible in some use cases. With vSphere 6.0, two lockdown modes are available:
- In normal lockdown mode, DCUI access is not stopped, and users on the DCUI access list can access the DCUI.
- In strict lockdown mode, the DCUI is stopped.
 - Exception users: vSphere 6.0 offers a new function called exception users. Exception users are local accounts or Microsoft Active Directory accounts with permissions defined locally on the host to which these users have host access. These exception users are not recommended for general user accounts, but they are recommended for use by third-party applications—for service accounts, for example—that need host access when either normal or strict lockdown mode is enabled. Permissions on these accounts should be set to the bare minimum required for the application to perform its task and with an account that needs only read-only permissions on the ESXi host.

Smart card authentication to DCUI: This function is for U.S. federal customers only. It enables DCUI login access using a Common Access Card (CAC) and Personal Identity Verification (PIV). The ESXi host must be part of an Active Directory domain.

VMware Horizon

VMware Horizon desktop virtualization solutions built on a unified architecture so they are simple to manage and flexible enough to meet the needs of all your organization's users. You use the same architecture and management tools to manage public, private, and hybrid cloud deployments as you do for on premises deployments

- VMware Horizon Virtual machines and RDSH known as server-based hosted sessions: These are applications hosted from Microsoft Windows servers to any type of device, including Windows PCs, Macs, smartphones, and tablets. Some VMware editions include technologies that further optimize the experience of using Windows applications on a mobile device by automatically translating native mobile-device display, navigation, and controls to Windows applications; enhancing performance over mobile networks; and enabling developers to optimize any custom Windows application for any mobile environment.
- VMware Horizon RDSH session users also known as server-hosted desktops: These are inexpensive, locked-down Windows virtual desktops hosted from Windows server operating systems. They are well suited for users, such as call center employees, who perform a standard set of tasks.

Advantages of Using VMware Horizon

VMware Horizon 7 version 7.0.1 provides the following new features and enhancements:

- Instant Clones
 - A new type of desktop virtual machines that can be provisioned significantly faster than the traditional View Composer linked clones.
 - A fully functional desktop can be provisioned in two seconds or less.
 - Recreating a desktop pool with a new OS image can be accomplished in a fraction of the time it takes a View Composer desktop pool because the parent image can be prepared well ahead of the scheduled time of pool recreation.
 - Clones are automatically rebalanced across available datastores.
 - View storage accelerator is automatically enabled.
- VMware Blast Extreme
 - VMware Blast Extreme is now fully supported on the Horizon platform.
 - Administrators can select the VMware Blast display protocol as the default or available protocol for pools, farms, and entitlements.
 - End users can select the VMware Blast display protocol when connecting to remote desktops and applications.

- VMware Blast Extreme features include:
 - o TCP and UDP transport support
 - o H.264 support for the best performance across more devices
 - Reduced device power consumption for longer battery life
 - NVIDIA GRID acceleration for more graphical workloads per server, better performance, and a superior remote user experience
- True SSO
 - For VMware Identity Manager integration, True SSO streamlines the end-to-end login experience. After users log in to VMware Identity Manager using a smart card or an RSA SecurID or RADIUS token, users are not required to also enter Active Directory credentials in order to use a remote desktop or application.
 - Uses a short-lived Horizon virtual certificate to enable a password-free Windows login.
 - Supports using either a native Horizon Client or HTML Access.
 - System health status for True SSO appears in the Horizon Administrator dashboard.
 - Can be used in a single domain, in a single forest with multiple domains, and in a multiple-forest, multiple-domain setup.
- Smart Policies
 - Control of the clipboard cut-and-paste, client drive redirection, USB redirection, and virtual printing desktop features through defined policies.
 - PCoIP session control through PCoIP profiles.
 - Conditional policies based on user location, desktop tagging, pool name, and Horizon Client registry values.
- Configure the Clipboard Memory Size for VMware Blast and PCoIP Sessions

Horizon administrators can configure the server clipboard memory size by setting GPOs for VMware Blast and PCoIP sessions. Horizon Client 4.1 users on Windows, Linux, and Mac OS X systems can configure the client clipboard memory size. The effective memory size is the lesser of the server and client clipboard memory size values.

• VMware Blast Network Recovery Enhancements

Network recovery is now supported for VMware Blast sessions initiated from iOS, Android, Mac OS X, Linux, and Chrome OS clients. Previously, network recovery was supported only for Windows client sessions. If you lose your network connection unexpectedly during a VMware Blast session, Horizon Client attempts to reconnect to the network and you can continue to use your remote desktop or application. The network recovery feature also supports IP roaming, which means you can resume your VMware Blast session after switching to a WiFi network.

• Configure Horizon Administrator to not remember the login name

Horizon administrators can configure not to display the Remember user name check box and therefore not remember the administrator's login name.

• Allow Mac OS X Users to Save Credentials

Horizon administrators can configure Connection Server to allow Horizon Client Mac OS X systems to remember a user's user name, password, and domain information. If users choose to have their credentials saved, the credentials are added to the login fields in Horizon Client on subsequent connections.

- Windows 10
 - Windows 10 is supported as a desktop guest operating system
 - Horizon Client runs on Windows 10
 - Smart card is supported on Windows 10.
 - The Horizon User Profile Migration tool migrates Windows 7, 8/8.1, Server 2008 R2, or Server 2012 R2 user profiles to Windows 10 user profiles.
- RDS Desktops and Hosted Apps
 - View Composer. View Composer and linked clones provide automated and efficient management of RDS server farms.
 - Graphics Support. Existing 3D vDGA and GRID vGPU graphics solutions on VDI desktops have been extended to RDS hosts, enabling graphics-intensive applications to run on RDS desktops and Hosted Apps.
 - Enhanced Load Balancing. A new capability provides load balancing of server farm applications based on memory and CPU resources.
 - One-Way AD Trusts

One-way AD trust domains are now supported. This feature enables environments with limited trust relationships between domains without requiring Horizon Connection Server to be in an external domain.

- Cloud Pod Architecture (CPA) Enhancements
 - Hosted App Support. Support for application remoting allows applications to be launched using global entitlements across a pod federation.
 - HTML Access (Blast) Support. Users can use HTML Access to connect to remote desktops and applications in a Cloud Pod Architecture deployment.
- Access Point Integration
 - Access Point is a hardened Linux-based virtual appliance that protects virtual desktop and application resources to allow secure remote access from the Internet. Access Point provides a new authenticating DMZ gateway to Horizon Connection Server. Smart card support on Access Point is available as a Tech Preview. Security server will continue to be available as an alternative configuration. For more information, see <u>Deploying and Configuring Access Point</u>.
- FIPS

- Install-time FIPS mode allows customers with high security requirements to deploy Horizon 6.
- Graphics Enhancements
 - AMD vDGA enables vDGA pass-through graphics for AMD graphics hardware.
 - 4K resolution monitors (3840x2160) are supported.
- Horizon Administrator Enhancements
 - Horizon Administrator shows additional licensing information, including license key, named user and concurrent connection user count.
 - Pool creation is streamlined by letting Horizon administrators clone existing pools.
- Horizon 6 for Linux Desktop Enhancements
 - Several new features are supported on Horizon 6 for Linux desktops, including NVIDIA GRID vGPU, vSGA, RHEL 7.1 and Ubuntu 14.04 guest operating systems, and View Agent installation of JRE 8 with no user steps required.
 - Support for managed virtual machines
 - Support for smart card redirection with SSO
 - Support for Horizon Client for iOS
 - Support for SLES 12 SP1
 - Support for H.264 encoder software
- Additional Features
 - Support for IPv6 with VMware Blast Extreme on security servers.
 - Horizon Administrator security protection layer. See VMware Knowledge Base (KB) article 2144303 for more information.
 - Protection against inadvertent pool deletion.
 - RDS per-device licensing improvements.
 - Support for Intel vDGA.
 - Support for AMD Multiuser GPU Using vDGA.
 - More resilient upgrades.
 - Display scaling for Windows Horizon Clients.
 - DPI scaling is supported if it is set at the system level and the scaling level is greater than 100.

What are VMware RDS Hosted Sessions?

The following describes the VMware RDS Hosted Sessions:

- An RDS host is a server computer that hosts applications and desktop sessions for remote access. An RDS host can be a virtual machine or a physical server.
- An RDS host has the Microsoft Remote Desktop Services role, the Microsoft Remote Desktop Session Host service, and Horizon Agent installed. Remote Desktop Services was previously known as Terminal Services. The Remote Desktop Session Host service allows a server to host applications and remote desktop sessions. With Horizon Agent installed on an RDS host, users can connect to applications and desktop sessions by using the display protocol PCoIP or Blast Extreme. Both protocols provide an optimized user experience for the delivery of remote content, including images, audio and video.
- The performance of an RDS host depends on many factors. For information on how to tune the performance of different versions of Windows Server, see http://msdn.microsoft.com/library/windows/hardware/gg463392.aspx.
- Horizon 7 supports at most one desktop session and one application session per user on an RDS host.
- When users submit print jobs concurrently from RDS desktops or applications that are hosted on the same RDS host, the ThinPrint server on the RDS host processes the print requests serially rather than in parallel. This can cause a delay for some users. Note that the print server does not wait for a print job to complete before processing the next one. Print jobs that are sent to different printers will print in parallel.
- If a user launches an application and also an RDS desktop, and both are hosted on the same RDS host, they share the same user profile. If the user launches an application from the desktop, conflicts may result if both applications try to access or modify the same parts of the user profile, and one of the applications may fail to run properly.
- The process of setting up applications or RDS desktops for remote access involves the following tasks:
- Installing Applications
 - If you plan to create application pools, you must install the applications on the RDS hosts. If you want Horizon 7 to automatically display the list of installed applications, you must install the applications so that they are available to all users from the Start menu. You can install an application at any time before you create the application pool. If you plan to manually specify an application, you can install the application at any time, either before or after creating an application pool.
- Important
 - When you install an application, you must install it on all the RDS hosts in a farm and in the same location on each RDS host. If you do not, a health warning will appear on the View Administrator dashboard. In such a situation, if you create an application pool, users might encounter an error when they try to run the application.
 - When you create an application pool, Horizon 7 automatically displays the applications that are available to all users rather than individual users from the Start menu on all of the RDS hosts in a farm. You can choose any applications from that list. In addition, you can manually specify an application that is not available to all users from the Start menu. There is no limit on the number of applications that you can install on an RDS host.

Farms, RDS Hosts, Desktop and Application Pools

With VMware Horizon, you can create desktop and application pools to give users remote access to virtual machine-based desktops, session-based desktops, physical computers, and applications. Horizon takes advantage of Microsoft Remote Desktop Services (RDS) and VMware PC-over-IP (PCoIP) technologies to provide high-quality remote access to users.

- RDS Hosts
 - RDS hosts are server computers that have Windows Remote Desktop Services and View Agent installed. These servers host applications and desktop sessions that users can access remotely. To use RDS desktop pools or applications, your end users must have access to Horizon Client 3.0 or later software.
- Desktop Pools
 - There are three types of desktop pools: automated, manual, and RDS. Automated desktop pools use a vCenter Server virtual machine template or snapshot to create a pool of identical virtual machines. Manual desktop pools are a collection of existing vCenter Server virtual machines, physical computers, or third-party virtual machines. In automated or manual pools, each machine is available for one user to access remotely at a time. RDS desktop pools are not a collection of machines, but instead, provide users with desktop sessions on RDS hosts. Multiple users can have desktop sessions on an RDS host simultaneously.
- Application Pools
 - Application pools let you deliver applications to many users. The applications in application pools run on a farm of RDS hosts.
- Farms
 - Farms are collections of RDS hosts and facilitate the management of those hosts. Farms can have a variable number of RDS hosts and provide a common set of applications or RDS desktops to users. When you create an RDS desktop pool or an application pool, you must specify a farm. The RDS hosts in the farm provide desktop and application sessions to users.



Figure 25 VMware Horizon Architectural Overview

Cisco HyperFlex Data Platform

- In a Cisco HyperFlex System, the data platform requires a minimum of three Cisco HyperFlex HX-Series converged nodes for the default three-way mirroring of data. To create a highly available cluster with N+1 resiliency, the solution considers a minimum of four hyperconverged nodes per cluster. Each node includes a Cisco HyperFlex HX Data Platform controller that implements the distributed file system using internal flash-based SSD drives and high-capacity HDDs to store data. The controllers communicate with each other over 10 Gigabit Ethernet to present a single pool of storage that spans the nodes in the cluster. Individual nodes access data through a data layer using file, block, object, or API plug-ins. As nodes are added, the cluster scales to deliver computing, storage capacity, and I/O performance.
- In the VMware vSphere environment, the controller occupies a virtual machine with a dedicated number
 of processor cores and memory, allowing it to deliver consistent performance and not affect the
 performance of the other virtual machines in the cluster. The controller can access all storage resources
 without hypervisor intervention through the VMware VMDirectPath feature. It uses the node's memory
 and SSD drives as part of a distributed caching layer, and it uses the node's HDDs for distributed
 capacity storage. The controller integrates the data platform into VMware software through the use of
 two preinstalled VMware ESXi vSphere Installation Bundles (VIBs):
 - IO Visor: This VIB provides a network file system (NFS) mount point so that the ESXi hypervisor can
 access the virtual disk drives that are attached to individual virtual machines. From the hypervisor's
 perspective, it is simply attached to a network file system.

- vStorage API for Array Integration (VAAI): This storage offload API mechanism is used by vSphere to request advanced file system operations related to snapshots and cloning from the underlying storage subsystem. The controller causes these operations to occur by manipulating the metadata rather than actually copying data, providing rapid response and thus rapid deployment of new application environments.



Figure 26 Cisco HyperFlex Data Flow

Definitions

- Primary Active Write Log (2 GB) Pa
- Pp Primary Passive Write Log (2 GB)
- M1a Mirror 1 Active Log (2 GB) M1p
- Mirror 1 Passive Log (2 GB) M2a Mirror 2 Active Log (2 GB)
- Mirror 2 Passive Log (2 GB)
- M2p RC Read Cache (Rest of Cache SSD)
 - As shown in Figure 26, the IO Visor intercepts workload traffic and stripes the block across available nodes in the cluster. The data then bypasses the hypervisor using VMDirectPath and is cached on the larger cache disk in one of the dedicated partitions. Replication across nodes takes place at this layer. Write blocks continue to be written to write logs until they are full, at which time they are marked as passive and destaged to disk. Data optimization processes such as deduplication and compression occur when the data is destaged from the cache and before it is written to disks.
 - The data platform implements a log-structured file system (LogFS) that uses a caching layer in the SSDs to accelerate read requests and write responses, and a persistence layer implemented with HDDs for capacity. The log-structured layer replicates incoming data to one or more SSDs located in different nodes before the write operation is acknowledged to the application. This process

allows incoming write operations to be acknowledged quickly while protecting data from SSD or node failures. If an SSD or node fails, the replica is quickly re-created on other SSDs or nodes using the available copies of the data.

The log-structured distributed object layer also replicates data that is moved from the write cache
to the capacity layer. This replicated data is likewise protected from hard disk or node failures.
There are a total of three data copies to survive disk or node failures without risk of data loss. See
the <u>Cisco HyperFlex Data Platform system administration guide</u> for a complete list of fault-tolerant
configurations and settings.

Architecture and Design of VMware Horizon on Cisco Unified Computing System and Cisco HyperFlex Storage Design Fundamentals

There are many reasons to consider a virtual desktop solution such as an ever growing and diverse base of user devices, complexity in management of traditional desktops, security, and even Bring Your Own Computer (BYOC) to work programs. The first step in designing a virtual desktop solution is to understand the user community and the type of tasks that are required to successfully execute their role. The following sample user classifications are provided:

- Knowledge Workers today do not just work in their offices all day they attend meetings, visit branch
 offices, work from home, and even coffee shops. These anywhere workers expect access to all of their
 same applications and data wherever they are.
- External Contractors are increasingly part of your everyday business. They need access to certain portions of your applications and data, yet administrators still have little control over the devices they use and the locations they work from. Consequently, IT is stuck making trade-offs on the cost of providing these workers a device vs. the security risk of allowing them access from their own devices.
- Task Workers perform a set of well-defined tasks. These workers access a small set of applications and have limited requirements from their PCs. However, since these workers are interacting with your customers, partners, and employees, they have access to your most critical data.
- Mobile Workers need access to their virtual desktop from everywhere, regardless of their ability to connect to a network. In addition, these workers expect the ability to personalize their PCs, by installing their own applications and storing their own data, such as photos and music, on these devices.
- Shared Workstation users are often found in state-of-the-art university and business computer labs, conference rooms or training centers. Shared workstation environments have the constant requirement to re-provision desktops with the latest operating systems and applications as the needs of the organization change, tops the list.

After the user classifications have been identified and the business requirements for each user classification have been defined, it becomes essential to evaluate the types of virtual desktops that are needed based on user requirements. There are essentially five potential desktops environments for each user:

- Traditional PC: A traditional PC is what -typicallyll constituted a desktop environment: physical device with a locally installed operating system.
- Hosted Shared Desktop: A hosted, server-based desktop is a desktop where the user interacts through a delivery protocol. With hosted, server-based desktops, a single installed instance of a server

operating system, such as Microsoft Windows Server 2012, is shared by multiple users simultaneously. Each user receives a desktop "session" and works in an isolated memory space. Changes made by one user could impact the other users.

- Hosted Virtual Desktop: A hosted virtual desktop is a virtual desktop running either on virtualization layer (ESX) or on bare metal hardware. The user does not work with and sit in front of the desktop, but instead the user interacts through a delivery protocol.
- Published Applications: Published applications run entirely on the VMware RDSH Session Hosts and the user interacts through a delivery protocol. With published applications, a single installed instance of an application, such as Microsoft, is shared by multiple users simultaneously. Each user receives an application "session" and works in an isolated memory space.
- Streamed Applications: Streamed desktops and applications run entirely on the user's local client device and are sent from a server on demand. The user interacts with the application or desktop directly but the resources may only available while they are connected to the network.
- Local Virtual Desktop: A local virtual desktop is a desktop running entirely on the user's local device and continues to operate when disconnected from the network. In this case, the user's local device is used as a type 1 hypervisor and is synced with the data center when the device is connected to the network.

For the purposes of the validation represented in this document both Horizon Virtual Desktops and Remote Desktop sever Hosted Sessions were validated. Each of the sections provides some fundamental design decisions for this environment.

Understanding Applications and Data

When the desktop user groups and sub-groups have been identified, the next task is to catalog group application and data requirements. This can be one of the most time-consuming processes in the VDI planning exercise, but is essential for the VDI project's success. If the applications and data are not identified and co-located, performance will be negatively affected.

The process of analyzing the variety of application and data pairs for an organization will likely be complicated by the inclusion cloud applications, like SalesForce.com. This application and data analysis is beyond the scope of this Cisco Validated Design, but should not be omitted from the planning process. There are a variety of third party tools available to assist organizations with this crucial exercise.

Project Planning and Solution Sizing Sample Questions

Now that user groups, their applications and their data requirements are understood, some key project and solution sizing questions may be considered.

General project questions should be addressed at the outset, including:

- Has a VDI pilot plan been created based on the business analysis of the desktop groups, applications and data?
- Is there infrastructure and budget in place to run the pilot program?
- Are the required skill sets to execute the VDI project available? Can we hire or contract for them?
- Do we have end user experience performance metrics identified for each desktop sub-group?

- How will we measure success or failure?
- What is the future implication of success or failure?

Below is a short, non-exhaustive list of sizing questions that should be addressed for each user sub-group:

- What is the desktop OS planned? Windows 7, Windows 8, or Windows 10?
- 32-bit or 64-bit desktop OS?
- How many virtual desktops will be deployed in the pilot? In production? All Windows 7/8/10?
- How much memory per target desktop group desktop?
- Are there any rich media, Flash, or graphics-intensive workloads?
- What is the end point graphics processing capability?
- Will VMware RDSH for Remote Desktop Server Hosted Sessions used?
- What is the hypervisor for the solution?
- What is the storage configuration in the existing environment?
- Are there sufficient IOPS available for the write-intensive VDI workload?
- Will there be storage dedicated and tuned for VDI service?
- Is there a voice component to the desktop?
- Is anti-virus a part of the image?
- Is user profile management (e.g., non-roaming profile based) part of the solution?
- What is the fault tolerance, failover, disaster recovery plan?
- Are there additional desktop sub-group specific questions?

Desktop Virtualization Design Fundamentals

An ever growing and diverse base of user devices, complexity in management of traditional desktops, security, and even Bring Your Own Device (BYOD) to work programs are prime reasons for moving to a virtual desktop solution.

VMware Horizon Design Fundamentals

VMware Horizon 7 integrates Remote Desktop Server Hosted sessions users and VDI desktop virtualization technologies into a unified architecture that enables a scalable, simple, efficient, mixed users and manageable solution for delivering Windows applications and desktops as a service.

Users can select applications from an easy-to-**use "store" that is accessible from tablets, smartphones, PCs,** Macs, and thin clients. VMware Horizon delivers a native touch-optimized experience via PCoIP or Blast Extreme high-definition performance, even over mobile networks.

Horizon VDI Pool and RDSH Servers Pool

Collections of identical Virtual Machines (VMs) or physical computers are managed as a single entity called a Desktop Pool. In this CVD, VM provisioning relies on VMware View Composer aligning with VMware Horizon View Connection Server and vCenter Server components. Machines in these Pools are configured to run either a Windows Server 2012 OS (for RDSH hosted shared sessions) or a Windows 10 Desktop OS (for linked clone, instant clone and persistent VDI desktops).

Server OS and Desktop OS Machines were configured in this CVD to support RDSH hosted shared desktops and a variety of VDI hosted virtual desktops.

Figure 27 VMware Horizon Design Overview





Figure 28 Horizon VDI and RDSH desktop Delivery based on display protocol (PCoIP/Blast/RDP)

VMware Horizon Composer

VMware Horizon Composer is a feature in Horizon that gives administrators the ability to manage virtual machine pools or the desktop pools that share a common <u>virtual disk</u>. An administrator can update the <u>master image</u>, then all desktops using <u>linked clones</u> of that master image can also be patched. Updating the master image will patch the cloned desktops of the users without touching their applications, data or settings.

The VMware View Composer pooled desktops solution's infrastructure is based on software-streaming technology. After creating and configuring the Master Image for a virtual desktop pool, a snapshot is taken of the OS and applications that is accessible to host(s).



Figure 29 VMware Horizon Composer Overview

VMware View Storage Accelerator

VMware View Storage Accelerator is an in-memory host caching capability that uses the content-based read cache (CBRC) feature in ESXi hosts. CBRC provides a per-host RAM-based solution for View desktops, which greatly reduces the number of read I/O requests that are issued to the storage layer. It also addresses boot storms—when multiple virtual desktops are booted at the same time—which can cause a large number of read operations. CBRC is beneficial when administrators or users load applications or data frequently. Note that CBRC was used in all tests that were performed on the solution described here: Horizon running pooled linked-clone desktops hosted on Cisco HyperFlex system.

Multiple Site Configuration

If you have multiple regional sites, you can use any of the Load Balances Tools (Ex:- Big-IP Global Traffic Manager) to direct the user connections to the most appropriate site to deliver the desktops and application to users.

In Figure 30, The image depicting sites, a site was created in two data centers. Having two sites globally, rather than just one, minimizes the amount of unnecessary WAN traffic. Two Cisco blade servers host the required infrastructure services (Domain Controllers, DNS, DHCP, Profile, SQL, VMware Horizon View Connection Servers, View Composer server and web servers).



Figure 30 Multisite Configuration Overview

Based on the requirement and no of data centers or remote location, we can chose any of the available Load balancing software or tools accelerates the application performance, load balances servers, increases security, and optimizes the user experience. In this example, two Big-IP Local Traffic Manager are used to provide a high availability configuration.

4

BIG-IP Local Traffic Manager has been shown as example for presentation purpose.

Designing a VMware Horizon Environment for Various Workload Types

With VMware Horizon 7, the method you choose to provide applications or desktops to users depends on the types of applications and desktops you are hosting and available system resources, as well as the types of users and user experience you want to provide.

Server OS machin	nes	 You want: Inexpensive server-based delivery to minimize the cost of delivering applications to a large number of users, while providing a secure, high-definition user experience. Your users: Perform well-defined tasks and do not require personalization or offline access to applications. Users may include task workers such as call center operators and retail workers, or users that share workstations. Application types: Any application.
Desktop machines	OS	You want: A client-based application delivery solution that is secure, provides central- ized management, and supports a large number of users per host server (or hypervi- sor), while providing users with applications that display seamlessly in high-definition.

Your users: Are internal, external contractors, third-party collaborators, and other provisional team members. Users do not require off-line access to hosted applications.

Application types: Applications that might not work well with other applications or might interact with the operating system, such as .NET framework. These types of applications are ideal for hosting on virtual machines.

Applications running on older operating systems such as Windows XP or Windows Vista, and older architectures, such as 32-bit or 16-bit. By isolating each application on its own virtual machine, if one machine fails, it does not impact other users.

You want: Employees with secure remote access to a physical computer without using a VPN. For example, the user may be accessing their physical desktop PC from home or through a public WIFI hotspot. Depending upon the location, you may want to restrict the ability to print or copy and paste outside of the desktop. This method enables BYO device support without migrating desktop images into the datacenter.
Your users: Employees or contractors that have the option to work from home, but need access to specific software or data on their corporate desktops to perform their jobs remotely.
Host: The same as Desktop OS machines.
Application types: Applications that are delivered from an office computer and display seamlessly in high definition on the remote user's device.

For the Cisco Validated Design described in this document, individual configuration of Remote Desktop Server Hosted sessions (RDSH) using RDS-based Server OS machines and Hosted Virtual Desktops (HVDs) using Desktop OS machines via Linked-clone and Instant-clone automated pool were configured and tested. The following sections discuss design decisions relative to the VMware Horizon deployment, including the CVD test environment.

Deployment Hardware and Software

Products Deployed

The architecture deployed is highly modular. While each customer's environment might vary in its exact configuration, the reference architecture contained in this document once built, can easily be scaled as requirements and demands change. This includes scaling both up (adding additional resources within existing Cisco HyperFlex system) and out (adding additional Cisco UCS HX-series nodes).

The solution includes Cisco networking, Cisco UCS and Cisco HyperFlex hyper-converged storage, which efficiently fits into a single data center rack, including the access layer network switches.

This validated design document details the deployment of the multiple configurations extending to 2000 or 2400 users for Horizon virtual desktop or Horizon RDSH published desktop workload respectively featuring the following software:

- VMware Horizon 7 Shared Remote Desktop Server Hosted sessions(RDSH) on Cisco HyperFlex.
- VMware Horizon 7 Non-Persistent Hosted Virtual Desktops (VDI) on Cisco HyperFlex.
- Microsoft Windows Server 2012 R2 for User Profile Manager.
- Microsoft Windows 2012 R2 Server for Login VSI Management and data servers to simulate real world VDI workload.
- VMware vSphere ESXi 6.0 Update 2 patch03 Hypervisor
- Windows Server 2012 R2 for RDSH Servers & Windows 10 64-bit Operating Systems for VDI virtual machines
- Microsoft SQL Server 2012
- Cisco HyperFlex data platform v1.8.1c.
- VMware Horizon 7 Connection Server and Replica Servers for redundancy and support up to 2400 seat scale.
- VMware Horizon 7 View Composer Server

Figure 31 Detailed Reference Architecture with Physical Hardware Cabling Configured to Enable the Solution



Cisco HyperFlex and VMware Horizon 7, Reference Architecture

Hardware Deployed

The solution contains the following hardware as shown in Figure 31:

• Two Cisco Nexus 9372PX Layer 2 Access Switches

- Two Cisco UCS C220 M4 Rack servers with dual socket Intel Xeon E5-2620v4 2.1-GHz 8-core processors, 128GB RAM 2133-MHz and VIC1227 mLOM card for the hosted infrastructure with N+1 server fault tolerance. (Not show in the diagram).
- Eight Cisco UCS HX240c-M4SX Rack servers with Intel Xeon E5-2690v4 2.6-GHz 14-core processors, 512GB RAM 2400-MHz and VIC1227 mLOM cards running Cisco HyperFlex data platform v1.8.1c for the virtual desktop workloads with N+1 server fault tolerance
- Eight Cisco UCS B200 M4 blade servers with Intel Xeon E5-2690v4 2.6-GHz 14-core processors, 512GB RAM 2400-MHz and VIC1340 mLOM cards running Cisco HyperFlex data platform v1.8.1c for the virtual desktop workloads with N+1 server fault tolerance

Software Deployed

Table 1 lists the software and firmware version used in the study.

Vendor	Product	Version
Cisco	UCS Component Firmware	3.1(2b) bundle release
Cisco	UCS Manager	3.1(2b) bundle release
Cisco	UCS HX240c-M4SX rack server	3.1(2b) bundle release
Cisco	VIC 1227	4.1(2d)
Cisco	UCS B200 M4 blade server	3.1(2b) bundle release
Cisco	VIC 1340	4.1(2d)
Cisco	HyperFlex Data Platform	1.8.1c - 19725
Cisco	Cisco eNIC	2.3.0.10
Cisco	Cisco fNIC	1.6.0.28
Network	Cisco Nexus 9000 NX-OS	7.0(3)I2(2d)
VMware	Horizon Connection Server	7.0.1-3988955
VMware	Horizon Composer Server	7.0.1-3978853
VMware	Horizon Agent	7.0.1-3989057
VMware	Horizon Client	4.1.0-3977225
VMware	vCenter Server Appliance	6.0.0-3634788

Table 1 Software and Firmware Versions

Vendor	Product	Version
VMware	vSphere ESXi 6.0 Update 2 patch03	6.0.0.4192238

Logical Architecture

The logical architecture of this solution is designed to support up to 2000 Hosted Virtual Microsoft Windows 10 Desktops or 2400 RDSH hosted shared server desktop users within an eight node Cisco UCS HX240c-M4SX and eight Cisco UCS B200 M4 HyperFlex cluster, which provides physical redundancy for each workload type.



Figure 32 Logical Architecture Design

Table 1 lists the software revisions for this solution.

This document is intended to allow you to fully configure your environment. In this process, various steps require you to insert customer-specific naming conventions, IP addresses, and VLAN schemes, as well as to record appropriate MAC addresses. Table 2 through Table 6 lists the information you need to configure your environment.

VLANs

The VLAN configuration recommended for the environment includes a total of seven VLANs as outlined in Error! Reference source not found.2.

VLAN Name	VLAN ID	VLAN Purpose
Default	1	Native VLAN
Hx-in-Band- Mgmt	40	VLAN for in-band management inter- faces
Infra-Mgmt	41	VLAN for Virtual Infrastructure
Hx-storage- data	42	VLAN for HyperFlex Storage
Hx-vmotion	43	VLAN for VMware vMotion
Vm-network	44	VLAN for VDI Traffic

VLAN Name	VLAN ID	VLAN Purpose
OOB-Mgmt	132	VLAN for out-of-band management interfaces

A dedicated network or subnet for physical device management is often used in datacenters. In this scenario, the mgmt0 interfaces of the two Fabric Interconnects would be connected to that dedicated network or subnet. This is a valid configuration for HyperFlex installations with the following caveat; wherever the HyperFlex installer is deployed it must have IP connectivity to the subnet of the mgmt0 interfaces of the Fabric Interconnects, and also have IP connectivity to the subnets used by the hx-inband-mgmt VLANs listed above.

Jumbo Frames

All HyperFlex storage traffic traversing the hx-storage-data VLAN and subnet is configured to use jumbo frames, or to be precise all communication is configured to send IP packets with a Maximum Transmission Unit (MTU) size of 9000 bytes. Using a larger MTU value means that each IP packet sent carries a larger payload, therefore transmitting more data per packet, and consequently sending and receiving data faster. This requirement also means that the Cisco UCS uplinks must be configured to pass jumbo frames. Failure to configure the Cisco UCS uplink switches to allow jumbo frames can lead to service interruptions during some failure scenarios, particularly when cable or port failures would cause storage traffic to traverse the northbound Cisco UCS uplink switches.

VMware Clusters

Three VMware Clusters were configured in one vCenter datacenter instance to support the solution and testing environment:

- Infrastructure Cluster: Infrastructure VMs (vCenter, Active Directory, DNS, DHCP, SQL Server, VMware Connection Servers, VMware Replica Servers, View Composer Server, Nexus 1000v Virtual Supervisor Module, and VSMs, etc.)
- HyperFlex Cluster: VMware Horizon RDSH VMs (Windows Server 2012 R2) or Persistent/Non-Persistent VDI VM Pools (Windows 10 64-bit)



HyperFlex release v1.8.1 supports 16 nodes in single VMware cluster. Which can support a combination of up to eight converged nodes and up to eight compute-only nodes.

• VSI Launcher Cluster: Login VSI Cluster (The Login VSI launcher infrastructure was connected using the same set of switches and vCenter instance, but was hosted on separate local storage and servers.)



Figure 33 VMware vSphere Clusters on vSphere Web GUI

ESXi Host Design

The following sections detail the design of the elements within the VMware ESXi hypervisors, system requirements, virtual networking and the configuration of ESXi for the Cisco HyperFlex HX Distributed Data Platform.

Virtual Networking Design

The Cisco HyperFlex system has a pre-defined virtual network design at the ESXi hypervisor level. Four different virtual switches are created by the HyperFlex installer, each using two uplinks, which are each serviced by a vNIC defined in the UCS service profile. The vSwitches created are:

- vswitch-hx-inband-mgmt: This is the default vSwitch0 which is renamed by the ESXi kickstart file as
 part of the automated installation. The default vmkernel port, vmk0, is configured in the standard
 Management Network port group. The switch has two uplinks, active on fabric A and standby on fabric
 B, without jumbo frames. A second port group is created for the Storage Platform Controller VMs to
 connect to with their individual management interfaces. The VLAN is not a Native VLAN as assigned to
 the vNIC template, and therefore assigned in ESXi/vSphere
- vswitch-hx-storage-data: This vSwitch is created as part of the automated installation. A vmkernel port, vmk1, is configured in the Storage Hypervisor Data Network port group, which is the interface used for connectivity to the HX Datastores via NFS. The switch has two uplinks, active on fabric B and standby on fabric A, with jumbo frames required. A second port group is created for the Storage Platform Controller VMs to connect to with their individual storage interfaces. The VLAN is not a Native VLAN as assigned to the vNIC template, and therefore assigned in ESXi/vSphere
- vswitch-hx-vm-network: This vSwitch is created as part of the automated installation. The switch has two uplinks, active on both fabrics A and B, and without jumbo frames. The VLAN is not a Native VLAN as assigned to the vNIC template, and therefore assigned in ESXi/vSphere
- vmotion: This vSwitch is created as part of the automated installation. The switch has two uplinks, active on fabric A and standby on fabric B, with jumbo frames required. The VLAN is not a Native VLAN as assigned to the vNIC template, and therefore assigned in ESXi/vSphere

The following table and figures help give more details into the ESXi virtual networking design as built by the HyperFlex installer:

Virtual Switch	Port Groups	Active vmnic(s)	Passive vmnic(s)	VLAN IDs	Jumbo
vswitch-hx- inband-mgmt	Management Network Storage Controller Management Network	vmnic0	vmnic1	hx- inband- mgmt	no
vswitch-hx- storage-data	Storage Controller Data Network Storage Hypervisor Data Network	vmnic3	vmnic2	hx- storage- data	yes
vswitch-hx- vm-network	none	vmnic4,vmnic5	none	vm- network	no
vmotion	none	vmnic6	vmnic7	hx- vmotion	yes

Table 3 Table ESXi Host Virtual Switch Configuration

Figure 34 ESXi Network Design



VMDirectPath I/O Pass-through

VMDirectPath I/O allows a guest VM to directly access PCI and PCIe devices in an ESXi host as though they were physical devices belonging to the VM itself, also referred to as PCI pass-through. With the appropriate driver for the hardware device, the guest VM sends all I/O requests directly to the physical device, bypassing the hypervisor. In the Cisco HyperFlex system, the Storage Platform Controller VMs use this feature to gain full control of the Cisco 12Gbps SAS HBA cards in the Cisco HX-series rack-mount servers. This gives the controller VMs direct hardware level access to the physical disks installed in the servers, which they consume to construct the Cisco HX Distributed Filesystem. Only the disks connected directly to the Cisco SAS HBA or to a SAS extender, in turn connected to the SAS HBA are controlled by the controller VMs. Other disks, connected to different controllers, such as the SD cards, remain under the control of the ESXi hypervisor. The configuration of the VMDirectPath I/O feature is done by the Cisco HyperFlex installer, and requires no manual steps.

Storage Platform Controller VMs

A key component of the Cisco HyperFlex system is the Storage Platform Controller Virtual Machine running on each of the nodes in the HyperFlex cluster. The controller VMs cooperate to form and coordinate the Cisco HX Distributed Filesystem, and service all the guest VM IO requests. The controller VMs are deployed as a vSphere ESXi agent, which is similar in concept to that of a Linux or Windows service. ESXi agents are tied to a specific host, they start and stop along with the ESXi hypervisor, and the system is not considered to be online and ready until both the hypervisor and the agents have started. Each ESXi hypervisor host has a single ESXi agent deployed, which is the controller VM for that node, and it cannot be moved or migrated to another host. The collective ESXi agents are managed via an ESXi agency in the vSphere cluster. The storage controller VM runs custom software and services that manage and maintain the Cisco HX Distributed Filesystem. The services and processes that run within the controller VMs are not exposed as part of the ESXi agents to the agency, therefore the ESXi hypervisors nor vCenter server have any direct knowledge of the storage services provided by the controller VMs. Management and visibility into the function of the controller VMs, and the Cisco HX Distributed Filesystem is done via a plugin installed to the vCenter server or appliance managing the vSphere cluster. The plugin communicates directly with the controller VMs to display the information requested, or make the configuration changes directed, all while operating within the same web-based interface of the vSphere Web Client. The deployment of the controller VMs, agents, agency, and vCenter plugin are all done by the Cisco HyperFlex installer, and requires no manual steps.

Controller VM Locations

The physical storage location of the controller VMs differs between the Cisco HX220c-M4S and HX240c-M4SX model servers, due to differences with the physical disk location and connections on the two models of servers. The storage controller VM is operationally no different from any other typical virtual machines in an ESXi environment. The VM must have a virtual disk with the bootable root filesystem available in a location separate from the SAS HBA that the VM is controlling via VMDirectPath I/O. The configuration details of the models are as follows:

- HX220c: The controller VM's root filesystem is stored on a 2.2 GB virtual disk, /dev/sda, which is
 placed on a 3.5 GB VMFS datastore, and that datastore is provisioned from the internal mirrored SD
 cards. The controller VM has full control of all the front facing hot-swappable disks via PCI passthrough control of the SAS HBA. The controller VM operating system sees the 120 GB SSD, also
 commonly called the "housekeeping" disk as /dev/sdb, and places HyperFlex binaries, logs, and
 zookeeper partitions on this disk. The remaining disks seen by the controller VM OS are used by the HX
 Distributed filesystem for caching and capacity layers.
- HX240c: The HX240c-M4SX server has a built-in SATA controller provided by the Intel Wellsburg
 Platform Controller Hub (PCH) chip, and the 120 GB housekeeping disk is connected to it, placed in an
 internal drive carrier. Since this model does not connect the 120 GB housekeeping disk to the SAS
 HBA, the ESXi hypervisor remains in control of this disk, and a VMFS datastore is provisioned there,
 using the entire disk. On this VMFS datastore, a 2.2 GB virtual disk is created and used by the controller
 VM as /dev/sda for the root filesystem, and an 87 GB virtual disk is created and used by the controller
 VM as /dev/sdb, placing the HyperFlex binaries, logs, and zookeeper partitions on this disk. The frontfacing hot swappable disks, seen by the controller VM OS through PCI pass-through control of the SAS
 HBA, are used by the HX Distributed filesystem for caching and capacity layers.

The following figures detail the Storage Platform Controller VM placement on the ESXi hypervisor hosts.



Figure 35 HX220c Controller VM Placement

The Cisco UCS B200-M4 compute-only blades also place a lightweight storage controller VM on a 3.5 GB VMFS datastore, provisioned from the SD cards.



Figure 36 HX240c Controller VM Placement

HyperFlex Datastores

The new HyperFlex cluster has no default datastores configured for virtual machine storage, therefore the datastores must be created using the vCenter Web Client plugin. A minimum of two datastores is recommended to satisfy vSphere High Availability datastore heartbeat requirements, although one of the two datastores can be very small. It is important to recognize that all HyperFlex datastores are thinly provisioned, meaning that their configured size can far exceed the actual space available in the HyperFlex cluster. Alerts will be raised by the HyperFlex system in the vCenter plugin when actual space consumption results in low amounts of free space, and alerts will be sent via auto support email alerts. Overall space consumption in the HyperFlex clustered filesystem is optimized by the default deduplication and compression features.

Figure 37 Datastore Example



CPU Resource Reservations

Since the storage controller VMs provide critical functionality of the Cisco HX Distributed Data Platform, the HyperFlex installer will configure CPU resource reservations for the controller VMs. This reservation guarantees that the controller VMs will have CPU resources at a minimum level, in situations where the physical CPU resources of the ESXi hypervisor host are being heavily consumed by the guest VMs. The following table details the CPU resource reservation of the storage controller VMs:

Table 4 Controller VM CPU Reservations

Number of vCPU	Shares	Reservation	Limit
8	Low	10800 MHz	unlimited

Memory Resource Reservations

Since the storage controller VMs provide critical functionality of the Cisco HX Distributed Data Platform, the HyperFlex installer will configure memory resource reservations for the controller VMs. This reservation guarantees that the controller VMs will have memory resources at a minimum level, in situations where the physical memory resources of the ESXi hypervisor host are being heavily consumed by the guest VMs.

The following table details the memory resource reservation of the storage controller VMs.

Table 5 Controller VM Memory Reservations

Server Model	Amount of Guest Memory	Reserve All Guest Memory
HX220c-M4S	48 GB	Yes
HX240c-M4SX	72 GB	Yes



The Cisco UCS B200-M4 compute-only blades have a lightweight storage controller VM, it is configured with only 1 vCPU and 512 MB of memory reservation.

Solution Configuration

This section details the configuration and tuning that was performed on the individual components to produce a complete, validated solution. Figure 38 illustrates the configuration topology for this solution.

Figure 38 Configuration Topology for Scalable VMware Horizon 7 Workload with HyperFlex

HX220c

HX240c

B200 & HX240c



Cisco UCS Compute Platform

The following subsections detail the physical connectivity configuration of the VMware Horizon 7 environment.

Physical Infrastructure

Solution Cabling

The information in this section is provided as a reference for cabling the physical equipment in this Cisco Validated Design environment. To simplify cabling requirements, the tables include both local and remote device and port locations.

The tables in this section contain the details for the prescribed and supported configuration.

This document assumes that out-of-band management ports are plugged into an existing management infrastructure at the deployment site. These interfaces will be used in various configuration steps.

Be sure to follow the cabling directions in this section. Failure to do so will result in necessary changes to the deployment procedures that follow because specific port locations are mentioned.

Figure 31 shows a cabling diagram for a VMware Horizon configuration using the Cisco Nexus 9000 and Cisco UCS Fabric Interconnect.

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco Nexus 9372 A	Eth1/1	10GbE	Cisco Nexus 9372 B	Eth1/1
	Eth1/2	10GbE	Cisco Nexus 9372 B	Eth1/2
	Eth1/3	10GbE	Cisco UCS fabric interconnect A	Eth2/13
	Eth1/4	10GbE	Cisco UCS fabric interconnect A	Eth2/14
	Eth1/5	10GbE	Cisco UCS fabric interconnect B	Eth2/15
	Eth1/6	10GbE	Cisco UCS fabric interconnect B	Eth2/16
	Eth1/25	10GbE	Infra-host-01	Port01
	Eth1/26	10GbE	Infra-host-02	Port01
	Eth1/27	10GbE	Launcher-host-01	Port01
	Eth1/28	10GbE	Launcher-host-02	Port01
	Eth1/29	10GbE	Launcher-host-03	Port01
	Eth1/30	10GbE	Launcher-host-04	Port01
	MGMTO	GbE	GbE management switch	Any

 Table 6
 Cisco Nexus 9372-Cabling Information

For devices requiring GbE connectivity, use the GbE Copper SFP+s (GLC-T=).

Table 7 Cisco Nexus 9372-B Cabling Information

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco Nexus 9372 B	Eth1/1	10GbE	Cisco Nexus 9372 A	Eth1/1
	Eth1/2	10GbE	Cisco Nexus 9372 A	Eth1/2
	Eth1/3	10GbE	Cisco UCS fabric interconnect A	Eth2/13
	Eth1/4	10GbE	Cisco UCS fabric interconnect A	Eth2/14
	Eth1/5	10GbE	Cisco UCS fabric interconnect B	Eth2/15
Local Device	Local Port	Connection	Remote Device	Remote Port
--------------	------------	------------	---------------------------------	----------------
	Eth1/6	40GbE	Cisco UCS fabric interconnect B	Eth2/16
	Eth1/25	10GbE	Infra-host-01	Port02
	Eth1/26	10GbE	Infra-host-02	Port02
	Eth1/27	10GbE	Launcher-host-01	Port02
	Eth1/28	10GbE	Launcher-host-02	Port02
	Eth1/29	10GbE	Launcher-host-03	Port02
	Eth1/30	10GbE	Launcher-host-04	Port02
	MGMT0	GbE	GbE management switch	Any

Table 8 Cisco UCS Fabric Interconnect A Cabling Information

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco UCS fabric interconnect A	Eth2/13	10GbE	Cisco Nexus 9372 A	Eth1/3
	Eth2/14	10GbE	Cisco Nexus 9372 A	Eth1/4
	Eth2/15	10GbE	Cisco Nexus 9372 B	Eth1/5
	Eth2/16	10 GbE	Cisco Nexus 9372 B	Eth 1/6
	MGMT0	GbE	GbE management switch	Any
	L1	GbE	Cisco UCS fabric interconnect B	L1
	L2	GbE	Cisco UCS fabric interconnect B	L2
	Eth2/1	10GbE	HyperFlex-host-01	Port01
	Eth2/2	10GbE	HyperFlex-host-02	Port01
	Eth2/3	10GbE	HyperFlex-host-03	Port01
	Eth2/4	10GbE	HyperFlex-host-04	Port01
	Eth2/5	10GbE	HyperFlex-host-05	Port01
	Eth2/6	10GbE	HyperFlex-host-06	Port01

Local Device	Local Port	Connection	Remote Device	Remote Port
	Eth2/7	10GbE	HyperFlex-host-07	Port01
	Eth2/8	10GbE	HyperFlex-host-08	Port01

Table 9 Cisco UCS Fabric Interconnect B Cabling Information

Local Device	Local Port	Connection	Remote Device	Remote Port
Cisco UCS fabric interconnect B	Eth2/13	10GbE	Cisco Nexus 9372 B	Eth1/3
	Eth2/14	10GbE	Cisco Nexus 9372 B	Eth1/4
	Eth2/15	10GbE	Cisco Nexus 9372 A	Eth1/5
	Eth2/16	10GbE	Cisco Nexus 9372 A	Eth 1/6
	MGMT0	GbE	GbE management switch	Any
	L1	GbE	Cisco UCS fabric interconnect A	L1
	L2	GbE	Cisco UCS fabric interconnect A	L2
	Eth2/1	10GbE	HyperFlex-host-01	Port02
	Eth2/2	10GbE	HyperFlex-host-02	Port02
	Eth2/3	10GbE	HyperFlex-host-03	Port02
	Eth2/4	10GbE	HyperFlex-host-04	Port02
	Eth2/5	10GbE	HyperFlex-host-05	Port02
	Eth2/6	10GbE	HyperFlex-host-06	Port02
	Eth2/7	10GbE	HyperFlex-host-07	Port02
	Eth2/8	10GbE	HyperFlex-host-08	Port02

Figure 39 Cable Connectivity Between Cisco Nexus 9372 A and B to Cisco UCS 6248 Fabric A and B



Cisco Unified Computing System Configuration

This section details the Cisco UCS configuration that was done as part of the infrastructure build out by the Cisco HyperFlex installer. Many of the configuration elements are fixed in nature, meanwhile the HyperFlex installer does allow for some items to be specified at the time of creation, for example VLAN names and IDs, IP pools and more. Where the elements can be manually set during the installation, those items will be noted in << >> brackets.

For complete detail on racking, power, and installation of the chassis is described in the install guide (see <u>www.cisco.com/c/en/us/support/servers-unified-computing/ucs-manager/products-installation-guides-list.html</u>) and it is beyond the scope of this document. For more information about each step, refer to the following documents: Cisco UCS Manager Configuration Guides – GUI and Command Line Interface (CLI) <u>Cisco UCS Manager - Configuration Guides - Cisco</u>

During the HyperFlex Installation a Cisco UCS Sub-**Organization is created named "hx-cluster"**. The suborganization is created below the root level of the Cisco UCS hierarchy, and is used to contain all policies, pools, templates and service profiles used by HyperFlex. This arrangement allows for organizational control using Role-Based Access Control (RBAC) and administrative locales at a later time if desired. In this way, control can be granted to administrators of only the HyperFlex specific elements of the Cisco UCS domain, separate from control of root level elements or elements in other sub-organizations.

Figure 40 Cisco UCSM configuration: HyperFlex Sub-organization

Fault Summary	😂 🏐 💷 New 👻 🔂 Options 🕜 🕕 Andread Activities 🛛 💽 Exit
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Deploy and Configure HyperFlex Data Platform

Prerequisites

To deploy and configure the HyperFlex Data Platform, you must complete the following prerequisites:

1. Set Time Zone and NTP: From the Cisco UCS Manager, from the Admin tab, Configure TimeZone and add NTP server. Save changes.

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Time Zone Management		🔍 Filter 🖨 Export 🎉 Print	
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2. Configure Server Ports: Under the Equipment tab, Select Fabric A, select port to be configured as server port to manager HyperFlex rack server through Cisco UCS Manager.

🔺 Cisco Unified Cor	mputing Sy	tem Man	ager - K22-HXViev	1							σ	\times
Fault Summary	A		3 🕘 🛚 New 🚽	🛃 Qotions 🛛 😧 🕕 🛔 Activities 🗍 🧿	Det							-deale- cisco
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	1		Ethernet Ports									
Equipment	Chassis Servers	Admin LAN	🕰 Filter 👄 Export	😸 Print 🛛 If Role: 🗸 All 🔽 Unconfigured 📿 Ne	etwork 🔽 Server	FCoE Uplink 🔽 Unified Uplink 🗹 Appl	ance Storage 🖌 FCoE Storage 🖌 Unified Stor	rage 🖌 Monitor				
Filter: Al	•		Slot	Aggr. Port ID	Port ID	MAC	If Role	IfType	Overall Status	Admin State		-
ier ier l			1				8 Unconfigured		🐥 Admin Down	Disabled		^
			1						🐥 Admin Down	Disabled		
Equipment			1						🐥 Admin Down	Disabled		
- ep Crasos			1						🐥 Admin Down	Disabled		
- FFX			1						🐥 Admin Down	Disabled		
Servers			1						Admin Down	Disabled		
Fabric Interconn	ects		1						Admin Down	Disabled		
- ER Fabric Intere	connect A (prim	ary)	1		8	Enable	Unconfigured		👃 Admin Down	Disabled		
Fixed Ma	odule		1	0	9	Disable	Unconfigured	Physical	Admin Down	Disabled		
	rnet Ports		1	0	10	Disable	Unconfigured	Physical	Admin Down	Disabled		
	orts		1	0	11	Configure as Server Port	Unconfigured	Physical	Admin Down	Disabled		
E Expansio	on Module 1		1	0	12	Configure as Uplink Port	Unconfigured	Physical	Admin Down	Disabled		
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E Fabric Intere	connect II (subc	rdinate)	1	0	14	configure as reor opinik Port	Unconfigured	Physical	Admin Down	Disabled		
E BE Fixed Ma	odule		1	0	15	Configure as FCoE Storage Port	Unconfigured	Physical	Admin Down	Disabled		
Expansion	on Module 1		1	0	16	Configure as Appliance Port	Unconfigured	Physical	Admin Down	Disabled		
🕀 🔯 Fans			1	0	17	Unconfigure	Unconfigured	Physical	Admin Down	Disabled		
🕀 🔛 PSUs			1	0	18	United States and Stat	Unconfigured	Physical	Admin Down	Disabled		
			1	0	19	Unconfigure ECoE Uplink Port	Unconfigured	Physical	Admin Down	Disabled		
				0	20	Unconfigure Uplink Port	the sead of the sead	Churcher	Admin Dama	I Disabled		

- 3. Repeat this step to configure server port on Fabric B.
- 4. Configure Uplink Ports: On Fabric A, Select port to be configured as uplink port for network connectivity to north bound switch.

0 2 0 0 >> 😭 Equips	ent 🕴 💼 Fabric Interconnects 🕨 📷 Fabric Interco	nnect A (primary) + 💵 Fixed Module +	- Ethernet Ports					-Ethernet
The storage Chassis Admin Ethernet Po	rts Export 😹 Print [f Role: 🗸 All 🗸 Unconfigured	Network Server FCoE	Jolink 🗸 Unified Uplink 🗸 Appliance Storad	e 🔽 FCoE Storage 🔽 Unified Sto	rage 🔽 Monitor			
Filter: Al Slot	Aggr. Port ID	Part ID	MAC	IfRole	If Type	Overall Status	Admin State	
	0	1	8C:60:4F:A9:A7:08	Unconfigured	Physical	Admin Down	Disabled	
1	0	2	8C:60:4F:A9:A7:09	Unconfigured	Physical	Admin Down	Disabled	
Equipment 1	0	3	8C:60:4F:A9:A7:0A	Unconfigured	Physical	Admin Down	Disabled	
Rack-Mounts	0	4	8C:60:4F:A9:A7:08	Unconfigured	Physical	Admin Down	Disabled	
TEX 1	0	5	8C:60:4F:A9:A7:0C	Unconfigured	Physical	Admin Down	Disabled	
Servers 1	0	6	8C:60:4F:A9:A7:0D	Unconfigured	Physical	Admin Down	Disabled	
Fabric Interconnects	0	7	8C:60:4F:A9:A7:0E	Unconfigured	Physical	Admin Down	Disabled	
Fabric Interconnect A (primary)	0	8	8C:60:4F:A9:A7:0F	Unconfigured	Physical	Admin Down	Disabled	
E State Fixed Module	0	9	8C:60:4F:A9:A7:10	Unconfigured	Physical	Admin Down	Disabled	
1 Contractions	0	10	8C:60:4F:A9:A7:11	Unconfigured	Physical	Admin Down	Disabled	
Experies Module 1	0	11	8C:60:4F:A9:A7:12	Unconfigured	Physical	Admin Down	Disabled	
Fans 1	0	12	8C:60:4F:A9:A7:13	Unconfigured	Physical	Admin Down	Disabled	
PSUs 1	0	13	8C:60:4F:A9:A7:14	Unconfigured	Physical	Admin Down	Disabled	
Fabric Interconnect B (subordinate)	0	14	8C:60:4F:A9:A7:15	Unconfigured	Physical	Admin Down	Disabled	
Fixed Module 1	0	15	8C:60:4F:A9:A7:16	Unconfigured	Physical	Admin Down	Disabled	
Expansion Module 1	0	16	8C:60:4F:A9:A7:17	Unconfigured	Physical	Admin Down	Disabled	
E Pans 1	0	17	8C:60:4F:A9:A7:18	Unconfigured	Physical	Admin Down	Disabled	
± psus 1	0	18	8C:60:4F:A9:A7:19	Unconfigured	Physical	Admin Down	Disabled	
1	0	19	8C:60:4F:A9:A7:1A	Unconfigured	Physical	Admin Down	Disabled	
1	0	20	8C:60:4F:A9:A7:18	Unconfigured	Physical	Admin Down	Disabled	
1	0	21	8C:60:4F:A9:A7:1C	Unconfigured	Physical	Admin Down	Disabled	
1	0	22	8C:60:4F:A9:A7:1D	Unconfigured	Physical	Admin Down	Disabled	
1	0	23	8C:60:4F:A9:A7:1E	Unconfigured	Physical	Admin Down	Disabled	
1	0	24	8C:60:4F:A9:A7:1F	Unconfigured	Physical	Admin Down	Disabled	
1	0	25	8C:60:4F:A9:A7:20	Unconfigured	Physical	Admin Down	Disabled	
1	0	26	8C:60:4F:A9:A7:21	Unconfigured	Physical	Admin Down	Disabled	
1	0	27	8C:60:4F:A9:A7:22	Unconfigured	Physical	Admin Down	Disabled	
1	0	28	8C:60:4F:A9:A7:23	Unconfigured	Physical	Admin Down	Disabled	
1		29	8C:60:4F:A9:A7:24	Unconfigured	Physical	Admin Down	Disabled	
1						Admin Down	Disabled	
1		31	- bla	Unconfigured		Admin Down	Disabled	
1	o	32	lable	Unconfigured	Physical	🚸 Admin Down	Disabled	
		Di	Bable					
		0	onligure as Server Port					
		0	onfigure as Uplink Port					
			oningure as PCor Uplink Port					
		0	onfigure as FCoE Storage Port					

- 5. Repeat this same on Fabric B.
- 6. Create Port Channels: Under LAN tab, select expand LAN → LAN cloud → Fabric A. Right-click Port Channel.
- 7. Select Create port-channel to connect with upstream switch as per UCS best practice. For our reference architecture, we connected a pair of Nexus 9372PX switches.



8. Enter port-channel ID number and name to be created, click Next.

SAN VM Storage Chassis Admin	Port Channels					
Equipment Servers LAN	🛨 🖃 🕰 Filter 👄 Export 👸	Print				
Filter: All	Name		Fabric ID	Aggr. Port ID	IfType	If Role
e e l		72-Po11)	A		Aggregation	Network
EAN Cloud		A Create Port	Channel			×
Port Channels			channer			~
🖶 – 🔲 Uplink Eth Interfaces						
VLAN Optimization Sets		Uni	ried Comp	uting System Ma	anager	
VLANs			_			
- Han Fabric B		Create Port Channel	Set Port	Channel Name		0
H		creater or centariner				
VLAN Optimization Sets		1. ✓ <u>Set Port</u>	Channel Name			
VLANs		2. Add Port	L I			
QoS System Class						
LAN Pin Groups						
H AN Crourse						
VI ANS						
Appliances			ID: 11			
🖨 🚍 Internal LAN						
🕕 –🖪 Internal Fabric A						
🖶 🔲 Internal Fabric B						
S Policies						
Appliances						
LAN Cloud						
🔒 🚿 Link Profile						
Threshold Policies						
UDLD Link Policy						
C Default vNIC Behavior			Name- NX93	72-Po11		
Flow Control Policies			0			
🗊 Dynamic vNIC Connection Policies						
LACP Policies						
LAN Connectivity Policies						
In Contract Policy Subscription						
S Network Control Policies						
- S QoS Policies					< Prev Next >	Finish Cancel
i m a turbantari						

9. Select uplink ports to add as part of the port-channel.

SAN VM Storage Chassis Admin Equipment Servers LAN	🛨 🖃 🍕 Filter 👄 Export 😸 Print	t								
Filter: All	Name		Fabric ID		Ag	gr. Port ID			If Type	
• -		911)	Α						Aggregation	
	Create Port Channel	Compu	ting S	ystem	n Ma	nage	r	_	_	×
VLAN Optimization Sets VLANs Table B Port Channels Table VLANs VLANS VLAN	Create Port Channel 1. √ <u>Set Port Channel Name</u> 2. √ <u>Add Ports</u>	Add Ports								0
VLAN Optimization Sets		Ports				Ports in the	port channel			
		Slot ID A 2 0 2 0 2 0	997: 0 Port 13 14 15 15 16	MAC [7] 54:77:EE 54:77:EE 54:77:EE	**	Slot ID	Aggr. Port ID	Port	MAC	9
LAN Connectivity Policies					-	-				
Survey Protocol Policy Survey Policies Survey Room Policies							< Prev	Next >	Finish	Cancel

10. Click Finish.



11. Follow the previous steps to create the port-channel on Fabric B, using a different port-channel ID.



- 12. Configure QoS System Classes: From the LAN tab, below the Lan Cloud node, select QoS system class and configure the Platinum through Bronze system classes as shown in the following figure.
- Set MTU to 9216 for Platinum (Storage data) and Bronze (vMotion)
- Uncheck Enable Packet drop on the Platinum class
- Set Weight for Platinum and Gold priority class to 4 and everything else as best-effort.
- Enable multicast for silver class.

Equipment Servers LAN SAN VM Storage Chassis Admin	General Events F	SM						
Filter: All	Priority	Enabled	CoS	Packet Drop	Weight	Weight (%)	МТU	Multicast Optimized
• -	Platinum	✓	5		4	33	9216	
LAN	Gold	✓	4	✓	4	33	normal	•
E Ebric A	Silver	✓	2	✓	best-effort	8	normal	✓
Cos System Class	Bronze	✓	1	✓	best-effort	8	9216	•
Threshold Policies	Best Effort	V	Any	✓	best-effort	8	normal	-
VLAN Groups	Fibre Channel		3		best-effort	10	fc	▼ N/A
Applances Jappeners Jappeners Jappeners Jappeners Jappeners Tremal Fabric A Jappeners Treshold Policies S Policies								

- 13. Verify UCS Manager Software Version: In the Equipment tab, select Firmware Management → Installed Firmware.
- 14. Check and verify, both Fabric Interconnects and Cisco USC Manager are configure with Cisco UCS Manager v3.1.2b.

	Name	Model	Running Version	Startup Version	Backup Version	Update Status	Activate Stat
	- 📥 UCS Manager		3.1(2b)	3.1(2b)	N/A	N/A	Ready
ounts	Fabric Interconnects						
uer s	Fabric Interconnect A (primary)	Cisco UCS 6248UP					
nterconnects	- @ Kernel		5.0(3)N2(3.12b)	5.0(3)N2(3.12b)	N/A	N/A	Ready
ric Interconnect A (primary)	- 😵 System		5.0(3)N2(3.12b)	5.0(3)N2(3.12b)	N/A	N/A	Ready
Fixed Module	E Fabric Interconnect B (subordinate)	Cisco UCS 6248UP					
Expansion Module 1	- @ Kernel		5.0(3)N2(3.12b)	5.0(3)N2(3.12b)	N/A	N/A	Ready
Fans	- 😵 System		5.0(3)N2(3.12b)	5.0(3)N2(3.12b)	N/A	N/A	Ready
PSUs	Rack-Mounts						
Fixed Module	🕀 🗇 Servers						
Expansion Module 1	😑 🐲 Server 1	Cisco HX220c M45 HyperFlex Syst					
Fans	Adapters						
PSUs	Adapter 1	Cisco UCS MLOM 1227	4.1(2d)	4.1(2d)	4.1(1h)	Ready	Ready
	BIOS	Cisco HX220c M45 HyperFlex Syst.	. C220M4.2.0.13d.0.0812161113	C220M4.2.0.13d.0.0812161113	C220M4.2.0.10h.0.0812161111	Ready	Ready
	Board Controller	Cisco HX220c M45 HyperFlex Syst	. 32.0	NA	N/A	N/A	Ready
	 	Cisco HX220c M4S HyperFlex Syst.	. 2.0(13e)	2.0(13e)	2.0(10f)	Ready	Ready
	FlexFlash Controller 1		1.3.2 build 165		N/A	N/A	N/A
	Storage Controller PCH 3				N/A	N/A	
	E Disks						
	Storage Controller SAS 1	Cisco 12G Modular SAS Pass thro	11.00.00.07	11.00.00.07	N/A	N/A	Ready
	😑 🔜 Disks						
	- Disk 1	120 GB 2.5 inch Enterprise Value	C501	CS01	N/A	N/A	Ready
	- 🐼 Disk 2	480GB 2.5 inch Enterprise perfor	C501	C501	N/A	N/A	Ready
	- 🕸 Disk 3	1.2TB 12G SAS 10K RPM SFF HDD	N003	N003	N/A	N/A	Ready
	- Disk 4	1.2 TB 12G SAS 10K RPM SFF HDD	A703	A703	N/A	N/A	Ready
	- Disk S	1.2 TB 12G SAS 10K RPM SFF HDD	A703	A703	N/A	N/A	Ready
	- 🕹 Disk 6	1.2 TB 12G SAS 10K RPM SFF HDD	A703	A703	N/A	N/A	Ready
	- Disk 7	1.2 TB 12G SAS 10K RPM SFF HDD	A703	A703	N/A	N/A	Ready
	- Disk 8	1.2 TB 12G SAS 10K RPM SFF HDD	A703	A703	N/A	N/A	Ready
	🕀 🐗 Server 2	Cisco HX220c M4S HyperFlex Syst					
	Server 3	Cisco HX220c MH5 HyperFlex Syst					
	🔒 🐗 Server 4	Cisco HX220c M45 HyperFlex Syst					
	Gerver 5	Cisco HX220c M4S HyperFlex Syst					
	🗄 🐗 Server 6	Cisco HX220c M4S HyperFlex Syst					
	🕕 🐗 Server 7	Cisco HX220c M45 HyperFlex Syst					
	Server 8	Cisco HI(220r MIS HyperFley Syst					

5

It is recommended to let the HX Installer handle upgrading the server firmware automatically as designed. This will occur once the service profiles are applied to the HX nodes during the automated deployment process.

15. Optional: If you are familiar with Cisco UCS Manager or you wish to break the install into smaller pieces, you can use the server auto firmware download to pre-stage the correct firmware on the nodes. This will speed up the association time in the HyperFlex installer at the cost of running two separate reboot operations. This method is not required or recommended if doing the install in one sitting.

Deploy Cisco HyperFlex Data Platform Installer VM

Download latest installer OVA from Cisco.com. Software Download Link: <u>https://software.cisco.com/download/release.html?mdfid=286305544&flowid=79522&softwareid=2863059</u> 94&release=1.8(1c)&relind=AVAILABLE&rellifecycle=&reltype=latest Deploy OVA to an existing host in the environment. Use either your existing vCenter Thick Client (C#) or vSphere Web Client to deploy OVA on ESXi host. This document outlines the procedure to deploy the OVA from the web client.

To deploy the OVA from the web client, complete the following steps:

- 1. Log into vCenter web client via login to web browser with vCenter management IP address: https://<FQDN or IP address for VC>:9443/vcenter-client
- 2. Select ESXi host under hosts and cluster when HyperFlex data platform installer VM to deploy.
- 3. Right-click ESXi host, select Deploy OVF Template.

vmware [®] vSphere Web Client ♠≡	
Navigator I 🖉 vcsa6-c1.vdila	b-hc.local Actions -
Home Summary Mon	itor Manage Related Objects
Image: Second control of the secon	vcsa6-c1.vdilab-hc.local Virtual Machines: 135 Hosts: 8
C1-VSIS New Resource Pool	Version Information
FileSrv0 FileSrv0 HX-Win Connection HX-Win Maintenance Mode HX-Win R	Category Description 6.0.0 This list is empty. Build 3634794
Provent Certificates Persona Discourse Storage	
SQL-01 Add Diagnostic Partition VCSA6 Add Diagnostic Partition ViewCo Loct Profile	Assign Remove

- 4. Follow the deployment steps to configure HyperFlex data-platform installer VM deployment.
- 5. Select OVA file to deploy, click Next.

Deploy OVF Template		? ₩
1 Source	Select source Select the source location	
 1a Select source 1b Review details 2 Destination 2a Select name and folder 2b Select storage 3 Ready to complete 	Enter a URL to download and install the OVF package from the Internet, or browse to a location accessible from your computer such as a local hard drive, a network share, or a CD/DVD drive. URL • Local file Browse D:\Stryker-software\HX1.8.1B\Cisco-HX-Data-Platform-Installer-v1.8.1b-19547.ova	;
	Back Next Finish Ca	ncel

6. Review and verify the details for OVF template to deploy, click Next.

Deploy OVF Template			(((
1 Source ✓ 1a Select source	Review details Verify the OVF tem	late details	
 Ib Review details 2 Destination 2a Select name and folder 2b Select storage 2c Setup networks 2d Customize template 3 Ready to complete 	Product Version Vendor Publisher Download size Size on disk Description	Cisco HyperFlex Installer 1.8.1b-19547 () Cisco Inc. (a) No certificate present 3.2 GB 5.0 GB (thin provisioned) 30.0 GB (thick provisioned)	
		В	ack Next Finish Cancel

7. Enter name for OVF to template deploy, select datacenter and folder location. Click Next.

Deploy OVF Template		(?)
Deploy OVF Template	Select name and folder Specify a name and location for the deployed template Name: HXDPI-19547 Select a folder or datacenter Select a folder or datacen	The folder you select is where the entity will be located, and will be used to apply permissions to it. The name of the entity must be unique within each vCenter Server VM folder.
		Back Next Finish Cancel

8. Select virtual disk format, VM storage policy set to datastore default, select datastore for OVF deployment. Click Next.

Deploy OVF Template								(4 €)
1 Source ✓ 1a Selectsource	Select storage Select location to store the	files for th	e deployed temp	plate				
1b Review details2 Destination	Select virtual disk format: VM Storage Policy:	Thick Pro	ovision Lazy Zero e Default	ed	•			
 2a Select name and folder 2b Select storage 	The following datastores a virtual machine configurat	are accessi ion files an	ible from the des nd all of the virtua	tination resourc Il disks.	e that you	I selected. Select	the destination dat	astore for the
2c Setup networks	Name		Capacity	Provisioned		Free	Туре	Storage DRS
2d Customize template	C220M4-InfraDS01		1.74 TB	1.00 TB		761.86 GB	VMFS	
3 Ready to complete	datastore1 (5)		103.25 GB	18.73 GB		84.52 GB	VMFS	
	4							•
					(Back	Next Finis	sh Cancel

9. Select Network adapter destination port-group.

Source Setup networks ✓ 1a Select source ✓ 1b Review details 2 Destination Source ✓ 2a Select name and folder ✓ 2b Select storage ✓ 2c Setup networks 2d Customize template IP protocol:	Deploy OVF Template			? H
✓ 1b Review details Source Destination Configuration 2 Destination VM Network IBMgmt ▼ ● ✓ 2a Select name and folder ✓ 2b Select storage ✓ ● ● ✓ 2b Select storage ✓ □ □ □ □ □ □ ✓ 2c Setup networks □ <th>1 Source</th> <th>Setup networks Configure the networks the deployed templa</th> <th>ate should use</th> <th></th>	1 Source	Setup networks Configure the networks the deployed templa	ate should use	
2 Destination VM Network IBMgmt ✓ ✓ 2a Select name and folder ✓ ✓ ✓ 2b Select storage ✓ ✓ ✓ 2c Setup networks ✓ ✓ 2d Customize template IP protocol: IPv4	 ✓ 1b Review details 	Source	Destination	Configuration
 ✓ 2a Select name and folder ✓ 2b Select storage ✓ 2c Setup networks 2d Customize template IP protocol: IPv4 IP allocation: Static Manual ● 	2 Destination	VM Network	IBMgmt	▼ ⊘
2b Select storage 2c Setup networks 2d Customize template IP protocol:	 2a Select name and folder 			
2c Setup networks 2d Customize template IP protocol: IPv4 IR allocation: Static Manual	✓ 2b Select storage			
2d Customize template	✓ 2c Setup networks			
3 Ready to complete	2d Customize template 3 Ready to complete	IP protocol: IPv4	IP allocation: Static - Manual 🕕	
Source: VM Network - Description Please ensure this VM network is on the same management network of host. The installer VM must be able to communicate withost. Destination: IBMgmt - Protocol settings No configuration peopled for this pervect		Source: VM Network - Description Please ensure this VM network is on the sar host. Destination: IBMgmt - Protocol settings	me management network of host. The installer VM must be able to	o communicate with
		No configuration needed for this network		

10. Fill out the parameters requested for hostname, gateway, DNS, IP address, and netmask. Alternatively, leave all blank for a DHCP assigned address.

Provide a single DNS server only. Inputting multiple DNS servers will cause queries to fail. You must connect to vCenter to deploy the OVA file and provide the IP address properties. Deploying directly from an ESXi host will not allow you to set these values correctly.

Deploy OVF Template		9				
1 Source ✓ 1a Selectsource	Customize template Customize the deployment	properties of this software solution				
 1b Review details 	All properties have valid	d values Show next Collapse all				
2 Destination	+ Name	1 setting				
 2a Select name and folder 	Hostname	The hostname for this VM Leave blank to try to reverse lookup the IP address.				
 2b Select storage 		HXDPI-19547				
 2c Setup networks 	- Networking Properties	4 settings				
2d Customize template	Default Gateway	The default gateway address for this VM. Leave blank if DHCP is desired.				
 3 Ready to complete 		10.10.50.1				
	DNS	The domain name servers for this VM (comma separated). Leave blank if DHCP is desired.				
		10.10.51.21				
	Network 1 IP Address	The IP address for this interface. Leave blank if DHCP is desired.				
	Network 1 Netmask	10.10.50.19				
		The netmask or prefix for this interface. Leave blank if DHCP is desired.				
		255.255.255.0				
		Back Next Finish Cancel				

If you have internal firewall rules between these networks, please contact TAC for assistance.

If required, an additional network adapter can be added to the HyperFlex Platform Installer VM after OVF deployment is completed successfully. For example, in case of a separate Inband and Out-Of-Mgmt network, see below:

🗄 HXDPI-19547 - Edit S	ettings	(
Virtual Hardware VM 0	Options SDRS Rules vApp Options	
F 🔲 CPU	3 🗣 🖲	
Memory	4096 v MB v	
▶ 🛄 Hard disk 1	30 GB 🗸	
▶ ☑ SCSI controller 0	LSI Logic Parallel	
▶ 飅 Network adapter 1	BMgmt	
▶ 🗾 Network adapter 2	OOB-Mgmt 🗸 Connected	
▶ loo CD/DVD drive 1	Client Device Connected	
▶ 🛄 Video card	Specify custom settings	
 المن المن المن المن المن المن المن المن		
 Other Devices 		
▶ Upgrade	Schedule VM Compatibility Upgrade	

11. Review settings selected part of the OVF deployment, click on check box for Power on after deployment. Click Finish.

De	eploy OVF Template				? ₩
	1 Source	Ready to complete Review your settings selections bet	ore finishing the wizard.		
>> >>>>>	 1a Select source 1b Review details 2 Destination 2a Select name and folder 2b Select storage 2c Setup networks 2d Customize template 3 Ready to complete 	CVF file Download size Size on disk Name Datastore Target Folder Disk storage Network mapping IP allocation Properties	D:\Stryker-software\HX1.8.1B\Cisco 3.2 GB 30.0 GB HXDPI_19547 C220M4-InfraDS01 10.10.50.67 Discovered virtual machine Thick Provision Lazy Zeroed VM Network to IBMgmt Static - Manual, IPv4 Hostname = HXDPI-19547 Default Gateway = 10.10.50.1 DNS = 10.10.51.21,10.10.51.22 Network 1 IP Address = 10.10.50.19 Network 1 Netmask = 255.255.255.	-HX-Data-Platform-Installer-v1.8.1b-19547.ova	
		Power on after deployment			
				Back Next Finish C	ancel

The default credentials for the HyperFlex installer VM are: user name: root password: Cisco123

Verify or Set DNS Resolution

SSH to HX installer VM, verify or set DNS resolution is set on HyperFlex Installer VM:

```
root@Cisco-HX-Data-Platform-Installer: # more /etc/network/eth0.interface
auto eth0
iface eth0 inet static
metric 100
address 10.10.40.19
netmask 255.255.255.0
gateway 10.10.40.1
dns-search vdilab-hc.local
dns-nameservers 10.10.41.21 10.10.41.22
root@Cisco-HX-Data-Platform-Installer:~# more /run/resolvconf/resolv.conf
# Dynamic resolv.conf(5) file for glibc resolver(3) generated by resolvconf(8)
#
      DO NOT EDIT THIS FILE BY HAND -- YOUR CHANGES WILL BE OVERWRITTEN
nameserver 10.10.41.21
nameserver 10.10.41.22
search vdilab-hc.local
```

Cisco HyperFlex Cluster Configuration

To configuring the Cisco HyperFlex Cluster, complete the following steps:

1. Login to HX Installer VM through a web browser: <u>http://<Installer_VM_IP_Address</u>>

Cisc	uluilu cisco
	CISCO
	LUSERNAME
	PASSWORD
	1.8(16

Create a HyperFlex Cluster

1. Select the workflow for cluster creation to deploy a new HyperFlex cluster on eight Cisco HX240c-M4SX nodes.

alialia cisco	HyperFlex Installer		0	?	ø	\$ ~
		Workflow				
Se	lect a Workflow					-
			, Ø. Ø. Ø			
	Cluster Creation	Cluster Exp	ansion			
	know what I'm doing, let me customize my workflow					

2. On the credentials page, enter the access details for Cisco UCS Manager, vCenter server, and Hypervisor. Click Continue.

cisco	HyperFlex Installer					0	0	● ¢ ~	
	Credentials	Server Selection	UCSM Configuration	Hypervisor Configuration	IP Addr	resses	Cluster Con	figuration	
UCS	Manager Credentials					Configuration		*	
UCS	Manager Host Name	User Name		Password					
10	.29.132.14	admin			•			1	
Ūuc	S Manager host name or IP address								
vCe	nter Credentials								
vCen	ter Server	User Name		Admin Password					
10	.10.40.20	administrator@v	sphere.local		•				
Hyp	ervisor Credentials								
Admi	in Liser Name	Admin Password				Dr configur	ag and drop ation files here	or	
ro	ot		0			s	elect a File		
								1	
						< Back	Con	Activat tinue Go to Sys	te Wir stem in

- 3. Select the top-most check box at the top right corner of the HyperFlex installer to select all unassociated servers. (To configure a subset of available of the HyperFlex servers, manually click the check box for individual servers.)
- 4. Click Continue after completing server selection.

Server Selection	Server Selection		Credentia	ls	Server Selection	UCSM C	onfiguration	Hypervisor Configu	ıration	IP Addres	sses	Cluster (Configuration
Lusscolated Associated Model Serial Assoc State Actions Server 1 Inassociated HX240C-M4SX FCH1944007H none Actions > Verter Name A Status HX240C-M4SX FCH1944007H none Actions > Imassociated HX240C-M4SX FCH1944007H none Actions > Actions > Imassociated HX240C-M4SX FCH194402F none Actions > Actions > Imassociated HX240C-M4SX FCH194407F none Actions > Actions > Imassociated HX240C-M4SX FCH19440F8 none Actions > Actions > Imassociated HX240C-M4SX FCH2035V47E none Actions > Actions >	Lussociated () Associated () Image: Server Name In Status Model Serial Associated () Actions Image: Server 1) Image: Server 1 unassociated () HX240C-M45X FCH1944V02D none () Actions Image: Server 1) Image: Server 3 unassociated () HX240C-M45X FCH1954V02D none () Actions Image: Server 3) Image: Server 4 unassociated () HX240C-M45X FCH1954V02D none () Actions Image: Server 3) Image: Server 4 unassociated () HX240C-M45X FCH1954V02D none () Actions Image: Server 4) Image: Server 4 unassociated () HX240C-M45X FCH2035V4E none () Actions Image: Server 4) Image: Server 4 unassociated () HX240C-M45X FCH2035V4E none () Actions Image: Server 4) Image: Server 7 unassociated () HX240C-M45X FCH2035V4E none () Actions Image: Server 4) Image: Server 7 unassociated () HX240C-M45X FCH2035V4E none () Actions Image: Server 4) Image: Server 7 unassociated () HX240C-M45X FCH2035V4E none () Actions Image: Server 4) Image: Server 7 unassociated () HX240C-M45X FCH2035V4E none () Actions Image: Server 4) Image: Server 7 unassociated () HX240C-M45X FCH2035V4E none () Actions Image: Server 4) Image: Server 7 unassociated () HX240C-M45X FCH2035V4E none () Actions Image: Server 4)	erve	r Select	ion			Con	figure Server Ports	Refresh		Configuration		
* Server Name ^ Status Model Serial Assoc State Actions * Server 1 unassociated HX240C-M4SX FCH1944V07H none Actions ~ * Server 3 unassociated HX240C-M4SX FCH1944V02D none Actions ~ * Server 3 unassociated HX240C-M4SX FCH1944V02D none Actions ~ * Server 3 unassociated HX240C-M4SX FCH1944V07B none Actions ~ * Server 3 unassociated HX240C-M4SX FCH1944V0FB none Actions ~ * Server 5 unassociated HX240C-M4SX FCH1944V0FB none Actions ~ * Server 5 unassociated HX240C-M4SX FCH2035V4BE none Actions ~ * Server 7 unassociated HX240C-M4SX FCH2035V4BE none Actions ~ * Server 8 unassociated HX240C-M4SX FCH2035V4BE none Actions ~ * * Server 7 unassociated HX240C-M4SX FCH2035V4DE none Actions ~	• Server Name ~ Status Model Serial Assoc State Actions • Server 1 unassociated HX240C-M45X FCH1944V027H none Actions ~ • Server 2 unassociated HX240C-M45X FCH1944V027D none Actions ~ • Server 3 unassociated HX240C-M45X FCH1944V027D none Actions ~ • Server 3 unassociated HX240C-M45X FCH1944V027D none Actions ~ • Server 3 unassociated HX240C-M45X FCH1944V07B none Actions ~ • Server 4 unassociated HX240C-M45X FCH2035V48L none Actions ~ • Server 5 unassociated HX240C-M45X FCH2035V47E none Actions ~ • Server 7 unassociated HX240C-M45X FCH2035V47E none Actions ~ • Server 7 unassociated HX240C-M45X FCH2035V47E none Actions ~ • Server 7 unassociated HX240C-M45X FCH2035V47E none Actions ~ <th>Una</th> <th>ssociated</th> <th>(8) Associated</th> <th>(0)</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>Credentials</th> <th></th> <th></th>	Una	ssociated	(8) Associated	(0)						Credentials		
Image: Server 1 unassociated HX240C-M4SX FCH1944V07H none Actions V Image: Server 2 unassociated HX240C-M4SX FCH1944V02D none Actions V Image: Server 3 unassociated HX240C-M4SX FCH1995V257 none Actions V Image: Server 4 unassociated HX240C-M4SX FCH1944V0F8 none Actions V Image: Server 5 unassociated HX240C-M4SX FCH1944V0F8 none Actions V Image: Server 6 unassociated HX240C-M4SX FCH2035V4FF none Actions V Image: Server 7 unassociated HX240C-M4SX FCH2035V4FF none Actions V Image: Server 8 unassociated HX240C-M4SX FCH2035V4FF none Actions V Image: Server 7 unassociated HX240C-M4SX FCH2035V4DE none Actions V Image: Server 8 unassociated HX240C-M4SX FCH2035V4DE none Actions V	Image: Server 1 unassociated HX240C-M45X FCH1944V07H none Actions v Image: Server 2 unassociated HX240C-M45X FCH1944V02D none Actions v Image: Server 3 unassociated HX240C-M45X FCH1944V02D none Actions v Image: Server 4 unassociated HX240C-M45X FCH1944V07B none Actions v Image: Server 5 unassociated HX240C-M45X FCH1944V07B none Actions v Image: Server 6 unassociated HX240C-M45X FCH2035V47E none Actions v Image: Server 7 unassociated HX240C-M45X FCH2035V47E none Actions v Image: Server 8 unassociated HX240C-M45X FCH2035V47E none Actions v Image: Server 8 unassociated HX240C-M45X FCH2035V47E none Actions v		-\$-	Server Name A	Status	Model	Serial	Assoc State	Actions		UCS Manager Host N	ame	10.29.132.1
Image: Server 2 unassociated HX240C-M4SX FCH1944V02D none Actions <	Image: Server 2 unassociated HX240C-M4SX FCH1944V02D none Actions v Image: Server 3 unassociated HX240C-M4SX FCH1905V257 none Actions v Image: Server 4 unassociated HX240C-M4SX FCH194V0F8 none Actions v Image: Server 5 unassociated HX240C-M4SX FCH2035V42L none Actions v Image: Server 6 unassociated HX240C-M4SX FCH2035V47Z none Actions v Image: Server 7 unassociated HX240C-M4SX FCH2035V47E none Actions v Image: Server 8 unassociated HX240C-M4SX FCH2035V4DE none Actions v		٥D	Server 1	unassociated	HX240C-M4SX	FCH1944V07H	none	Actions $$		vCenter Server		10.10.40.2
Image: Server 3 unassociated HX240C-M4SX FCH1905V257 none Actions v Image: Server 4 unassociated HX240C-M4SX FCH1944V0F8 none Actions v Image: Server 5 unassociated HX240C-M4SX FCH2035V48L none Actions v Image: Server 6 unassociated HX240C-M4SX FCH2035V47Z none Actions v Image: Server 7 unassociated HX240C-M4SX FCH2035V4FF none Actions v Image: Server 8 unassociated HX240C-M4SX FCH2035V4FF none Actions v	Image: Server 3 unassociated HX240C-M45X FCH1905V257 none Actions <		OD	Server 2	unassociated	HX240C-M4SX	FCH1944V02D	none	Actions $$		User Name ad	ministrator@	୬vsphere.loc
Image: Server 4 unassociated HX240C-M4SX FCH1944V0F8 none Actions × Image: Server 5 unassociated HX240C-M4SX FCH2035V48L none Actions × Image: Server 6 unassociated HX240C-M4SX FCH2035V47Z none Actions × Image: Server 7 unassociated HX240C-M4SX FCH2035V4FF none Actions × Image: Server 8 unassociated HX240C-M4SX FCH2035V4FF none Actions ×	Server 4 unassociated HX240C-M4SX FCH1944V0F8 none Actions Server 5 unassociated HX240C-M4SX FCH2035V4BL none Actions Server 6 unassociated HX240C-M4SX FCH2035V4FZ none Actions Server 7 unassociated HX240C-M4SX FCH2035V4FF none Actions Server 8 unassociated HX240C-M4SX FCH2035V4FF none Actions		OD	Server 3	unassociated	HX240C-M4SX	FCH1905V257	none	Actions ~		Admin User Name		ro
Image: Server 5 unassociated HX240C-M45X FCH2035V48L none Actions × Image: Server 6 unassociated HX240C-M45X FCH2035V47Z none Actions × Image: Server 7 unassociated HX240C-M45X FCH2035V4FF none Actions × Image: Server 8 unassociated HX240C-M45X FCH2035V4DE none Actions ×	Image: Server 5 unassociated HX240C-M45X FCH2035V48L none Actions > Image: Server 6 unassociated HX240C-M45X FCH2035V4FF none Actions > Image: Server 7 unassociated HX240C-M45X FCH2035V4FF none Actions > Image: Server 8 unassociated HX240C-M45X FCH2035V4DE none Actions >		OD	Server 4	unassociated	HX240C-M4SX	FCH1944V0F8	none	Actions ~				
Image: Server 6 unassociated HX240C-M4SX FCH2035V47Z none Actions > Image: Server 7 unassociated HX240C-M4SX FCH2035V4FF none Actions > Image: Server 8 unassociated HX240C-M4SX FCH2035V4DE none Actions >	Image: Server 6 unassociated HX240C-M4SX FCH2035V47Z none Actions v Image: Server 7 unassociated HX240C-M4SX FCH2035V4FF none Actions v Image: Server 8 unassociated HX240C-M4SX FCH2035V4DE none Actions v			Server 5	unassociated	HX240C-M4SX	FCH2035V48L	none	Actions ~				
Image: Server 7 unassociated HX240C-M4SX FCH2035V4FF none Actions > Image: Server 8 unassociated HX240C-M4SX FCH2035V4DE none Actions >	Image: Server 7 unassociated HX240C-M4SX FCH2035V4FF none Actions × Image: Server 8 unassociated HX240C-M4SX FCH2035V4DE none Actions ×			Server 6	unassociated	HX240C-M4SX	FCH2035V47Z	none	Actions ~				
Image: Construct of the second se	✓ Server 8 unassociated HX240C-M45X FCH2035V4DE none Actions ✓	1		Server 7	unassociated	HX240C-M4SX	FCH2035V4FF	none	Actions ~				
				Server 8	unassociated	HX240C-M45X	FCH2035V4DE	none	Actions ~				
4											(Deals		entinue

The required server ports can be configured from Installer workflow but it will extend the time to complete server discovery. Therefore, we recommend configuring the server ports and complete HX node discovery in Cisco UCS Manager as described in the Pre-requisites section above prior starting workflow for HyperFlex installer.

Configure Server Ports (Optional)

If you choose to allow the installer to configure the server ports, complete the following steps:

- 1. Click Configure Server Ports at the top right corner of the Server Selection window.
- 2. Provide the port numbers for each Fabric Interconnect in the form:

A1/x-y,B1/x-y where A1 and B1 designate Fabric Interconnect A and B and where x=starting port number and y=ending port number on each Fabric Interconnect.

3. Click Configure.

1 1+ co	Нуре	rFlex Installer						0	Ø	o o -
	Credential	5	Server Selection	UCSM	Configuration	Hypervisor Co	onfiguration	IP Addresses	Cluste	er Configuration
Serve	er Select	ion			>Cor	figure Server Po	rts Refresh	Configurat	ion	÷.
Un	associated	(8) Associated		Con	figure Server Port	s	×	Credentials		
		Server Name	Status	Model List a	I ports to be configured	as server ports	s		ost Name	10.29.132.11
100				A/1		a server ports		User Name		admin
2		Server 1	unassociated	HX2200	/1-0,01/1-0		s v			10.10.50.20
		Server 2	unassociated	HX2200			s ~	User Name	administra	tor@vsphere.local
Ø		Server 3	unassociated	HX2200		-	s ~	Admin User Na	ne	root
		Server 4	unassociated	HX2200	Cancel	Cor	nfigure S ×			
		Server 5	unassociated	HX2206-1414-5	rcn195792ju	none	ActionS ~			
Ø		Server 6	unassociated	HX220C-M4S	FCH1937V2TS	none	Actions ~			
		Server 7	unassociated	HX220C-M4S	FCH1937V2JT	none	Actions ~			
Ø		Server 8	unassociated	HX220C-M45	FCH1842V1JG	none	Actions ~			

- 4. Enter the Details for the Cisco UCS Manager Configuration;
 - a. Enter VLAN ID for hx-inband-mgmt, hx-storage-data, hx-vmotion, vm-network.
 - b. MAC Pool Prefix: The prefix to use for each HX MAC address pool. Please select a prerfix that does not conflict with any other MAC address pool across all Cisco UCS domains.
 - c. The blocks in the MAC address pool will have the following format:

\${prefix}:\${fabric_id}\${vnic_id}:{service_profile_id}

The first three bytes should always be "00:25:B5".

- 5. Enter range of IP address to create a block of IP addresses for external management and access to CIMC/KVM.
- 6. Cisco UCS firmware version is set to 3.1(2b) which is the required Cisco UCS Manager release for HyperFlex v1.8.1 installation.
- 7. Enter HyperFlex cluster name.
- 8. Enter Org name to be created in Cisco UCS Manager.
- 9. Click Continue.

Credentials	Server Selection	UCSM Configuration	Hypervisor Configuration	IP Addresses	Cluste	r Configuratio	n
/LAN Configuration				Configu	ration		
/LAN for Hypervisor and l	dyperFlex management	VLAN for HyperFlex :	storage traffic	Credential	s		
/LAN Name	VLAN ID	VLAN Name	VLAN ID	LUCE Manage	ar Hest Name	10 20 122	1.4
hx-inband-mgmt	40	hx-storage-data	42	UCS Manag	er Host Name	10.29.152.	.14
				User Name		adm	110
				vCenter Ser	ver	10.10.40.	.20
/LAN for VM vMotion	VIANID	VLAN for VM Networ	VIANID	User Name	administrato	r@vsphere.lo	cal
by umotion	42	vm notwork		Admin User	Name	ro	ot
nx-vmouon	43	VIII-HELWOIK	44	Server Sele	ection		
				Server 8	FCH2035V4DE	/ HX240C-M4	ISX
MAC Pool				Server 2	FCH1944V02D	/ HX240C-M4	JSX
				Server 3	FCH1905V257	/ HX240C-M4	SX
MAC Pool Prefix				Server 1	FCH1944V07H	/ HX240C-M4	sx
00:25:B5:C3				Server 6	FCH2035V472	/ HX240C-M4	iSX
				Server 7	FCH2035V4FF	/ HX240C-M4	ISX
				Server 4	FCH1944V0F8	/ HX240C-M4	ISX
ext-mgmt' IP Pool fo	or Out-of-band CIMC			Server 5	FCH2035V48L	/ HX240C-M4	ISX
P Blocks	Subnet Mask	G	iateway				
10.29.132.80-99	255.255.255	.0	10.29.132.1				
Advanced							
Advanced JCS Firmware Version	HyperFlex Clust	er Name C	Drg Name				

Configure Hypervisor Settings

To configure the Hypervisor settings, complete the following steps:

- 1. In the Configure common Hypervisor Settings section, enter:
- Subnet Mask
- Gateway
- DNS server(s)
- 2. In the Hypervisor Settings section:
- Select check box Make IP Address and Hostnames Sequential if they are following in sequence.
- Provide the starting IP Address.

- Provide the starting Host Name or enter Static IP address and Host Names manually for each node
- 3. Click Continue.

Credentials	Server Selection	UCSM Configuration	Hypervisor Configuration	IP Addresses	Clus	ter Configuration
Configure common H	ypervisor Settings			Configu	uration	
Subnet Mask	Gateway		DNS Server(s)	Credentia	als	
255.255.255.0	10.10.40.1		10.10.41.21,10.10.41.22	UCS Mana	ger Host Name	10.29.132.1
				User Nam	e	adm
Hyponyisor Sottings				vCenter Se	rver	10.10.40.2
Hypervisor Settings				User Nam	a administra	tor@vsphere.loc
Make IP Addresses and I	Hostnames Sequential			Admin Use	er Name	ro
↓t ★ Name ^	Serial St	atic IP Address	Hostname	Server Se	lection	
				Server 8	FCH2035V4E)E / HX240C-M49
= OD Server 1	FCH1944V07H	10.10.40.27	HX240M4-01	Server 2	FCH1944V02	D / HX240C-M49
= Server 2	ECH1944V02D	10 10 40 28	HX240M4-02	Server 3	FCH1905V25	57 / HX240C-M45
	1011344020	10.10.40.20	1772 10111 02	Server 1	FCH1944V07	H / HX240C-M45
≡ (●)⊃ Server 3	FCH1905V257	10.10.40.29	HX240M4-03	Server 6	FCH2035V4	7Z / HX240C-M45
				Server 4	ECH1944V0	-F / HX240C-M4
≡ (●)⊃ Server 4	FCH1944V0F8	10.10.40.30	HX240M4-04	Server 5	FCH2035V4	8L / HX240C-M4
= O Server 5	FCH2035V48L	10.10.40.31	HX240M4-05	UCSM Co	nfiguration	
= 🔿 Senver h	ECH2025W/77	10 10 40 32	HX240M4-06	VLAN Nam	ie	hx-inband-mgn
	1 CH20537472			VLAN ID		4
≡ ◯● Server 7	FCH2035V4FF	10.10.40.33	HX240M4-07	VLAN Nam	,e	hx-storage-dat
= Server 8	ECH2035V4DE	10 10 40 34	HX240M4-08	VLAN ID VLAN Nam	ie	hx-vmotic
- Gervers	10120334462	10.10.40.34	177240114 00	4		

IP Addresses

To add the IP addresses, complete the following steps:

When the IP Addresses page appears, the hypervisor IP address for each node that was configured in the Hypervisor Configuration tab, appears under the Management Hypervisor column.

Three additional columns appear on this page:

- Storage Controller/Management
- Hypervisor/Data
- Storage Controller/Data



The Data network IP addresses are for vmkernel addresses for storage access by the hypervisor and storage controller virtual machine.

- 1. On the IP Addresses page, check the box Make IP Addresses Sequential or enter the IP address manually for each node for the following requested values:
- Storage Controller/Management
- Hypervisor/Data
- Storage Controller/Data
- 2. Enter subnet and gateway details for the Management and Data subnets configured.
- 3. Click Continue to proceed.

`	Hyperfiex ins						
	Credentials	Server Selection	UCSM Con	figuration H	ypervisor Configuration	IP Addresses Cluster Configurati	ion
P Ado	dresses				Add Server	Configuration	
Ma	ke IP Addresses Seque	ential				Credentials	
		Manage	ment		Data	UCS Manager Host Name 10.29.132	2.14
						User Name ad	min
भा अ	Server	Hypervisor ①	Storage Controller ①	Hypervisor ①	Storage Controller (1)	vCenter Server 10.10.40).20
	D FCH1944V07H	10.10.40.27	10.10.40.101	10.10.42.27	10.10.42.101	User Name administrator@vsphere.le	ocal
						Admin User Name r	oot
= (0	FCH1944V02D	10.10.40.28	10.10.40.102	10.10.42.28	10.10.42.102	Server Selection	
	D FCH1905V257	10.10.40.29	10.10.40.103	10.10.42.29	10.10.42.103	Server 8 FCH2035V4DE / HX240C-M	.45X
						Server 3 FCH1905V257 / HX240C-M	45X
	D FCH1944V0F8	10.10.40.30	10.10.40.104	10.10.42.30	10.10.42.104	Server 1 FCH1944V07H / HX240C-M	I4SX
= (0	FCH2035V48L	10.10.40.31	10.10.40.105	10.10.42.31	10.10.42.105	Server 6 FCH2035V47Z / HX240C-M	I4SX
						Server 7 FCH2035V4FF / HX240C-M	4SX
	D FCH2035V47Z	10.10.40.32	10.10.40.106	10.10.42.32	10.10.42.106	Server 4 FCH1944V0F8 / HX240C-M	4SX
						Server 5 FCH2035V48L / HX240C-M	4SX
	ECH2035V4FF	10.10.40.33	10.10.40.107	10.10.42.33	10.10.42.107	UCSM Configuration	
	D FCH2035V4DE	10.10.40.34	10.10.40.108	10.10.42.34	10.10.42.108	VLAN Name hx-inband-m	gmt
						VLAN ID	40
						VLAN Name hx-storage-c	Jata
		Charles 1	Management	Data		VLAN ID VLAN Name hx-vmo	+2
		Subnet Mask	205.255.255.0	255.255.255.0		4	
			Management	Data		✓ Back Continue	
		Gateway	10.10.40.1	10.10.42.1]		

4. On the Cluster Configuration page, enter the following:

- Cluster Name
- Cluster management IP address
- Cluster data IP Address
- Set Replication Factor: 2 or 3
- Controller VM password
- vCenter configuration
 - o vCenter Datacenter name
 - o vCenter Cluster name
- System Services
 - o DNS Server(s)
 - NTP Server(s)
 - o Time Zone
- Auto Support
 - o Click on check box for Enable Auto Support
 - o Mail Server
 - o Mail Sender
 - ASUP Recipient(s)
- Advanced Networking
 - o Management vSwitch
 - o Data vSwitch
- Advanced Configuration
 - o Click on check box to Optimize for VDI only deployment
 - o Enable jumbo Frames on Data Network
 - o Clean up disk partitions (optional)
- vCenter Single-Sign-On server

renentials	Server Colortion	UCCM Configuration	Human inc. Configuration	ID Addresser	Chusten Card and
Credentials	Server Selection	UCSM Configuration	Hypervisor Configuration	IP Addresses	Cluster Configurati
ïsco HX Cluster				Configu	ration
luster Name	Cluster Managem	ent IP Address	Cluster Data IP Address	Credentia	ls
HX-Cluster	10.10.40.100		10.10.42.100	UCS Manag	ger Host Name 10.29.132
eplication Factor				User Name	adr
T				vCenter Ser	rver 10.10.40
				User Name	administrator@vsphere.lo
ontroller VM				Admin User	r Name r
Admin Deserved	Canfirm Adapia D			Server Sel	ection
eate Admin Password		issword		Server 8	FCH2035V4DE / HX240C-M4
		U		Server 2	FCH1944V02D / HX240C-M4
				Server 3	FCH1905V257 / HX240C-M
				Server 1	ECH1944V07H / HY240C M
Center Configuration				Server 6	FCH1044V071711X240C4M
Center Configuration	vCenter Cluster N	ame		Server 6	FCH2035V47Z / HX240C-M
Center Configuration Center Datacenter Name VDILAB-HX	vCenter Cluster N HX-Cluster	ame		Server 6 Server 7 Server 4	FCH1944V0F8 / HX240C-M- FCH2035V4FF / HX240C-M- FCH1944V0F8 / HX240C-M-
Center Configuration ienter Datacenter Name VDILAB-HX	vCenter Cluster N HX-Cluster	ame		Server 7 Server 7 Server 4 Server 5	FCH194400/1/ H1240C-M FCH2035V47Z / HX240C-M FCH1944V0F8 / HX240C-M FCH1944V0F8 / HX240C-M FCH2035V48L / HX240C-M
Center Configuration Eenter Datacenter Name VDILAB-HX vstem Services	vCenter Cluster N HX-Cluster	ame		Server 7 Server 7 Server 4 Server 5 UCSM Con	FCH194405/1711240544 FCH2035V47Z / HX240C-M FCH2035V4FF / HX240C-M FCH1944V0F8 / HX240C-M FCH2035V48L / HX240C-M
Center Configuration Center Datacenter Name VDILAB-HX ystem Services	vCenter Cluster N HX-Cluster	ame	7000	Server 7 Server 7 Server 4 Server 5 UCSM Con	FCH194H00/I/110240C4M FCH2035V472 / HX240C-M FCH2035V4FF / HX240C-M FCH1944V0F8 / HX240C-M FCH2035V48L / HX240C-M FCH2035V48L / HX240C-M reguration e hx-inband-mg
Center Configuration Center Datacenter Name VDILAB-HX ystem Services NS Server(s) 10.10.41.21.10.10.41.22	vCenter Cluster N HX-Cluster NTP Server(s)	ame Time	Zone TC-08:00) Pacific Time	Server 7 Server 7 Server 4 Server 5 UCSM Con VLAN Name VLAN ID	FCH194H00/I/11240C4M FCH2035V47Z / HX240C-M FCH2035V4FF / HX240C-M FCH1944V0F8 / HX240C-M FCH2035V48L / HX240C-M fGuration e hx-inband-mg
Center Configuration Center Datacenter Name VDILAB-HX ystem Services NS Server(s) 10.10.41.21,10.10.41.22	vCenter Cluster N HX-Cluster NTP Server(s) 10.10.40.2,10.10.4	ame Time 40.3	Zone TC-08:00) Pacific Time	Server 7 Server 4 Server 5 UCSM Com VLAN Name	FCH194H00/I/110240C4M FCH2035V472 / HX240C-M FCH2035V4FF / HX240C-M FCH1944V0F8 / HX240C-M FCH2035V48L / HX240C-M FCH2035V48L / HX240C-M figuration e hx-inband-mg e hx-storage-d
Center Configuration Center Datacenter Name VDILAB-HX ystem Services NS Server(s) 10.10.41.21,10.10.41.22	vCenter Cluster N HX-Cluster NTP Server(s) 10.10.40.2,10.10.4	ame Time 40.3	: Zone TC-08:00) Pacific Time	Server 6 Server 7 Server 4 Server 5 UCSM Con VLAN Name VLAN ID VLAN ID VLAN ID	FCH194H00/I/11/240C4W FCH2035V47Z / HX240C-M FCH2035V4FF / HX240C-M FCH1944V0F8 / HX240C-M FCH2035V48L / HX240C-M FCH2035V48L / HX240C-M reduction e hx-inband-mg e hx-storage-d
Center Configuration Center Datacenter Name VDILAB-HX ystem Services NS Server(s) 10.10.41.21,10.10.41.22 uto Support	vCenter Cluster N HX-Cluster NTP Server(s) 10.10.40.2,10.10.4	ame Time 40.3	: Zone 'C-08:00) Pacific Time		FCH194H00/I/110240C4M FCH2035V472 / HX240C-M FCH2035V4FF / HX240C-M FCH1944V0F8 / HX240C-M FCH2035V48L / HX240C-M FCH2035V48L / HX240C-M e hx-inband-mg e hx-storage-d e hx-storage-d

/Center Configuration				
/Center Datacenter Name	vCenter Cluster Name		Configuration	+
VDILAB-HX	HX-Cluster		Credentials	
			UCS Manager Host Name	10.29.132.14
System Services			User Name	admin
			vCenter Server	10.10.40.20
ns server(s)	NTP Server(s)	(UTC-08:00) Pacific Time	User Name adminis	strator@vsphere.local
10.10.41.21,10.10.41.22	10.10.40.2,10.10.40.3		Admin User Name	root
			Server Selection	
uto Support			Server 8 FCH2035	V4DE / HX240C-M4SX
uto Support	Mail Server	Mail Sender	Server 2 FCH1944	V02D / HX240C-M4SX
Enable Auto Support			Server 3 FCH1905	3V257 / HX240C-M4SX
			Server 1 FCH1944	V07H / HX240C-M4SX
UP Recipient(s)			Server 6 FCH2035	3V47Z / HX240C-M4SX
			Server 7 FCH2035	5V4FF / HX240C-M4SX
			Server 4 FCH1944	4V0F8 / HX240C-M4SX
dvanced Networking			Server 5 FCH2035	5V48L / HX240C-M4SX
			UCSM Configuration	
anagement vSwitch	Data vSwitch		VLAN Name	hx-inband-mgmt
vswitch-hx-inband-mgmt	vswitch-hx-storage-data		VLAN ID	40
			VLAN Name	hx-storage-data
dvanced Configuration			VLAN ID	42
			VLAN Name	hx-vmotion
Optimize for VDI only deployment	Enable Jumbo Frames on Data Network	Clean up disk partitions	K Back	Start
enter Single-Sign-On Server				
https:// <address>^{.7}7444/sts/STSService</address>				

- 5. The configuration details can be exported to a JSON file by clicking the down arrow icon in the top right corner of the Web browser page as shown in the screenshot below.
- 6. Configuration details can be reviewed on Configuration page on right side section. Verify entered details for IP address entered in Credentials page, server selection for cluster deployment and creation workflow, Cisco UCS Manager configuration, Hypervisor Configuration, IP addresses.
- 7. Click Start after verifying details.

• HyperFlex Inst	aller				→ 0	
Credentials	Server	Selection	UCSM Configuration	Hypervisor Configuration	IP Addresses	Cluster Configuration
Cisco HX Cluster					Configura	tion
Cluster Name		Cluster Managemer	it IP Address	Cluster Data IP Address	Credentials	
HX-Cluster		10.10.40.100		10.10.42.100	UCS Manager	Host Name 10.29.132.14
Replication Factor					User Name	admir
3 •					vCenter Serve	10.10.40.20
					User Name	administrator@vsphere.loca
Controller VM					Admin User N	ame root
		Conform Admin Description			Server Select	ion
.reate Admin Password		Confirm Admin Pass	word		Server 8	FCH2035V4DE / HX240C-M4S)
			v		Server 2	FCH1944V02D / HX240C-M4S)
					Server 3	FCH1905V257 / HX240C-M4S>
Center Configuration					Server 1	FCH1944V07H / HX240C-M4SX
/Center Datacenter Name		vCenter Cluster Nar	ne		Server 7	ECH2035V4FE / HX240C-M45)
VDILAB-HX		HX-Cluster			Server 4	FCH1944V0F8 / HX240C-M4S
					Server 5	FCH2035V48L / HX240C-M4S>
System Services					UCSM Config	uration
NS Server(s)	N	ITP Server(s)	Tim	- 700e	VLAN Name	hx-inband-mgm
10.10.41.21.10.10.41.22		10.10.40.2.10.10.40	.3 (U	TC-08:00) Pacific Time	VLAN ID	40
					VLAN Name	hx-storage-data
					VLAN ID	42
Auto Support					VLAN Name	nx-vmotion
Auto Support		Mail Server		Mail Sender	(Back	Start
					V Duck	Juli

Once the installation workflow begins, it will go through the Cisco UCS Manager validation.

li.ili. cisco	HyperFlex Install	er						0 (3 Ø :	\$ ~
					Progress					
0	0							Configuration		
Start	UCSM	UCSM	Hypervisor	Deploy	Deploy	Create	Cluster	VLAN Name	hx-vmotion	1
	Validation	configuration	Configuration	Validation		Validation	Creation	VLAN ID	53	3
								VLAN Name	vm-network	<u>د</u>
2	LICEM Validation in F	rogross						VLAN ID	54	1
5		rogress						MAC Pool Prefix	00:25:B5:22	2
								IP Blocks	10.29.132.40-79)
					U	SM Validation	٣	Subnet Mask	255.255.255.0)
	UCSM Validation - C	Overall	4 Lania ta 11/20	4.01				Gateway	10.29.132.1	-
	In Pro	gress	 Login to UCS 	API				UCS Firmware Version	3.1(2b))
			 Inventory physical 	ysical servers				HyperFlex Cluster Name	HX-VDI-CL	
			 Validate the s 	setup/environment				Org Name	HX-VDI	1
								Hypervisor Configurat	ion	
								Subnet Mask	255.255.255.0	,
								Gateway	10.10.50.1	
								DNS Server(s) 1	0.10.51.21,10.10.51.22	2
								IP Addresses		
								Management	255.255.255.0)
								Data	255.255.255.0)
								Management	10.10.50.1	
								Data	10.10.52.1	n i
								Cluster Configuration		
								Cluster Name	HX-VDI-CL	_

After a successful validation, the workflow continues with the Cisco UCS Manager configuration.

cisco	HyperFlex Instal	ler						e	o ⊘ o	
					Progress					
0		0						Configuration		
Start	UCSM Validation	UCSM Configuration	Hypervisor Configuration	Deploy Validation	Deploy	Create Validation	Cluster Creation	Management	255.255.255.0	•
								Data	255.255.255.0	
								Management	10.10.50.1	
\sim	UCSM Configuration	n in Progress						Data	10.10.52.1	
								Cluster Configuration		
					luce	1 Confirmation		Cluster Name	HX-VDI-CL	
					UCSI	Configuration	•	Cluster Management IP	Address 10.10.50.100	
	UCSM Configuration -	Overall	 Login to U 	CS API				Cluster Data IP Address	10.10.52.100	
		ogress	 Validate U 	CS firmware version				Replication Factor	3	
			 Get invent 	ory of firmware bundles				vCenter Datacenter Nan	ne VDILAB-HX	
			 Download 	firmware bundle				vCenter Cluster Name	HX-VDI-CL	
			 Activating 	infra bundle version				DNS Server(s)	10.10.51.21,10.10.51.22	
			✓ Configure	UCS Fabric Interconnect				NTP Server(s)	10.10.50.2,10.10.50.3	
			✓ Configure	FI Server Ports				Time Zone	America/Los_Angeles	1
			✓ Configure	QoS classes				Auto Support		L.
			✓ Configure	org for the hx cluster				Management VLAN Tag	0	L.
			 Inventory 	physical servers				Management vSwitch v	witch-hx-inband-mgmt	L.
			 Configure 	VLANs				Data VLAN Tag	0	L.
			✓ Configure	Host Firmware policy				Virtual Decktop (VDI)	switch-nx-storage-data	L.
			✓ Configure	MAC address pools				lumbo Frames	VDI	
			 Configure 	QoS policies				Disk Partitions		
			 Configure 	Network Control policies				4	Þ	Ψ.
			 Configure 	Adapter policies						

After a successful Cisco UCS Manager configuration, the installer proceeds with the Hypervisor configuration.

		Progress				
⊙ <u> </u> ⊙ ⊙	0				Configuration	
art UCSM UCSM Validation Configuration	Hypervisor Deploy on Configuration Validatio	Deploy	Create Validation	Cluster Creation	IP Addresses	
					Management	255.255.255
					Data	255.255.255
Hypervisor Configuration in Pr	ogress				Management	10.10.50
					Data	10.10.52
					Cluster Configuration	
		Hypervis	or Configuration	•	Cluster Name	HX-VDI-0
Hypervisor Configuration - Overall	 Login to UCS API 				Cluster Management IP Ad	dress 10.10.50.1
In Progress	 Configure static ip on the s 	ecified esxi servers			Cluster Data IP Address	10.10.52.10
	 Create threads to configure 	static ip on the esxi serv	ers		Replication Factor	
					vCenter Datacenter Name	VDILAB-H
					vCenter Cluster Name	HX-VDI-0
					DNS Server(s) 10.1	10.51.21,10.10.51.2
					NTP Server(s) 1	0.10.50.2,10.10.50
					Time Zone A	merica/Los_Angel
					Auto Support	
					Management VLAN Tag	
					Management vSwitch vswit	ch-hx-inband-mgr
					Data VLAN Tag	
					Data vSwitch vsw	itch-hx-storage-da
					Virtual Desktop (VDI)	V
					Jumbo Frames	
					Disk Partitions	

After a successful Hypervisor configuration and deploy validation, the installer begins to configure the HyperFlex controller VMs on each HX240c-M4SX nodes with the IP address information provided earlier.

HyperFlex Installer		000¢~
	Progress	
<u> </u>	⊘ C ● ●	Configuration
Start UCSM UCSM Validation Configurat	Hypervisor Deploy Deploy Create Cluster on Configuration Validation Creation	IP Addresses
		Management 255.255.255.0
		Data 255.255.255.0
 Deploy in Progress 		Management 10.10.50.1
		Data 10.10.52.1
		Cluster Configuration
	Deploy •	Cluster Name HX-VDI-CL
Deploy - Overall		Cluster Management IP Address 10.10.50.100
In Progress		Cluster Data IP Address 10.10.52.100
10 10 50 27		Replication Factor 3
In Progress	Configuring Hypervisor	vCenter Datacenter Name VDILAB-HX
	Preparing ESXI Host for Installation Basic ESX Configuration.	vCenter Cluster Name HX-VDI-CL
	✓ Initializing Configuration	DNS Server(s) 10.10.51.22
	create compute group	NTP Server(s) 10.10.50.2,10.10.50.3
	_ Deploying Storage Controller VM on ESXi Host	Time Zone America/Los_Angeles
	Configuring Network (Port Groups) for ESXi and Storage Controller VM	Auto Support
10 10 50 00		Management VLAN Tag 0
10.10.50.28	✓ Configuring Hypervisor	Management vSwitch vswitch-hx-inband-mgmt
in rogicas	Preparing ESXi Host for Installation Basic ESX Configuration.	Data VLAN Tag 0
	Initializing Configuration	Virtual Desktop (VDI) VDI
	create compute group	Jumbo Frames
	Deproying storage Controller VM on ESXI Host Configuring Network (Port Groups) for ESXI and Storage Controller VM	Disk Partitions

After a successful deployment of the ESXi hosts configuration, the Controller VM software components for HyperFlex installer checks for validation prior to creating the cluster.

ւիվո. cisco Hyj	perFlex Insta	ller						•		Ø	\$
					Progress						
0		(>		(>	(>	C		Configurati	on		
Start	Validations	UCSM Configuration	Hypervisor Configuration	Deploy Validation	Deploy	Create Validation	Cluster Creation	Credentials			Í
								UCS Manager H	ost Name	10.29.132	2.11
								User Name		ad	min
Creat	te Validation i	n Progress						vCenter Server		10.10.50	0.20
								User Name	administrat	or@vsphere.l	ocal
								Admin User Nar	ne	r	root
					Cre	eate Validation	•	Server Selection	on		
	Create Validation	- Overall						Server 8	FCH1936V00	GE / HX220C-1	M4S
	in i	Progress						Server 2	FCH1937V2	2JT / HX220C-1	M4S
								Server 3	FCH1937V2	JU / HX220C-1	M4S
								Server 1	FCH1937V2	TV / HX220C-1	M4S
								Server 6	FCH1937V2	TS / HX220C-1	M4S
								Server 7	FCH1937V2	JV / HX220C-1	M4S
								Server 4	FCH1938V0	85 / HX220C-1	M4S
								Server 5	FCH1842V1	JG / HX220C-1	M4S
								UCSM Configu	ration		
								VLAN Name		hx-inband-m	gmt

After a successful validation, the installer creates and starts the HyperFlex cluster service.

uluulu H	HyperFlex Insta	aller						0		0	\$ ~
					Progress						
0							0	Configuration	ו		
Start	Validations	UCSM Configuration	Hypervisor Configuration	Deploy Validation	Deploy	Create Validation	Cluster Creation	Credentials			^
								UCS Manager Host	Name	10.29.132	.11
								User Name		adn	nin
	uster Creation ir	n Progress						vCenter Server		10.10.50	.20
								User Name	administrato	r@vsphere.lo	cal
								Admin User Name		r	oot
					Cl	uster Creation	•	Server Selection			
	Cluster Creation	- Overall						Server 8	CH1936V0G	E / HX220C-N	14S
	In	Progress						Server 2	FCH1937V2J	T / HX220C-N	14S
								Server 3	FCH1937V2J	U / HX220C-N	14S
								Server 1	FCH1937V2T	V / HX220C-N	14S
								Server 6	FCH1937V2T	S / HX220C-N	14S
								Server 7	FCH1937V2J	V / HX220C-N	14S
								Server 4	FCH1938V08	5 / HX220C-N	145
								Server 5	FCH1842V1J	G / HX220C-N	14S
								UCSM Configurat	ion		
								VLAN Name	ł	nx-inband-mg	;mt 🖕
								•) - F

After a successful HyperFlex Installer VM workflow completion, the installer GUI provides a summary of the cluster that has been created.

Cluster Name C3-HX-VDI ONLINE HEALTHY			
Version	1.8.1c-19725	vCenter Server	10.10.40.20
Cluster Management IP Address	10.10.40.100	vCenter Datacenter Name	VDILAB-HX
Cluster Data IP Address	10.10.42.100	vCenter Cluster Name	HX-VDI-CL
Replication Factor	3	DNS Server(s)	10.10.41.21, 10.10.41.22
Available Capacity	67.7 TB	NTP Server(s)	10.10.40.3, 10.10.40.2

Servers

Model	Serial Number	Management Hypervisor	Management Storage Controller	Data Network Hypervisor	Data Network Storage Controller
HX240C-M4SX	FCH1905V257	10.10.40.28	10.10.40.102	10.10.42.28	10.10.42.102
HX240C-M4SX	FCH1944V0F8	10.10.40.33	10.10.40.107	10.10.42.33	10.10.42.107
HX240C-M4SX	FCH2035V4DE	10.10.40.32	10.10.40.106	10.10.42.32	10.10.42.106
HX240C-M4SX	FCH1944V02D	10.10.40.31	10.10.40.105	10.10.42.31	10.10.42.105
HX240C-M4SX	FCH2035V47Z	10.10.40.27	10.10.40.101	10.10.42.27	10.10.42.101
HX240C-M4SX	FCH2035V48L	10.10.40.30	10.10.40.104	10.10.42.30	10.10.42.104
HX240C-M4SX	FCH2035V4FF	10.10.40.34	10.10.40.108	10.10.42.34	10.10.42.108
HX240C-M4SX	FCH1944V07H	10.10.40.29	10.10.40.103	10.10.42.29	10.10.42.103

Cisco HyperFlex Cluster Expansion

For this exercise, we will add the compute node workflow part of the cluster exansion.

Prerequisite

Configure the service profile for compute-only nodes and install ESXi hypervisor.

To add the compute node workflow, complete the following steps:

- 1. Login to Cisco UCS Manger.
- 2. Under "hx-cluster" sub-organization:
 - d. In the existing vMedia policy "HyperFlex" add vMedia mount details to boot ESXi image from data-platform installer VM.
 - e. For Hostname/IP Address Add IP address of data-platform installer VM which can also communicate with Cisco UCS Manager.

Equipment Servers LAN SAN VM Storage Chassis Admin General Events									
Filter: Policies Actions	Properties								
(+) (-) Create v	vMedia Mount	Name: H	/perFlex						
Policies		Description: vi	Aedia policy to in	stall or re-install software or	n HyperFlex se	ervers			
- A root		Owner: Lo	cal						
Snow Po	Dircy Usage Retry on M	ount Eailure:	No. Yes						
🗄 🛒 🛐 BIOS Defaults 👔 👔 Use Global	Ked y of the	ounce allore.							
	vMedia	Mounts							
🖅 🖉 Boot Policies		🔍 Filter 🖨 E	xport 😹 Print						
Host Firmware Packages			1 -						
IPMI Access Profiles	Name	Туре	Protocol	Authentication Protocol	Server	Filename	Remote Path	User	r ₽
KVM Management Policies	S 8								^
Local Disk Config Policies		-							_
Maintenance Policies		S Propert	ies for: B200M4	ļ.				- 0	×
S Management Firmware Packages			_						
Emiliary Policy		General Ev	ents						
E Power Control Policies									
E Scrub Policies		Actions		Properties					
Serial over LAN Policies		(Starl)		Name:	B200M4				
Server Pool Policies		T Dex	te	Description	Deserves	ويتقادمه والمعالمي			
Server Pool Policy Qualifications				Description:	Recommende	ed vinedia policy i	or hypernex ser	vers	
Threshold Policies				Device Type:	O CDD O) HDD			
SCSI Authentication Profiles									
				Protocol:	ONFS ○	CIFS HTTP	○ HTTPS		
🗄 🎪 Sub-Organizations				Hostname/IP Address:	10.29.132.2	33			
⊖ <u>Å</u> hx-duster									
Adapter Policies				Image Name Variable:	None) Service Profile	Name		
BIOS Policies				Remote File:	HX-Vmware-F	ESXI-6012-41922	38-Cisco-Custom	-6.0.2.3.iso	
Boot Policies				recine to the				0101210100	
(Hong) Host Firmware Packages				Remote Path:	images				
COM Management Delicion				Username:					
E I oral Disk Confin Policies				Dagword					
Maintenance Policies				Passworu.					
Management Firmware Packages									
Sever Control Policies									
i		<							>
🐑 🖉 Serial over LAN Policies						OK	Apply	Cancel	Help
Server Pool Policies						JK	Ohhu3	Curreer	. nup
Server Pool Policy Qualifications									
Threshold Policies			_		_	_	_		
) SCSI Authentication Profiles									
Wreda Police Weda Police Weda Police Wida									
Werlia Policy HX220C									
Media Policy HyperElex									
WIC/VHBA Placement Policies									
the sub-Organizations									
m									

- 3. Change the existing service profile template to accommodate the new changes; install ESXi via vMedia policy.
- 4. In the existing service profile template "compute-nodes" select vMedia Policy tab.
- 5. Click Modify vMedia Policy.
- 6. From the drop-down list of vMedia Policy, select HyperFlex.



- 7. In the existing service profile template "compute-nodes" click Boot Order tab.
- 8. Click Modify Boot Policy.
- 9. From the drop-down list of Boot Policies, select HyperFlexInstall.
- 10. Save changes.



11. Create the service profile from the **"compute-nodes" updating service profile template** located in the HyperFlex cluster sub organization.



12. Add the Naming Prefix and Number of Instances to be created.

Filter: Service Profile Templ Actions Properties Service Profile Templates Create Service Profiles From Template Name: compute-nodes Service Profile Templates Create a Clone Unique Identifier: Hardware Default
Sub-Organizations Service Template HX220c-nodes Enservice Template HX240c-nodes Sub-Organizations Power State: 1: Up Template HX240c-nodes Sub-Organizations Power State: 1: Up Power State: 1: Power State: 1: Up

13. Click OK.


14. After the of ESXi install, assign the VLAN tag on the ESXi host; the static IP address configuration is located in the Configure Management Network section.



15. Log into the HyperFlex data platform installer WebUI. Select Cluster Expansion.

cisco	HyperFlex Installer		0	• ¢ ~
		Workflow		
Selec	t a Workflow			
			,	
	Cluster Creation	Cluster Expansion		
A Ukr	ow what I'm doing, let me customize my workflow			

16. Enter the credentials for Cisco UCS Manager, vCenter server, and ESXi. Click Continue.

Creuenuais C	luster Expand Configuration	Server Selection	UCSM Configuration	Hyperviso	r Configuration	IP Addresses
JCS Manager Credentials					Configuration	*
CS Manager Host Name	User Name	1	Password			
10.29.132.14	admin			G		
Center Credentials						
Center Server	User Name		Admin Password			
10.10.40.20	administrator@vsp	nere.local		۵		
dmin User Name	Admin Password				D configu	rag and drop ration files here or
root	Admin Password	٥			s	elect a File

17. Select Cluster to expand, click Continue.

	Cluster Expand Configuration	Server Selection	UCSM Configuration	Hypervisor Con	figuration	IP Addresses	
Select a Cluster to Ex	kpand				Configuration		4
HX-Cluster	0				Credentials		
State	ONLINE				JCS Manager Host Name	10.29.132.14	
Health	HEALTHY				Jser Name	admin	
IP Address	10.10.42.100				Center Server	10.10.40.20	
Management IP Address	10.10.40.100				Jser Name administra	ator@vsphere.local	
Size	8				Admin User Name	root	
Cluster Management IP Addi 10.10.40.100	ress						
							Þ

Since you are performing a compute-node only expansion, no servers report in to the Cisco UCS Manager configuration tab.

18. Click Continue.

◬



19. The Cisco UCS Manager configuration is auto-populated from the existing configuration. Click Continue.

Credentals Curser Expand Configuration Server Selection UCSM Configuration VLAN for Hypervisor and Hyperfilex management: VLAN for Hyperfilex storage traffic VLAN ID VLAN for Hypervisor and Hyperfilex management: VLAN for Hyperfilex storage traffic VLAN ID VLAN for VM VMotion VLAN for VM Network 42 VLAN for VM vMotion VLAN for VM Network VLAN ID VLAN for VM vMotion VLAN for VM Network 44 MAC Pool 43 vm-network MAC Pool Server Selection A los Server Selection MAC Pool for Submet Mask Gateway act 10 193.211 124-127, 10 193.211 158- ex: 255.255.0.0 ex: 10 193.0.1 Advanced US Firmware Version Hyperfilex cluster Or g Name 1.(2b) Hyperfilex cluster Or g Name Cataler	HyperFlex In	staller				• •		₽ ~
VLAN Configuration VLAN for Hyperflex management VLAN for Hyperflex storage traffic VLAN name VLAN for VLAN In withuband mgmt 40 In-storage-data 42 VLAN for VM Motion VLAN for VM Network VLAN Name VLAN IND VLAN Name VLAN ID	Credentials	Cluster Expand Configuration	Server Selection	UCSM Configuration	Hypervisor Con	figuration	IP Addresses	
VLN for Hyperflex management: VLN for Hyperflex storage traffic VLN Name VLN ID he-inbaind-mgmt 40 he-inbaind-mgmt 42 VLN for VM vMotion VLAN for VM vMotion VLAN for VM Name VLN Name VLN ID vLN Name VLN ID VLN Name VLN ID Name VLN ID VLN Name VLN ID MAC Pool	VLAN Configuration					Configuration		*
VLAN Name VLAN ID VLAN Name VLAN ID Int-inband-mgmt 40 Int-storage-data 42 VLAN for VM vMotion VLAN for VM Network VLAN ID VLAN Name VLAN Name VLAN ID Int-imband-mgmt 43 VLAN Name MAC Pool VLAN Server's Selected MAC Pool Server Selected MAC Pool Server Selected int 1P Pool for Out-of-band CIMC ec: 10.193.211.198- P Bicks Subnet Mask Gateway ac: 10.193.211.124-127,10.193.211.198- ec: 255.255.0.0 VGAY need Wperflex Cluster Name Org Name 3.1(20) Hyperflex cluster Int-cluster	VLAN for Hypervisor and Hy	yperFlex management	VLAN for HyperFlex s	torage traffic		Credentials		*
hx-inband-mgmt 40 hx-storage-data 42 VLAN for VM vMotion VLAN for VM vMotion VLAN for VM Name VLAN ID <td>VLAN Name</td> <td>VLAN ID</td> <td>VLAN Name</td> <td>VLAN ID</td> <td></td> <td>UCS Manager Host Name</td> <td>10.29.132.1</td> <td>4</td>	VLAN Name	VLAN ID	VLAN Name	VLAN ID		UCS Manager Host Name	10.29.132.1	4
VLAN for VM vMotion VLAN ID VLAN Name VLAN ID UCH VIAN VLAN ID UC	hx-inband-mgmt	40	hx-storage-data	42		User Name	adm	n
VLAN for VM Netorion VLAN Norr VLAN Norr VLAN Norr VLAN Norr VLAN ID MAC Pool 44 Cluster Name root MAC Pool MAC Pool Prefix Cluster Selected 00:25:85:G3 Subnet Mask Gateway ext:ngmt' IP Pool for Out-of-band CIMC ex: 10.193.211.124-127,10.193.211.158- ex: 255.255.0.0 PBicks Subnet Mask Gateway ex: 10.193.211.124-127,10.193.211.158- ex: 255.255.0.0 uCS firmware Version Hyperflex Cluster Name Org Name 3.1(2b) Hyperflex Cluster Name Org Name 3.1(2b) Hyperflex Cluster Name Org Name						vCenter Server	10.10.40.2	0
VLN Name VLN ID hx-vmolion 43 MAC Pool MAC Pool MAC Pool Image: selection 00:25:85:C3 'ext-mgmt' IP Pool for Out-of-band CIMC IP Blocks Subnet Mask Gateway ex: 10:193.211.124-127,10.193.211.158- ex: 255.255.0.0 ex: 10:193.211.124-127,10.193.211.158- ex: 255.255.0.0 ex: 10:193.0.1 Advanced UCS Firmware Version HyperFlex Cluster Name Org Name HyperFlex Cluster Name Org Name (* Back Continue	VLAN for VM vMotion	14.000	VLAN for VM Networ	k		User Name adminis	trator@vsphere.loc	al
Internation Internation MAC Pool MAC Pool MAC Pool MAC Pool MAC Pool Prefix 00:25:85:C3 'ext-mgmt' IP Pool for Out-of-band CIMC P Blocks Subnet Mask ex: 10:193.211:124-127,10:193.211:158- ex: 255:255:0.0 ex: 10:193.211:124-127,10:193.211:158- ex: 255:255:0.0 ex: 10:193.0.1 Advanced UCS Firmware Version HyperFlex Cluster Name Org Name It.12b HyperFlex Cluster Name Org Name (d Back 	VLAN Name	VLAN ID	VLAN Name	VLAN ID		Admin User Name	ro)t
MAC Pool MAC Pool MAC Pool Prefix 00:25:85:C3 'ext-mgmt' IP Pool for Out-of-band CIMC IP Blocks subnet Mask Gateway ex: 10:193:211:124-127,10:193:211:158- ex: 25:255:0.0 ex: 10:193:0.1 Advanced UCS Firmware Version HyperFlex Cluster Name Org Name 3.1(2b) HyperFlex cluster Mack Continue	nx-viiouon	40	VII-HEWOIK	44		Cluster Expand Configu	iration	
MAC Pool MAC Pool Prefix Oc25:85:03 'ext-mgmt' IP Pool for Out-of-band CIMC IP Blocks Subnet Mask Gateway ext: 10.193.211.124-127,10.193.211.158- ext: 255.255.0.0 ext: 10.193.0.1 Advanced UCS Firmware Version HyperFlex Cluster Name Org Name 3.1(2b) HyperFlex Cluster Name Corg Name (x Continue (x Continue (x Contin						Cluster Management IP A	idress 10.10.40.10	0
MAC Pool Prefix 00:25:B5:C3 'ext-mgmt' IP Pool for Out-of-band CIMC IP Blocks subnet Mask Gateway ex: 10:193.211.124-127,10.193.211.158- ex: 255.255.0.0 ex: 10.193.0.1 Advanced UCS Firmware Version HyperFlex Cluster Name Org Name HyperFlex cluster Name Org Name HyperFlex cluster Cluster	MAC Pool					Server Selection		
00:25:85:C3 'ext-mgmt' IP Pool for Out-of-band CIMC IP Blocks Subnet Mask ex: 10.193.211.124-127,10.193.211.158- ex: 255.255.0.0 ex: 10.193.0.1 Advanced UCS Firmware Version HyperFlex Cluster Name Org Name 1.1(2b) HyperFlex cluster hx-cluster hx-cluster	MAC Pool Prefix					A No Servers Selected		
'ext-mgmt' IP Pool for Out-of-band CIMC IP Blocks subnet Mask ex: 10.193.211.124-127,10.193.211.158- ex: 255.255.0.0 ex: 10.193.0.1 Advanced UCS Firmware Version HyperFlex Cluster Name Org Name 3.1(2b) HyperFlex cluster hx-cluster Continue	00:25:B5:C3							
'ext-mgmt' IP Pool for Out-of-band CIMC IP Blocks Subnet Mask ex: 10.193.211.124-127,10.193.211.158- ex: 255.255.0.0 Advanced UCS Firmware Version HyperFlex Cluster Name Org Name 3.1(2b) HyperFlex cluster hx-cluster (Back Continue								
IP Blocks Subnet Mask Gateway ex: 10.193.211.124-127,10.193.211.158- ex: 255.255.0.0 ex: 10.193.0.1 Advanced	'ext-mgmt' IP Pool for	r Out-of-band CIMC						
ex: 10.193.211.124-127,10.193.211.158- ex: 255.255.0.0 ex: 10.193.0.1 Advanced UCS Firmware Version HyperFlex Cluster Name MyperFlex cluster Cluster Name MyperFlex Clu	IP Blocks	Subnet Mask	G	ateway				
Advanced UCS Firmware Version HyperFlex Cluster Name Org Name 3.1(2b) HyperFlex cluster hx-cluster hx-cluster $4 \rightarrow 1$ K Back Continue	ex: 10.193.211.124-127,10	ex: 255.255.0.0		ex: 10.193.0.1				
UCS Firmware Version HyperFlex Cluster Name Org Name 3.1(2b) HyperFlex cluster 4 K Back Continue	Advanced							
3.1(2b) HyperFlex cluster hx-cluster K Back Continue	UCS Firmware Version	HyperFlex Cluster N	ame O	rg Name				-
K Back Continue	3.1(2b)	HyperFlex cluste	r	hx-cluster	4			•
						< Back	Continue	

20. Enter the configuration for common hypervisor settings. Click Continue.

cisco	HyperFlex Ins	taller				0	0 0	¢ ~
	Credentials	Cluster Expand Configuration	Server Selection	UCSM Configuration	Hypervisor	Configuration	IP Addresses	5
Co	nfigure common Hy	pervisor Settings				Configuration		*
Sub	net Mask	Gateway		DNS Server(s)		Credentials		^
2	55.255.255.0	10.10.40.1		10.10.41.21,10.10.41.22		UCS Manager Host N	Name 10.29.1	32.14
						User Name	ä	admin
Hv	nonvisor Sottings					vCenter Server	10.10	.40.20
i iy	pervisor settings					User Name ad	lministrator@vsphere	e.local
						Admin User Name		root
						Cluster Expand Co	onfiguration	_
						Cluster Managemen	t IP Address 10.10.4	10.100
		No servers selected	ed.			Server Selection		
		Feel free to go ba	ck and select some servers.			A No Servers Selec	ted	
						UCSM Configurati	on	
						VLAN Name	hx-inband-	mgmt
						VLAN ID		40
						VLAN Name	hx-storage	e-data
						VLAN ID		42
						VLAN Name	hx-vn	notion
						VLAN ID		43
						VLAN Name	vm-ne	twork
						VLAN ID		44
						MAC Pool Prefix	00:25:	B5:C3
						4		1/36\ ▶
						< Back	Continue	e

- 21. Add the compute nodes IP address configuration for management and the storage data vmkernel for ESXi.
- 22. Click Start to deploy the compute-node into the existing cluster.

<u>;</u>	HyperFlex Ir	staller			0 0	S 1
Cr	edentials	Cluster Expand Configuration	Server Selection	UCSM Configuration	Hypervisor Configuration IP Add	esses
Addr	esses		Add Compu	te Server Add Converges	d Server Configuration	
) Make	IP Addresses Seq	uential		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Credentials	
		Management		Data	UCS Manager Host Name 10	.29.132.14
		wanagement		Data	User Name	admin
11 ÷	Server	Hypervisor ① Stora	ge Controller ① Hypervisor	 Storage Controller 	vCenter Server	0.10.40.20
-	Server 1	10.10.40.35	10.10.42.35	i	User Name administrator@vs	ohere.local
	compute				Admin User Name	root
	Server 2 compute	10.10.40.36	10.10.42.36	i	X Cluster Expand Configuration	
	Secure 3				Cluster Management IP Address 10	.10.40.100
	compute	10.10.40.37	10.10.42.37		× Server Selection	
	Server 4	10.10.40.38	10.10.42.38	l l	A No Servers Selected	
	compute				UCSM Configuration	
					VLAN Name hx-int	and-mgm
ontrol	ler VM Passw	ord			VLAN ID	40
					VLAN Name hx-st	orage-data
ntroller	VM Password				VLAN ID	42
		©			VLAN Name	x-vmotion
Password the HX Cl	d for the Administrati uster	ve User of			VLAN ID	43
					VLAN Name v	m-network
					VLAN ID	44
					MAC Pool Prefix	0:25:B5:C3
					UPS Elemente Varrian	2 1/DF
					(Back	art _
					K Back	art i

23. Click Skip Validation.

			Progress	5				
)[]						Configuration		4
tart Validations Con	UCSM figuration	Deploy Validation	Deploy	Expansion Validation	Cluster Expansion	Credentials		
						UCS Manager Host Name	10.29.132.14	
						User Name	admin	
Warnings found during Valid	ations		Retry	Validations Skip	Validations	vCenter Server	10.10.40.20	
						User Name adminis	strator@vsphere.local	
						Admin User Name	root	
				Validations	٣	Cluster Expand Configu	uration	
Validations - Overall	A	VLAN				Cluster Management IP A	ddress 10.10.40.100	
Warning		Validating 'storage-data'	VLAN 42 specified for n	ew cluster is already assign	ned	Server Selection		
	×	Firmware				A No Servers Selected		
		Validating HyperFlex ver	sion '1.8(1b)' is compatil	ble with UCS version '3.1(2)	D)'	UCSM Configuration		
	×	Validating MTU change f	or QoS system class: 'pla	atinum'		VI AN Name	hy.inband.mgmt	÷
	1	QoS				VLAN ID	40	
		Validating MTU change f	or QoS system class: 'go	old'		VI AN Name	hx-storage-data	
	1	QoS				VLAN ID	42	
		Validating MTU change f	or QoS system class: 'sil	iver"		VLAN Name	hx-vmotion	
	*	Validating MTU change f	or QoS system class: 'br	'onze'		VLAN ID	43	
		QoS				VLAN Name	vm-network	
		Validating MTU change f	or QoS system class: 'br	onze'		VLAN ID	44	
	1	VLAN				MAC Pool Prefix	00:25:B5:C3	
		Validating vNIC template VLAN	storage-data' and 'hv-r	mgmt [,] are not assigned the	e same	UCE Firmwara Varrian	2 1/36)	
	1	VLAN				4		•
		Validating vNIC template VLAN	hv-mgmt' and 'hv-vmo	tion' are not assigned the	same	< Edit Con	figuration	

24. The installer completes the configuration and validation prior to the deployment steps. During deployment, the HyperFlex data installer GUI, the installation completes the VIB installation, deploying the light-weight controller VM and basic ESXi configuration.

	-	
	Progress	
0	<u> </u>	Configuration
Start Validations I Conf	JCSM Deploy Deploy Expansion Cluster iguration Validation Expansion	Credentials
		UCS Manager Host Name 10.29.132.14
		User Name admin
C Deploy in Progress		vCenter Server 10.10.40.20
		User Name administrator@vsphere.local
		Admin User Name root
	Deploy •	Cluster Expand Configuration
Deploy - Overall		Cluster Management IP Address 10.10.40.100
In Progress		Server Selection
10.10.40.35	Drapping ECV: Hort for Installation	A No Servers Selected
In Progress	Basic ESX Configuration,	UCSM Configuration
	✓ Initializing Configuration	VLAN Name hx-inband-mgmt
	create compute group	VLAN ID 40
	Configuring Hypervisor Validating Datastore Availability	VLAN Name hx-storage-data
		VLAN ID 42
10.10.40.36		VLAN Name hx-vmotion
In Progress	Preparing ESX Host for Installation Basic ESX Configuration.	VLAN ID 43
	 Initializing Configuration 	VLAN Name vm-network
	create compute group	VLAN ID 44
	Configuring Hypervisor	MAC Pool Prefix 00:25:B5:C3
	Validating Datastore Availability	UCS Firmware Version 3.1(2b)
		HyperFlex Cluster Name HyperFlex cluster
10.10.40.37	 Preparing ESXi Host for Installation 	Org Name hx-cluster

The Installer completes the deployment and validation prior to the completion of the cluster expansion.

cisco HyperFlex Installer					0 0	Ø 🗘
		Progress				
0	- <u>Ø</u> <u>Ø</u> -	<u></u>		0	Configuration	
Start Validations Co	UCSM Deploy nfiguration Validation	Deploy	Expansion Validation	Cluster Expansion	Credentials	
					UCS Manager Host Name	10.29.132.14
					User Name	admin
Cluster Expansion in Progre	SS				vCenter Server	10.10.40.20
					User Name administ	rator@vsphere.local
					Admin User Name	root
			Cluster Expansion	•	Cluster Expand Configu	ation
Cluster Expansion - Overall					Cluster Management IP Ad	dress 10.10.40.100
In Progress					Server Selection	
c+C+IVM ECU10421676					A No Servers Selected	
In Progress	StNode Controller VM				UCSM Configuration	
					VLAN Name	hx-inband-mgmt
stCtIVM-FCH19377PVA	C StNode				VLAN ID	40
In Progress	Controller VM				VLAN Name	hx-storage-data
					VLAN ID	42
stCtIVM-FLM19379C6B	C StNode				VLAN Name	hx-vmotion
In Progress	Controller VM				VLAN ID	43
					VLAN Name	vm-network
stCtIVM-FLM19379CJF	C StNode				VLAN ID	44
In Progress	Controller VM				MAC Pool Prefix	00:25:B5:C3
					UCS Firmware Version	3.1(2b)
					HyperFlex Cluster Name	HyperFlex cluster
					Org Name	hx-cluster

After creating a successful Cluster Expansion workflow, a summary of the cluster is shown.

Cluster Name H	X-Cluster ONLINE	HEALTHY				
Version			1.8.1b-19547	vCenter Se	rver	10.10.40.20
Cluster Managemen	nt IP Address		10.10.40.100 vCenter Datacenter Name			VDILAB-HX
Cluster Data IP Add	ress		10.10.42.100	vCenter Cl	uster Name	HX-Cluster
Replication Factor			3	DNS Serve	r(s)	10.10.41.21, 10.10.41.22
Available Capacity	apacity 67.			NTP Serve	r(s)	10.10.40.3, 10.10.40.2
Servers						
Model	Serial Number	Management Hypervisor	Management Storage Con	troller	Data Network Hypervisor	Data Network Storage Controller
HX240C-M4SX	FCH2035V47Z	10.10.40.32	10.10.40.106		10.10.42.32	10.10.42.106
HX240C-M4SX	FCH1944V0F8	10.10.40.30	10.10.40.104		10.10.42.30	10.10.42.104
HX240C-M4SX	FCH1944V07H	10.10.40.27	10.10.40.101		10.10.42.27	10.10.42.101
HX240C-M45X	FCH2035V4FF	10.10.40.33	10.10.40.107		10.10.42.33	10.10.42.107
HX240C-M45X	FCH2035V48L	10.10.40.31	10.10.40.105		10.10.42.31	10.10.42.105
HX240C-M4SX	FCH1944V02D	10.10.40.28	10.10.40.102		10.10.42.28	10.10.42.102
HX240C-M4SX	FCH1905V257	10.10.40.29	10.10.40.103		10.10.42.29	10.10.42.103
UCSB-B200-M4	FOX1926G3BA	10.10.40.35			10.10.42.35	
UCSB-B200-M4	FOX1926G3BA	10.10.40.38			10.10.42.38	
UCSB-B200-M4	FOX1926G3BA	10.10.40.37			10.10.42.37	
UCSB-B200-M4	FOX1926G3BA	10.10.40.36			10.10.42.36	
HX240C-M45X	FCH2035V4DE	10.10.40.34	10.10.40.108		10.10.42.34	10.10.42.108

As part of the cluster creation operations, the HyperFlex Installer adds HyperFlex functionality to the vSphere vCenter identified in earlier steps. This functionality allows vCenter administrators to manage the HyperFlex cluster entirely from their vSphere Web Client.

25. Click Launch vSphere Web Client.

Cisco HyperFlex installer creates and configured a controller VM on each converged or compute-only node. Naming convention used is as "stctlvm-<Serial Number for Cisco UCS Node>" shown in Figure 41.



mware [,] vSphere Web Cli	ent n ≘									U Administrator@VSPHERELOCAL	+ Help +	I Q Search		
Navigator I	HX-VDI-CL Actions -												=*	
(Home) 🕲	Summary Monitor Manage Related	Objects												(0) V
Victorial Interview Interv	Top Level Objects Hosts Virtual Machine	es vApps Datas	stores Datastore	Clusters Networks	Distributed Sv	vitches								OTK IN P
VDILAB-HX	19 월 19 1월 🕨 🖬 😂 🗛	🚳 Actions 👻									X 🛛	🕼 🔍 stcti	-	sseibou
HX-Launcher-CL	Name	State	Status	Provisioned Space	Used Space	1 A Host CPU	Host Mem	EVC Mode	HA Protecti	ion				
🗢 🗓 HX-VDI-CL 💦 💙	StCIIVM-FLM1942AFAR	Powered On	O Normal	2.41 GB	2.41 GB	0 MHz	366 MB		② N/A					
10.10.40.27	stCtlVM-FCH19057QG2	Powered On	Normal	2.41 GB	2.41 GB	0 MHz	369 MB		② N/A					
10.10.40.28	stCtIVM-FLM19379CJF	Powered On	Normal	2.41 GB	2.41 GB	0 MHz	366 MB		② N/A					
10.10.40.29	stCtIVM-FCH18387ZPL	Powered On	Normal	2.41 GB	2.41 GB	0 MHz	370 MB		② N/A	Controller VM for B200 M4				
10.10.40.30	stCtIVM-FLM2033LLYE	Powered On	 Normal 	2.41 GB	2.41 GB	0 MHz	370 MB		② N/A	Compute-only nodes				
10.10.40.31	StCtIVM-FCH19377PVA	Powered On	 Normal 	2.41 GB	2.41 GB	0 MHz	373 MB		② N/A					
10.10.40.32	stCtIVM-FLM2033LLTP	Powered On	Normal	2.41 GB	2.41 GB	0 MHz	370 MB		② N/A					
0.10.40.33	stCtIVM-FLM19379C6B	Powered On	Normal	2.41 GB	2.41 GB	0 MHz	371 MB		② N/A					
B 10.10.40.34	stCtIVM-FCH2035V4DE	Powered On	Normal	92.42 GB	92.42 GB	959 MHz	73,985 MB		② N/A					
10.10.40.35	stCtIVM-FCH2035V4FF	Powered On	Normal	92.42 GB	92.42 GB	2,255 MHz	73,985 MB		② N/A					
10.10.40.37	stCtIVM-FCH1944V02D	Powered On	Normal	92.42 GB	92.42 GB	2,022 MHz	73,985 MB		② N/A					
10.10.40.38	stCtIVM-FCH2035V47Z	Powered On	Normal	92.42 GB	92.42 GB	1,815 MHz	73,985 MB		② N/A	Controller VM for HX240c-M4SX				
10.10.40.39	StCIIVM-FCH1944V07H	Powered On	Normal	92.42 GB	92.42 GB	1.866 MHz	73,985 MB		(2) N/A	Converged nodes				
10.10.40.40	StCtIVM-FCH1944V0F8	Powered On	Normal	92.42 GB	92.42 GB	1.218 MHz	73.985 MB		(2) N/A	-				
10.10.40.41	stCtIVM-FCH2035V48L	Powered On	Normal	92.42 GB	92.42 GB	1.192 MHz	73.985 MB		(2) N/A					
10.10.40.42	A stCtlVM-FCH1905V257	Powered On	Normal	92.42 GB	92.42 GB	1.063 MHz	73.985 MB		(2) N/A					
🕨 🔒 (2021) Virtual Machines		-	-						9					
4														

Figure 41 Cisco UCS Node Naming Convention

Run Cluster Post Installation Script

After a successful installation of HyperFlex cluster, run the post_install script by loging into the Data Platform Installer VM via SSH, using the credentials configured earlier.

A built-in post install script automates basic final configuration tasks like enabling HA/DRS on HyperFlex cluster, configuring vmKernel for vMotion interface, creating datastore for ESXi logging, etc., as shown in the following figures.

root@Cisco-HX-Data-Platform-Installer:~# post install Getting ESX hosts from HX cluster... vCenter URL: 10.10.50.20 Enter vCenter username (user@domain): administrator@vsphere.local vCenter Password: Found datacenter VDILAB-HX Found cluster HX-VDI-CL Enable HA/DRS on cluster? (y/n) y Disable SSH warning? (y/n) y Configure ESXi logging onto HX datastore? (y/n) y No datastores found Creating datastore ... Name of datastore: HX-Logs Size (GB): 100 Storing logs on datastore HX-Logs Creating folder [HX-Logs]/esxi logs Add vmotion interfaces? (y/n) y Netmask for vMotion: 255.255.255.0 VLAN ID: (0-4096) 53 vMotion IP for 10.10.50.27: 10.10.53.27 Adding vmotion to 10.10.50.27 Adding vmkernel to 10.10.50.27 vMotion IP for 10.10.50.28: 10.10.53.28 Adding vmotion to 10.10.50.28 Adding vmkernel to 10.10.50.28 vMotion IP for 10.10.50.29: 10.10.53.29 Adding vmotion to 10.10.50.29 Adding vmkernel to 10.10.50.29 vMotion IP for 10.10.50.30: 10.10.53.30 Adding vmotion to 10.10.50.30 Adding vmkernel to 10.10.50.30 vMotion IP for 10.10.50.31: 10.10.53.31 Adding vmotion to 10.10.50.31 Adding vmkernel to 10.10.50.31 vMotion IP for 10.10.50.32: 10.10.53.32 Adding vmotion to 10.10.50.32 Adding vmkernel to 10.10.50.32 vMotion IP for 10.10.50.33: 10.10.53.33 Adding vmotion to 10.10.50.33 Adding vmkernel to 10.10.50.33 vMotion IP for 10.10.50.34: 10.10.53.34 Adding vmotion to 10.10.50.34 Adding vmkernel to 10.10.50.34

```
Add VM network VLANs? (y/n) n
Enable NTP on ESX hosts? (y/n) y
Starting ntpd service on 10.10.50.27
Starting ntpd service on 10.10.50.28
Starting ntpd service on 10.10.50.30
Starting ntpd service on 10.10.50.31
Starting ntpd service on 10.10.50.32
Starting ntpd service on 10.10.50.33
Starting ntpd service on 10.10.50.34
Send test email? (y/n) n
Validating cluster health and configuration...
Found UCSM 10.29.132.11, logging with username admin. Org is hx-vdi-org
UCSM Password:
```

- 1. To run the script, first use your tool of choice to make a secure connection to the Cisco HyperFlex Data Platform installer using it's IP address and port 22.
- 2. Authenticate with the credentials provided earlier. (user name: root with password Cisco 123 if you did not change the defaults.)
- 3. When authenticated, enter post_install at the command prompt, then press Enter.
- 4. Provide a valid vCenter administrator user name and password and the vCenter url IP address.
- 5. Type y for yes to each of the promts that follow except Add VM network VLANs? (y/n) where you can choose whether or not to send health status data via SMS to Cisco support.
- 6. Provide the requested user credentials, the vMotion netmask, VLAN ID and an IP address on the vMotion VLAN for each host when prompted for the vmkernel IP.
- 7. Sample post install input and output:

```
root@Cisco-HX-Data-Platform-Installer:root@Cisco-HX-Data-Platform-
Installer:~#post_install Getting ESX hosts from HX cluster...
vCenter URL: 10.10.40.20
Enter vCenter username (user@domain): administrator@vsphere.local
vCenter Password:
Found datacenter VDILAB-HX
Found cluster HX-VDI-CL
Enable HA/DRS on cluster? (y/n) y
Disable SSH warning? (y/n) y
Configure ESXi logging onto HX datastore? (y/n) y
```

No datastores found Creating datastore... Name of datastore: HX-Logs Size (GB): 100 Storing logs on datastore HX-Logs Creating folder [HX-Logs]/esxi_logs Add vmotion interfaces? (y/n) y Netmask for vMotion: 255.255.255.0 VLAN ID: (0-4096) 43 vMotion IP for 10.10.40.27: 10.10.43.27 Adding vmotion to 10.10.40.27 Adding vmkernel to 10.10.40.27 vMotion IP for 10.10.40.28: 10.10.43.28 Adding vmotion to 10.10.40.28 Adding vmkernel to 10.10.40.28 vMotion IP for 10.10.40.29: 10.10.43.29 Adding vmotion to 10.10.40.29 Adding vmkernel to 10.10.40.29 vMotion IP for 10.10.40.30: 10.10.43.30 Adding vmotion to 10.10.40.30 Adding vmkernel to 10.10.40.30 vMotion IP for 10.10.40.31: 10.10.43.31 Adding vmotion to 10.10.40.31 Adding vmkernel to 10.10.40.31 vMotion IP for 10.10.40.32: 10.10.43.32 Adding vmotion to 10.10.40.32 Adding vmkernel to 10.10.40.32 vMotion IP for 10.10.40.33: 10.10.43.33 Adding vmotion to 10.10.40.33 Adding vmkernel to 10.10.40.33 vMotion IP for 10.10.40.34: 10.10.43.34 Adding vmotion to 10.10.40.34

124

Adding vmkernel to 10.10.40.34 Add VM network VLANs? (y/n) n Enable NTP on ESX hosts? (y/n) y Starting ntpd service on 10.10.40.27 Starting ntpd service on 10.10.40.28 Starting ntpd service on 10.10.40.29 Starting ntpd service on 10.10.40.30 Starting ntpd service on 10.10.40.31 Starting ntpd service on 10.10.40.32 Starting ntpd service on 10.10.40.33 Starting ntpd service on 10.10.40.34 Send test email? (y/n) n Validating cluster health and configuration... Found UCSM 10.29.132.11, logging with username admin. Org is hx-vdi-org UCSM Password: TChecking MTU settings Pinging 10.10.42.107 from vmk1 Pinging 10.10.42.101 from vmk1 Pinging 10.10.42.105 from vmk1 Pinging 10.10.42.108 from vmk1 Pinging 10.10.42.102 from vmk1 Pinging 10.10.42.104 from vmk1 Pinging 10.10.42.106 from vmk1 Pinging 10.10.42.103 from vmk1 Setting vnic2 to active and vmnic3 to standby Pinging 10.10.42.107 from vmk1 Pinging 10.10.42.107 with mtu 8972 from vmk1 Pinging 10.10.42.101 from vmk1 Pinging 10.10.42.101 with mtu 8972 from vmk1 Pinging 10.10.42.105 from vmk1 Pinging 10.10.42.105 with mtu 8972 from vmk1 Pinging 10.10.42.108 from vmk1

Pinging 10.10.42.108 with mtu 8972 from vmk1 Pinging 10.10.42.102 from vmk1 Pinging 10.10.42.102 with mtu 8972 from vmk1 Pinging 10.10.42.104 from vmk1 Pinging 10.10.42.104 with mtu 8972 from vmk1 Pinging 10.10.42.106 from vmk1 Pinging 10.10.42.106 with mtu 8972 from vmk1 Pinging 10.10.42.103 from vmk1 Pinging 10.10.42.103 with mtu 8972 from vmk1 Setting vmnic3 to active and vnic2 to standby Pinging 10.10.40.33 from vmk0 Pinging 10.10.40.27 from vmk0 Pinging 10.10.40.31 from vmk0 Pinging 10.10.40.34 from vmk0 Pinging 10.10.40.28 from vmk0 Pinging 10.10.40.30 from vmk0 Pinging 10.10.40.32 from vmk0 Pinging 10.10.40.29 from vmk0 Setting vnic1 to active and vmnic0 to standby Pinging 10.10.40.33 from vmk0 Pinging 10.10.40.27 from vmk0 Pinging 10.10.40.31 from vmk0 Pinging 10.10.40.34 from vmk0 Pinging 10.10.40.28 from vmk0 Pinging 10.10.40.30 from vmk0 Pinging 10.10.40.32 from vmk0 Pinging 10.10.40.29 from vmk0 Setting vmnic0 to active and vnic1 to standby Pinging 10.10.43.27 from vmk2 Pinging 10.10.43.28 from vmk2 Pinging 10.10.43.29 from vmk2 Pinging 10.10.43.30 from vmk2

Pinging 10.10.43.31 from vmk2 Pinging 10.10.43.32 from vmk2 Pinging 10.10.43.33 from vmk2 Pinging 10.10.43.34 from vmk2 Setting vnic7 to active and vmnic6 to standby Pinging 10.10.43.27 from vmk2 Pinging 10.10.43.27 with mtu 8972 from vmk2 Pinging 10.10.43.28 from vmk2 Pinging 10.10.43.28 with mtu 8972 from vmk2 Pinging 10.10.43.29 from vmk2 Pinging 10.10.43.29 with mtu 8972 from vmk2 Pinging 10.10.43.30 from vmk2 Pinging 10.10.43.30 with mtu 8972 from vmk2 Pinging 10.10.43.31 from vmk2 Pinging 10.10.43.31 with mtu 8972 from vmk2 Pinging 10.10.43.32 from vmk2 Pinging 10.10.43.32 with mtu 8972 from vmk2 Pinging 10.10.43.33 from vmk2 Pinging 10.10.43.33 with mtu 8972 from vmk2 Pinging 10.10.43.34 from vmk2 Pinging 10.10.43.34 with mtu 8972 from vmk2 Setting vmnic6 to active and vnic7 to standby Network Summary: Host: 10.10.40.27 vswitch: vswitch-hx-inband-mgmt - mtu: 1500 - policy: loadbalance srcid vmnic0 - 1 - K22-HXVDI-A - active vmnic1 - 1 - K22-HXVDI-B - standby Portgroup Name - VLAN Storage Controller Management Network - 40 Management Network - 40 vswitch: vswitch-hx-vm-network - mtu: 1500 - policy: loadbalance srcid vmnic4 - 1 - K22-HXVDI-A - active

vmnic5 - 1 - K22-HXVDI-B - active Portgroup Name - VLAN vm-network-44 - 44 vswitch: vmotion - mtu: 9000 - policy: loadbalance srcid vmnic6 - 1 - K22-HXVDI-A - active vmnic7 - 1 - K22-HXVDI-B - standby Portgroup Name - VLAN vmotion - 43 vswitch: vswitch-hx-storage-data - mtu: 9000 - policy: loadbalance srcid vmnic2 - 1 - K22-HXVDI-A - standby vmnic3 - 1 - K22-HXVDI-B - active Portgroup Name - VLAN Storage Controller Data Network - 42 Storage Hypervisor Data Network - 42 Host: 10.10.40.28 vswitch: vswitch-hx-inband-mgmt - mtu: 1500 - policy: loadbalance_srcid vmnic0 - 1 - K22-HXVDI-A - active vmnic1 - 1 - K22-HXVDI-B - standby Portgroup Name - VLAN Storage Controller Management Network - 40 Management Network - 40 vswitch: vswitch-hx-vm-network - mtu: 1500 - policy: loadbalance srcid vmnic4 - 1 - K22-HXVDI-A - active vmnic5 - 1 - K22-HXVDI-B - active Portgroup Name - VLAN vm-network-44 - 44 vswitch: vmotion - mtu: 9000 - policy: loadbalance srcid vmnic6 - 1 - K22-HXVDI-A - active vmnic7 - 1 - K22-HXVDI-B - standby Portgroup Name - VLAN vmotion - 43 vswitch: vswitch-hx-storage-data - mtu: 9000 - policy: loadbalance srcid

```
vmnic2 - 1 - K22-HXVDI-A - standby
      vmnic3 - 1 - K22-HXVDI-B - active
       Portgroup Name - VLAN
       Storage Controller Data Network - 42
        Storage Hypervisor Data Network - 42
Host: 10.10.40.29
   vswitch: vswitch-hx-inband-mgmt - mtu: 1500 - policy: loadbalance srcid
      vmnic0 - 1 - K22-HXVDI-A - active
      vmnic1 - 1 - K22-HXVDI-B - standby
       Portgroup Name - VLAN
       Storage Controller Management Network - 40
       Management Network - 40
   vswitch: vswitch-hx-vm-network - mtu: 1500 - policy: loadbalance srcid
      vmnic4 - 1 - K22-HXVDI-A - active
      vmnic5 - 1 - K22-HXVDI-B - active
       Portgroup Name - VLAN
       vm-network-44 - 44
   vswitch: vmotion - mtu: 9000 - policy: loadbalance srcid
      vmnic6 - 1 - K22-HXVDI-A - active
     vmnic7 - 1 - K22-HXVDI-B - standby
       Portgroup Name - VLAN
       vmotion - 43
   vswitch: vswitch-hx-storage-data - mtu: 9000 - policy: loadbalance srcid
      vmnic2 - 1 - K22-HXVDI-A - standby
      vmnic3 - 1 - K22-HXVDI-B - active
       Portgroup Name - VLAN
       Storage Controller Data Network - 42
        Storage Hypervisor Data Network - 42
Host: 10.10.40.30
  vswitch: vswitch-hx-inband-mgmt - mtu: 1500 - policy: loadbalance srcid
     vmnic0 - 1 - K22-HXVDI-A - active
      vmnic1 - 1 - K22-HXVDI-B - standby
```

Portgroup Name - VLAN Storage Controller Management Network - 40 Management Network - 40 vswitch: vswitch-hx-vm-network - mtu: 1500 - policy: loadbalance srcid vmnic4 - 1 - K22-HXVDI-A - active vmnic5 - 1 - K22-HXVDI-B - active Portgroup Name - VLAN vm-network-44 - 44 vswitch: vmotion - mtu: 9000 - policy: loadbalance srcid vmnic6 - 1 - K22-HXVDI-A - active vmnic7 - 1 - K22-HXVDI-B - standby Portgroup Name - VLAN vmotion - 43 vswitch: vswitch-hx-storage-data - mtu: 9000 - policy: loadbalance srcid vmnic2 - 1 - K22-HXVDI-A - standby vmnic3 - 1 - K22-HXVDI-B - active Portgroup Name - VLAN Storage Controller Data Network - 42 Storage Hypervisor Data Network - 42 Host: 10.10.40.31 vswitch: vswitch-hx-inband-mgmt - mtu: 1500 - policy: loadbalance srcid vmnic0 - 1 - K22-HXVDI-A - active vmnic1 - 1 - K22-HXVDI-B - standby Portgroup Name - VLAN Storage Controller Management Network - 40 Management Network - 40 vswitch: vswitch-hx-vm-network - mtu: 1500 - policy: loadbalance srcid vmnic4 - 1 - K22-HXVDI-A - active vmnic5 - 1 - K22-HXVDI-B - active Portgroup Name - VLAN vm-network-44 - 44 vswitch: vmotion - mtu: 9000 - policy: loadbalance srcid

```
vmnic6 - 1 - K22-HXVDI-A - active
     vmnic7 - 1 - K22-HXVDI-B - standby
       Portgroup Name - VLAN
       vmotion - 43
   vswitch: vswitch-hx-storage-data - mtu: 9000 - policy: loadbalance srcid
      vmnic2 - 1 - K22-HXVDI-A - standby
     vmnic3 - 1 - K22-HXVDI-B - active
       Portgroup Name - VLAN
       Storage Controller Data Network - 42
       Storage Hypervisor Data Network - 42
Host: 10.10.40.32
  vswitch: vswitch-hx-inband-mgmt - mtu: 1500 - policy: loadbalance srcid
     vmnic0 - 1 - K22-HXVDI-A - active
     vmnic1 - 1 - K22-HXVDI-B - standby
       Portgroup Name - VLAN
       Storage Controller Management Network - 40
       Management Network - 40
   vswitch: vswitch-hx-vm-network - mtu: 1500 - policy: loadbalance srcid
      vmnic4 - 1 - K22-HXVDI-A - active
     vmnic5 - 1 - K22-HXVDI-B - active
       Portgroup Name - VLAN
       vm-network-44 - 44
   vswitch: vmotion - mtu: 9000 - policy: loadbalance srcid
      vmnic6 - 1 - K22-HXVDI-A - active
      vmnic7 - 1 - K22-HXVDI-B - standby
       Portgroup Name - VLAN
       vmotion - 43
   vswitch: vswitch-hx-storage-data - mtu: 9000 - policy: loadbalance srcid
     vmnic2 - 1 - K22-HXVDI-A - standby
     vmnic3 - 1 - K22-HXVDI-B - active
       Portgroup Name - VLAN
        Storage Controller Data Network - 42
```

Storage Hypervisor Data Network - 42 Host: 10.10.40.33 vswitch: vswitch-hx-inband-mgmt - mtu: 1500 - policy: loadbalance srcid vmnic0 - 1 - K22-HXVDI-A - active vmnic1 - 1 - K22-HXVDI-B - standby Portgroup Name - VLAN Storage Controller Management Network - 40 Management Network - 40 vswitch: vswitch-hx-vm-network - mtu: 1500 - policy: loadbalance srcid vmnic4 - 1 - K22-HXVDI-A - active vmnic5 - 1 - K22-HXVDI-B - active Portgroup Name - VLAN vm-network-44 - 44 vswitch: vmotion - mtu: 9000 - policy: loadbalance srcid vmnic6 - 1 - K22-HXVDI-A - active vmnic7 - 1 - K22-HXVDI-B - standby Portgroup Name - VLAN vmotion - 43 vswitch: vswitch-hx-storage-data - mtu: 9000 - policy: loadbalance_srcid vmnic2 - 1 - K22-HXVDI-A - standby vmnic3 - 1 - K22-HXVDI-B - active Portgroup Name - VLAN Storage Controller Data Network - 42 Storage Hypervisor Data Network - 42 Host: 10.10.40.34 vswitch: vswitch-hx-inband-mgmt - mtu: 1500 - policy: loadbalance_srcid vmnic0 - 1 - K22-HXVDI-A - active vmnic1 - 1 - K22-HXVDI-B - standby Portgroup Name - VLAN Storage Controller Management Network - 40 Management Network - 40 vswitch: vswitch-hx-vm-network - mtu: 1500 - policy: loadbalance srcid

vmnic4 - 1 - K22-HXVDI-A - active vmnic5 - 1 - K22-HXVDI-B - active Portgroup Name - VLAN vm-network-44 - 44 vswitch: vmotion - mtu: 9000 - policy: loadbalance srcid vmnic6 - 1 - K22-HXVDI-A - active vmnic7 - 1 - K22-HXVDI-B - standby Portgroup Name - VLAN vmotion - 43 vswitch: vswitch-hx-storage-data - mtu: 9000 - policy: loadbalance_srcid vmnic2 - 1 - K22-HXVDI-A - standby vmnic3 - 1 - K22-HXVDI-B - active Portgroup Name - VLAN Storage Controller Data Network - 42 Storage Hypervisor Data Network - 42 Host: 10.10.40.27 No errors found Host: 10.10.40.28 No errors found Host: 10.10.40.29 No errors found Host: 10.10.40.30 No errors found Host: 10.10.40.31 No errors found Host: 10.10.40.32 No errors found Host: 10.10.40.33 No errors found Host: 10.10.40.34

No errors found

```
Controller VM Clocks:
    stCtlVM-FCH1937V2JV - 2016-10-07 05:32:09
    stCtlVM-FCH1937V2TV - 2016-10-07 05:32:25
    stCtlVM-FCH1842V1JG - 2016-10-07 05:32:41
    stCtlVM-FCH1936V0GE - 2016-10-07 05:32:57
    stCtlVM-FCH1937V2JT - 2016-10-07 05:33:14
    stCtlVM-FCH1938V085 - 2016-10-07 05:33:30
    stCtlVM-FCH1937V2TS - 2016-10-07 05:33:46
    stCtlVM-FCH1937V2JU - 2016-10-07 05:34:02
Cluster:
    Version - 1.8.1c-19725
    Model - HX240C-M4SX
    Health - HEALTHY
    Access Policy - LENIENT
    ASUP enabled - False
    SMTP Server -
root@Cisco-HX-Data-Platform-Installer:~#
```

- 8. Login to vSphere WebClient to create additional shared datastore.
- 9. Go to the Summary tab on the cluster created via the HyperFlex cluster creation workflow.

10. On Cisco HyperFlex Systems click the cluster name.

vmware [®] vSphere Web Cli	ent π ≘			Updated at 1:24 PM 👌 Administrator@VSPHERE.LOCAL +	Help + 🔍	Search
Navigator I	HX-VDI-CL Actions	-				= 2
(I Home) 🕲	Summary Monitor Ma	anage Related Objects				0) W
Image: Control of the state of th	HX.1 Total Total	/DL-CL Processors: 448 vMotion Migrations: 5082			CPU USED: 200, 03 GHz MEMORY USED: 3.39 TB STORAGE USED: 1.34 TB	FREE: 804 73 GHz CAPACITY: 1.16 TH2 FREE: 4.61 TB CAPACITY: 8.00 TB FREE: 00.06 TB CAPACITY: 70.00 TB
10.10.40.29 10.10.40.30 10.10.40.31 10.10.40.32 10.10.40.33 10.10.40.34	Cluster Resources Tags Cisco HyperFlex Sy	stems				
10.10.40.35	Name	🖞 СЗ-НХ-УДІ 🗲 ——	More Related Objects			
10.10.40.36 10.10.40.37	Capacity	61.60 TB	vSphere HA			
10.10.40.38	Free	59.69 TB				
0.10.40.39 0.10.40.40 0.10.40.41 0.10.40.41 0.10.40.42 ♥ (3.1221) Yihai Machines (3.14.42, 10.10, 10.10) (3.14.42, 10.10) (3.14.4	→ Savings Total Savings	99.44%				

The Summary tab shows the details about the cluster status, capacity, and performance.

vmware [,] vSphere Web Cli	ent † ≘					Updated at 5:51 PM 👌 Administrator@VSPHER	E.LOCAL → Help →
Navigator I	C3-HX-VDI Actions	-					
Center Inventory L > 3	Getting Started Sumn	ary Monitor Manage					
💱 Cisco HX Data Platform	C3-h Total Data Vers Mode V c c	XVOI ① Notes: 16 tors: 11 on: 1.8 (1c) t: HOL40F0:M45X:UC58-8260-M4 haster: HO-VDI-CL grade Cluster:				STORAGE USED 1.99 TB OPERATIONAL STATUS CONVERGED NODES 8 RESILENCY STATUS 2 NOST FAILURES) CAN BU	FREE 60.51 TB CAPACITY 61.60 TB ONLINE CONTROLLERS 16 HEALTHY E TOLERATED
	* Status			· Performance			
	Operational Status	Online		* IOPS	•		
	▶ Resiliency Status	Healthy	0	Current	14.90/37.30		
	Last Updated	1/31/2017 5:51:25 PM		Past Hour	5000 - Read Write		
	▶ Converged Nodes	8 Hosts online 8 Controllers online	0		4000 - Winter Battern		
	+ Compute Nodes						
	- Capacity				16:51 17:01 17:11 17:21 17:31 17:41 17:51		
	Total	Free Used		 	0.03/0.11 (MBps)		
	Usable Capacity	61.60 TB					
	Used	1.09 TB					
	Free	60.51 TB					
	Provisioned	70.00 TB		- Latency	10.01 17.01 17.11 17.21 17.31 17.41 17.51		
	Over Provisioned	8.40 TB		Current	0.03/0.70 (msec)		
				Past Hour	6 Read = Write I		
	Total Savings	89.59%			1 4		
	Compression	55.63%			E ANDADA MANANA AND AND AND AND AND AND AND AND AN		
	Deduplication	76.55%	d		3		

11. Click Manage, select Datastores. Click the Add datastore icon, select the datastore name and size to provision.

Navigator	I HX-Cluster Actions -		Create New Datastore	×	
 vCenter Inventory L → 	Summary Monitor Manage				
Cisco HX Data Platform	Cluster Datastores		Datastore name: HX-C3		
HX-Cluster			Size: 70.00		(0 ===
	E C SQ: Actions -		360.		
	Name	Mount Status		Used	Free
					0 of 0
	Summary Hosts				
	Summary Hosts				
	Details	Trends			
	Total	IOPs	100 —		
			80		
	Status		60		
	Provisioned		S S		
	Used		40		
	Free		20 -		
	Hosts 0				
	VMs 0		0		
			10.00	10.01	
	Top VMs by Disk Usage				
	Name	Size			

We created a 70TB datastore for the Horizon pooled, persistent/non-persistent, and RDSH server desktop performance test.

Building the Virtual Machines and Environment for Workload Testing

This section details how to configure the software infrastructure components that comprise this solution.

Horizon 7 Infrastructure Components Installation

The prerequisites for installing the view connection server, replica server(s) and composer server is to have Windows 2008, 2012 or 2012 R2 virtual machines ready.

In this study, we used Windows Server 2012 R2 virtual machines for all Horizon infrastructure servers.

Download the VMware Horizon 7 installation package from this link: https://my.vmware.com/web/vmware/info?slug=desktop_end_user_computing/vmware_horizon/7_0

This subsection provides a detailed, step-by-step installation process for Horizon 7 v7.0.1.

Install VMware Horizon Composer Server

To install the VMware Horizon Composer Server, complete the following steps:

- 1. Open installer for Horizon composer. VMware-viewcomposer-7.0.1-3978853.exe
- 2. Click Next to continue.



3. Accept the EULA. Click Next.

岁 VMware Horizon 7 Composer	x
License Agreement Please read the following license agreement carefully.	P
VMWARE END USER LICENSE AGREEMENT	^
PLEASE NOTE THAT THE TERMS OF THIS END USER LICENSE AGREEMENT SHALL GOVERN YOUR USE OF THE SOFTWARE, REGARDLESS OF ANY TERMS THAT MAY APPEAR DURING THE INSTALLATION OF THE SOFTWARE.	×
 I accept the terms in the license agreement; I do not accept the terms in the license agreement 	
InstallShield <u>Back N</u> ext > C	ancel

4. Click Next to accept the default installation folder.

閿	VMware Horizon 7 Composer
Destinati Click Ne:	ion Folder xt to install to this folder, or click Change to install to a different folder.
	Install VMware Horizon 7 Composer to: C:\Program Files (x86)\VMware\VMware View Composer\ Change
InstallShield -	< Back Next > Cancel

5. Enter the database information. The ODBC database can be configured during the installation by clicking ODBC DSN Setup.

9	VMware Horizon 7 Com	poser
Databas Enter a	se Information additional database configuration information.	
Enter t the DSI	he Data Source Name (DSN) for the VMware Horizon N click the ODBC Setup button.	7 Composer database. To set up
Horizo	onComposer	ODBC DSN Setup
Enter t Horizo	the username that you entered in the ODBC Data So onService	urce Administrator.
Enter t Horizo	the username that you entered in the ODBC Data So onService the password for this database connection.	urce Administrator.
Enter t Horizo Enter t	the username that you entered in the ODBC Data So onService the password for this database connection.	urce Administrator.
Enter t Horizo Enter t	the username that you entered in the ODBC Data So onService the password for this database connection.	urce Administrator.

Configure the ODBC Source Name

1. Open 64bit ODBC, select System DSN tab and click Add.

ODBC Data Source Administrator (64-bit)	
User DSN System DSN File DSN Drivers Tracing Connection Pooling About	
System Data Sources:	
Name Platform Driver	Add
	Remove
	Configure
An ODBC System data source stores information about how to connect to the A System data source is visible to all users on this machine, including NT server	e indicated data provider. vices.
OK Cancel	Apply Help

2. Create new Data source, select SQL server native client. We are using an existing instanace of the Mircosoft SQL server 2012 for the current deployment. Click Finish.

	N	lame OL Server		Version	Com
011		QL Server Native C	lient 11.0	2011.110.2100.60	Micro
	-				
	<	III			>

3. Create a name for data source, select SQL server, click Next.

	Create a New Data Source to SQL Server
SOL Server 2012	This wizard will help you create an ODBC data source that you can use to connect to SQL Server. What name do you want to use to refer to the data source?
	Name: HorizonComposer How do you want to describe the data source?
	Description:
	Server: SQL01.vdilab-hc.local
	Finish Next > Cancel Hole
	Finish Next > Cancel Help

4. Enter the login credentails for the SQL server authentication or use Windows Authentication. Click Next.

	Create a New Data Source to SQL Server
SQL Server 2012	How should SQL Server verify the authenticity of the login ID? O With Integrated Windows authentication. SPN (Optional): With SQL Server authentication using a login ID and password entered by the
	Login ID: HorizonService Password: ••••••
	< <u>B</u> ack <u>N</u> ext > Cancel Help

5. Select Default Database, click Next.

No.	Change the default database to:	
and the second s	HorizonComposer	Y
SQL Server 2012	Mirror server:	
	SPN for mirror server (Optional):	
	Attach database filename:	
	✓ Use ANSI quoted identifiers.	
	Use ANSI nulls, paddings and warnings.	
	Application intent:	
	READWRITE	~
	Multi-subnet failover.	

6. Check the box to select language for SQL server system messages. Click Finish.

SQL Server 2012		
	Use strong encryption for data	
	Perform translation for character data	1.11
	Use regional settings when outputting currency, numbers, da	ates and times.
	Save long running queries to the log file:	
	C:\Users\ADMINI~1\AppData\Local\Temp\1\QUEI	Browse
	Long query time (milliseconds): 300	00
	Log ODBC driver statistics to the log file:	
	C:\Users\ADMINI~1\AppData\Local\Temp\1\STA1	Browse

- 7. Click Test datastore to verify connectivity between SQL server and newly create Data source.
- 8. Since this a new instanace of Composer server installation, a new SSL certificate will be created. In case of update or existing composer server installation either create new SSL certificate or use existing certificate.
- 9. Leave default port configuration for SOAP port.
- 10. Click Next.

谩	VMware Horizon 7 Composer	x
VMware Horiz Enter the cor	zon 7 Composer Port Settings nnection information for the VMware Horizon 7 Composer.	P
Specify the we	b access port and security settings for VMware Horizon 7 Composer.	
SOAP Port:	18443	
SSL Certificate	: No SSL certificates were found on your machine. A default SSL certificate will be created for you.	
InstallShield ——	< Back Next > C	ancel

11. Click Install.

闄	VMware Horizon 7 Composer
R	The wizard is ready to begin installation.
	VMware Horizon 7 Composer will be installed in:
	C:\Program Files (x86)\VMware\VMware View Composer\
	If you want to review or change any of your installation settings, click Back. Click Install to begin the installation or Cancel to exit the wizard.
Inst	allShield < Back Install Cancel

12. Click Finish.

岁 VN	Iware Horizon 7 Composer	x
	Installer Completed The installer has successfully installed VMware Horizon 7 Composer. Click Finish to exit the wizard.	
vMware Horizon™7 Composer ല്₽c⊚ഈ		
	< Back Finish Cancel	

Install Horizon Connection/Replica Servers

To install the Horizon Connection/Replica Servers, complete the following steps:

- 1. Open view connection server installation, VMware-viewconnectionserver-x86_64-7.0.1-3988955.exe.
- 2. Click Next.
| 岁 VMwar | e Horizon 7 Connection Server |
|--|--|
| P | Welcome to the Installation Wizard for
VMware Horizon 7 Connection Server |
| | The installation wizard will install VMware Horizon 7 Connection
Server on your computer. To continue, click Next. |
| VMware Horlzon™7
Connection
Server | Copyright (c) 1998-2016 VMware, Inc. All rights reserved. This
product is protected by U.S. and international copyright and
intellectual property laws. VMware products are covered by
one or more patents listed at
http://www.vmware.com/go/patents. |
| Product version: 7.0.1-3988955 | x64 < Back Next > Cancel |

3. Accpet the EULA, click Next.

闄	VMware Horizon 7 Connection Server	x
License Please	e Agreement read the following license agreement carefully.	₽Ъ
VMW	ARE END USER LICENSE AGREEMENT	^
PLEA LICEN THE S MAY SOFT	ASE NOTE THAT THE TERMS OF THIS END USER NSE AGREEMENT SHALL GOVERN YOUR USE OF SOFTWARE, REGARDLESS OF ANY TERMS THAT APPEAR DURING THE INSTALLATION OF THE IWARE.	>
● I acce	ept the terms in the license agreement	
○ I do n	not accept the terms in the license agreement	
	< Back Next > Can	cel

4. Leave default destination folder, click Next.

₿	VMware Horizon 7 Connection Server
Destin Click I	ation Folder Next to install to this folder, or click Change to install to a different folder.
	Install VMware Horizon 7 Connection Server to: C:\Program Files\VMware\VMware View\Server\ Change
	< Back Next > Cancel

- 5. Select type of instance intended to install.
- 6. Select Standard Server instance for primary connection server installation.

e VN	VMware Horizon 7 Connection Server		
Installation Options			
Select the type of Horiz	on 7 Connection Server instance you want to install.		
Select the type of Horizo	on 7 Connection Server instance you want to install.		
Horizon 7 Standard Ser	ver		
Horizon 7 Replica Serve Horizon 7 Security Serv Horizon 7 Enrollment Se	er Install HTML Access er erver		
Specify what IP protoco	e first instance of a group of servers. I version shall be used to configure this Horizon 7 Connection Server		
IPv4	This server will be configured to choose the IPv4		
IPv6	protocol for establishing all connections.		
	< Back Next > Cancel		

7. Select Replica server instance for fault tolerant connection server configration after completion of Standard Server instance installation.

🛃 VMware	Horizon 7 Connection Server
Installation Options Select the type of Horizon 7 Con	nection Server instance you want to install.
Select the type of Horizon 7 Con	nection Server instance you want to install.
Horizon 7 Standard Server Horizon 7 Replica Server Horizon 7 Security Server Horizon 7 Enrollment Server	✓ Install HTML Access
second or subsequent server in a directory configuration. Specify what IP protocol version instance:	shall be used to configure this Horizon 7 Connection Server
IPv4 IPv6	This server will be configured to choose the IPv4 protocol for establishing all connections.
	< Back Next > Cancel

8. Enter the Data Recovery Password.

👸 VMware Horiz	zon 7 Connection Server
Data Recovery Enter data recovery password details.	6
This password protects data backups of y will require entry of this password.	our Horizon 7 Connection Server. Recovering a backup
Enter data recovery password:	•••••
Re-enter password:	•••••
Enter password reminder (optional):	Default
-	< Back Next > Cancel

9. Click Next.

₿	VMware Horizon 7 Connection Server
Firewal Autom conne	Il Configuration natically configure the Windows Firewall to allow incoming TCP protocol ctions.
In ord ports for th (JMS- 8443	der for Horizon 7 Connection Server to operate on a network, specific incoming TCP must be allowed through the local Windows Firewall service. The incoming TCP ports the Standard Server are 8009 (AJP13), 80 (HTTP), 443 (HTTPS), 4001 (JMS), 4002 -SSL), 4100 (JMSIR), 4101 (JMSIR-SSL), 4172 (PCoIP), 8472 (Inter-pod API), and (HTML Access). UDP packets on port 4172 (PCoIP) are allowed through as well.
	 Configure Windows Firewall automatically Do not configure Windows Firewall
	< Back Next > Cancel

10. Select authorized users and group, click Next.

9	VMware Horizon 7 Connection Server
Initial Speci	Horizon 7 Administrators fy the domain user or group for initial Horizon 7 administration.
To login Administ allowed	to Horizon 7 Administrator, you will need to be authorized. Select the local trators group option or enter the name of a domain user or group that will be initially to login and will be granted full admistrative rights.
The list Administ	of authorized administrator users and groups can be changed later in Horizon 7 trator.
C	Authorize the local Administrators group
() Authorize a specific domain user or domain group
	VDILAB-VS\administrator
	, (domainname\username, domainname\groupname or UPN format)
	< Back Next > Cancel

- 11. Opt-in or Opt-out of User Experience Improvement Program.
- 12. Click Next.

뤙	VMware Horizon 7 Conn	ection Server	x
User Expension Basic Cust	rience Improvement Program tomer Demographics		P
VMware is co help us in thi completely a about it visit button.	onstantly trying to improve the user experie s effort by agreeing to send product usage nonymous, and is restricted to product usage the VMware user experience improvement	nce of our products. You can statistics. This data is ge metrics. For more details web page by clicking the ''	
🗌 Particip	pate anonymously in the user experience im	provement program	
Select your (organization industry type:		~
Select locatio	on of your organization's headquarter:		~
Select appro	ximate number of employees:		¥.
			3
	< Back	Next > C	ancel

13. Click Install.

谩	VMware Horizon 7 Connection Server
Ready to The wiza	Install the Program rd is ready to begin installation.
VMware	Horizon 7 Connection Server will be installed in:
C:\Prog	ram Files\VMware\VMware View\Server\
Click Ins	all to begin the installation or Cancel to exit the wizard.
	< Back Install Cancel

14. Click Finish.



Create a Microsoft Management Console Certificate Request

To generate a Horizon View SSL certificate request, use the Microsoft Management Console (MMC) Certificates snap-in:

https://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=206 8666

Configure the Horizon 7 Environment

To configure the Horizon 7 environment, complete the following steps:

1. Open WebUI, Login to https://<Horizon_Connection_server_Management_IP_Address>/admin.



Configure Event Database

To configure the Event Database, complete the following steps:

- 1. Configure the Event Database by adding Database Server, Database name, login credentials and prefix for the table from the Horizon 7 Administrator, View Configuration, Event Configuration node of the Inventory pane.
- 2. Click Edit in the action pane.

VMware Horizon 7 Adm				
Updated 11/30/2016 1:25 PM	Event Configuration			
Socions	a rem comigaration			
Problem vCenter VMs	Filent Database	Surlag		
Problem RDS Hosts 0		Oranfor		
Events 🔶 0 🛕 0	LOIT	recom	nended.	iyying using one or
System Health 🔲 🔲 💽	No database has been defined, events will not be recorded. Click 'Edit' to specify a database server.			
3010	Funct Sattings	Send t	o syslog servers:	Add
Inventory				
Operhaud	Event settings cannot be configured until a database server has been specified.			
Sa Dashboard				
► Catalog				
V Resources		Log to	file:	📃 Enable
Farms		Copy t	o location:	Add
🗿 Machines				
🔜 Persistent Disks	Edit Event Database			
► Monitoring				
► Policies	Database server:			
View Configuration	Database type: Microsoft	t SQL Server 🛛 🔻		
Servers				
Product Licensing and Usage	Port: 1433			
Global Settings	Database name:			
Registered Machines				
Administrators	User name:			
ThinApp Configuration	Password			
Cloud Pod Architecture				
Event Configuration	Confirm password:			
	Table profiv			
		.i)		

Details are shown below:

Edit Event Database	
Database server:	SQL01
Database type:	Microsoft SQL Server 🗸 –
Port:	1433
Database name:	HorizonEvent
User name:	HorizonAgent
Password:	****
Confirm password:	****
Table prefix:	VE_
	OK Cancel

Configure Horizon 7 Licenses

To configure the Horizon 7 licenses, complete the following steps:

1. Click View Configuration.

- 2. Select Product Licensing and Usage.
- 3. Click Edit License in the action pane.
- 4. Add the License Serial Number.
- 5. Click OK.

Updated 11/30/2016 1:25 PM 没	Licensing and Usage				
Sessions 0 Problem vCenter VMs 0 Problem RDS Hosts 0	Licensing				Customer Experience Program
Events 0 0 A 0 System Health	Edit License				Edit Settings
3 0 1 0	🔥 No valid license present for View	Manager. Click Edit to add a valid li	cense.		Send anonymous data to VMware Off
Inventory					Geographic Location:
Dashhoard					Business Vertical:
👸 Users and Groups					Number of Employees:
▶ Catalog					
▼ Resources	Usage				
👪 Farms	usaye				
The standard second					
🚰 Machines 🚐 Persistent Disks	Reset Highest Count Reset Named U	Isers Count		æ	
 B Machines ■ Persistent Disks Monitoring 	Reset Highest Count Reset Named U	Isers Count	Hisbar	2	
 Machines □ Persistent Disks Monitoring Policies 	Reset Highest Count Reset Named L Session Mode	Current	Highes	<i>2</i>	
 Machines Mensistent Disks Monitoring Policies ¥ View Configuration 	Reset Highest Count Reset Named L Session Mode Total Concurrent Connections Total Named Licers	Isers Count Current 0 1	0 N/A	2 ⁹	
Machines Machines Persistent Disks Nonitoring Policies View Configuration Servers Instant Clear Density Admine	Reset Highest Count Reset Named L Session Mode Total Concurrent Connections Total Named Users Detailed Connection Breakdown	Isers Count Current 0 1	U Highes	¢	
Machines Persistent Disks Nonitoring Policies View Configuration Servers Instant Clone Domain Admins Product Licensing and Usage	Reset Highest Count Reset Named L Session Mode Total Concurrent Connections Total Named Users Detailed Connection Breakdown Total Remote	Isers Count Current 0 1 0 0	0 N/A Edit License	æ	
Machines Machines Persistent Disks Monitoring Policies View Configuration Servers Instant Clone Domain Admins Product Litensing and Usage Global Settings	Reset Highest Count Reset Named L Session Mode Total Concurrent Connections Total Named Users Detailed Connection Breakdown Total Remote Active - full virtual machines	Isers Count Current 0 1 0	Highes 0 N/A Edit License	<i>æ</i>	
Machines Machines Persistent Disks Monitoring Policices View Configuration Servers Instant Clone Domain Admins Product Licensing and Usage Global Settings Registered Machines	Reset Highest Count Reset Named L Session Mode Total Concurrent Connections Total Named Users Detailed Connection Breakdown Total Remote Active - full virtual machines Active - linked clone Active - linked clone	Isers Count Current Current 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Highes 0 N/A Edit License License serial number: •	æ :	
Machines Machines Machines Prosistent Disks Nonitoring Policies View Configuration Servers Instant Clone Domain Admins Product Licensing and Usage Global Settings Registered Machines Administrators	Reset Highest Count Reset Named L Session Mode Total Concurrent Connections Total Named Users Detailed Connection Breakdown Total Remote Active - full virtual machines Active - full virtual machines Active - other machine sources	Isers Count Current Current O O O O O O O O O O O O O O O O O O O	U Highes 0 N/A Edit License License serial number: *	æ	
Machines Ma	Reset Highest Count Reset Named L Session Mode - Total Concurrent Connections - Total Named Users - Detailed Connection Breakdown - Total Remote - Active - full virtual machines - Active - inked clone - Active - other machine sources - Active - applications -	Isers Current	U Highes 0 N/A Edit License License serial number: *	2	OK Cancel

Configure vCenter

To configure the vCenter, complete the following steps:

- 1. In View Configuration, Select Servers. Click Add vCenter Server tab.
- 2. Enter vCenter Server IP Address or FQDN, login credentials.
- 3. Advanced Settings options can be modified to change existing operations limit. Keep the advanced settings options as default.

	vContor Sorver Infor	mation	
Add vCenter Server	VCenter Server Infor		uContor Soruer Settings
Vermonnauon	vCenter Server Sett	tings	vcenter server settings
Storage	Server address:	vcsa6u2.vdilab-vs.local	Before you add vCenter Server to View, install a valid SSL certificate
Ready to Complete	User name:	administrator@vsphere.local	environment, you can use the
	Password:	*****	installed with vCenter Server, but
	Description:		you must accept the certificate thumbprint.
	Port:	443	Provide the vCenter Server FQDN or IP address, user name, and password.
	Advanced Settings		Concurrent Operations Limits
	Specify the concurrer	nt operation limits.	Max concurrent vCenter provisioning
	Max concurrent vCen provisioning operatio	ons: 20	concurrent VM cloning and deletion operations on this vCenter server
	Max concurrent powe operations:	er 50	(full clones).
	Max concurrent View		the maximum number of concurrent
	Composer maintenar	nce 12	VM power-on, power-off, reset, and
	operations:		and linked clones).
	Max concurrent View Composer provisioni	8	Maria and a state of the Company
	operations:		max concurrent view Composer maintenance operations: the
	May consurrent Insta	unt Clana	maximum number of concurrent View

4. Click View certificate. Accept the certificate.

Add vCenter Server				
Add vCenter Server	vCenter Sei	rver Informatio	on	
VC Information	vCenter Se	rver Settings		vCenter Server Settings
View Composer Storage Ready to Complete	Server addr	ress:	vcsa6u2.vdilab-vs.local	Before you add vCenter Server to View, install a valid SSL certificate signed by a trusted CA. In a test
	- Coser manner.		administrator@vspriere.iotar	environment, you can use the default, self-signed certificate that is
	Password	Invalid Certifi	cate Detected	installed with vCenter Server, but
	Descriptio		11/30/2016 1:30 PM	you must accept the certificate thumbprint.
	Port:	The identity o verified for the	f the specified vCenter Server cannot be e following reasons:	Provide the vCenter Server FQDN or IP address, user name, and password.
	Advanced	▲ Server's (certificate subject name does not match the	Concurrent Operations Limits
	Specify th	A Server's	certificate cannot be checked.	Max concurrent vCenter provisioning operations: the maximum number of
	Max concl provisioni	VMware recor trusted Certifi	nmends the use of certificates signed by a ication Authority.	concurrent VM cloning and deletion operations on this vCenter server (full clones).
	operation			
	Max concu Composer r operations:	maintenance	View Certificate Cancel	Max concurrent power operations: the maximum number of concurrent VM power-on, power-off, reset, and configuration operations (full clones and linked clones)
	Max concur Composer p operations:	rent View provisioning	8	Max concurrent View Composer maintenance operations: the maximum number of concurrent View
				Next > Cancel

- 5. Add View composer settings, View composer server FQDN or Management IP address, login credentials.
- 6. Click Next.

Add vCenter Server	View Composer			F
VC Information	View Composer Set	tings	View Composer Settings	L
View Composer View Composer Domains Storage Ready to Complete	 Do not use View (View Composer of Choose this if View Port: 18443 Standalone View Choose this if View vCenter Server address: User name: Password: Port: 	Composer p-installed with vCenter Server w Composer is installed on the same server as vCenter Composer Server w Composer is installed on a separate server from vh-comp.vdilab-vs.local administrator ******** 18443	View Composer can be installed on the vCenter Server host or a standalone host. Before you add View Composer to View, install a valid SSL certificate signed by a trusted CA. In a test environment, you can use the default, self-signed certificate that is installed with View Composer, but you must accept the certificate thumbprint.	

7. View and accept the certificate.



- 8. Click Add a new domain or Edit the existing domain.
- 9. Click Next.

Add vCenter Server	View Composer Doma	View Composer Domains		
VC Information	View Composer Dom	ains		View Composer Domains
View Composer View Composer Domains	Add Edit	Remove		View Composer adds computer accounts for linked-clone
Storage Ready to Complete	Domains	User	Desktop Pool	configured here. The View
Ready to complete	vdilab-vs.local	administrator		Composer user accounts for the
				Computer Objects, Delete
				Computer Objects, and Write Al Properties permissions in the
				domains.
				When you create a linked-clone
				desktop pool, you select a
				domain from this list to store the computer accounts.

- 10. In Storage settings, select Reclaim VM disk space and View Storage Accelarator.
- 11. Configure default host cache size between 100MB and 2048MB. We configured the maximum, which is 2048MB.
- 12. Click Next.

Add vCenter Server			
Add vCenter Server	Storage		_
VC Information	Storage Settings		Storage Settings
View Composer View Composer Domains Storage	☑ Reclaim VM disk space		ESXi hosts can be configured to cache virtual machine disk data, which improves performance
Ready to Complete	🗹 Enable View Storage Accelerator		during I/O storms such as when
	Default host cache size: 2048	MB	anti-virus scans at once. Hosts
	Cache must be between 100 MB ar	nd 2048 MB	read common data blocks from cache instead of reading the OS
	Hosts		from disk.
	Show all hosts		By reducing IOPS during boot storms, View Storage Accelerator
	Edit cache size		lowers the demand on the
	Host	Cache Size	storage I/O bandwidth.
	/VDILAB-VS/host/VDI-GPU/10.10.10.	Default	Disk Space Reclamation
	/VDILAB-VS/host/VDI-GPU/10.10.10.1	Default	With vSphere 5.x, virtual
	/VDILAB-VS/host/VDI-Infra-CL/10.10	Default	machines can be configured to
	/VDILAB-VS/host/VDI-Infra-CL/10.10	Default	that supports reclamation of
	/VDILAB-VS/host/VDI-Launchers/10.:	Default	unused disk space (such as deleted files). This option reclaims
	/VDILAB-VS/host/VDI-Launchers/10.:	Default #	unused disk space on each virtual
	/VDILAB-VS/host/VDI-VSAN/10.10.10	Default	machine. The operation is
	/VDILAB-VS/host/VDI-VSAN/10.10.10	Default	used disk space exceeds the
	/VDILAB-VS/host/VDI-VSAN/10.10.10	Default	specified threshold.
			< Back Next > Cancel

13. Review Add vCenter Server settings, click Finish.

Add vCenter Server		
Add vCenter Server	Ready to Complete	<u>+</u>
VC Information	vCenter Server	vcsa6u2.vdilab-vs.local
View Composer	User name	administrator@vsphere.local
View Composer Domains	Password	****
Storage Roady to Complete	Description	
Ready to Complete	Server Port	443
	Max Provision	20
	Max Power	50
	Max View Composer Operations	12
	Max View Composer Provision	8
	Max Instant Clone Engine Provision	20
	View Composer State	Standalone View Composer Server
	View Composer Address	vh-comp.vdilab-vs.local
	View Composer Password	****
	View Composer User Name	administrator
	View Composer Port	18443
	Enable View Storage Accelerator	Yes
	Default host cache size:	2048
	VM Disk Space Reclamation	Yes
		< Back Finish Cancel

Master Image Creation for Tested Horizon Deployment Types

To create the Master Image for the tested Horizon deployment types, complete the following steps:

1. Select an ESXi host in an existing infrastructure cluster and create the virtual machines to use as Golden Images with Windows 10 and Office 2016 for Linked-Clone, Instant Clone and Full Clone desktops.

Æ

We used a 64 bit version of OS and Office for our testing.



A fourth Golden Image was created using Microsoft Windows Server 2012 R2 for RDSH session host virtual machines.

For the Golden Image virtual machines, the following parameters were used (Table 10).

Attribute	Linked-Clone/Instant- clone	Persistent/Full Clone	RDSH server
Desktop operating system	Microsoft Windows 10 En- terprise (64-bit)	Microsoft Windows 10 Enterprise (64-bit)	Microsoft Windows Server 2012 R2 standard (64-bit)
Hardware	VMware Virtual Hardware Version 11	VMware Virtual Hardware Version 11	VMware Virtual Hardware Version 11
VCPU	2	2	6
Memory	2048 MB	3072 MB*	24576MB
Memory reserved	2048 MB	3072 MB*	24576MB
Video RAM	35 MB	35 MB	4MB
3D graphics	Off	Off	Off
NIC	1	1	1
Virtual network adapter 1	VMXNet3 adapter	VMXNet3 adapter	VMXNet3 adapter
Virtual SCSI con- troller 0	Paravirtual	Paravirtual	Paravirtual
Virtual disk: VMDK 1	24 GB	40 GB	40 GB
Virtual disk: VMDK 2 (non-persistent	6 GB	_	-

 Table 10
 Golden Image Virtual Machine Parameters

Attribute	Linked-Clone/Instant- clone	Persistent/Full Clone	RDSH server
disk)			
Virtual floppy drive 1	Removed	Removed	Removed
Virtual CD/DVD drive 1	-	-	_
Applications	 Login VSI 4.1.5 application installation Adobe Acrobat 11 Adobe Flash Player 16 Doro PDF 1.82 FreeMind Microsoft Internet Explorer Microsoft Office 2016 	 Login VSI 4.1.5 application installation Adobe Acrobat 11 Adobe Flash Player 16 Doro PDF 1.82 FreeMind Microsoft Internet Explorer Microsoft Office 2016 	 Login VSI 4.1.5 application installation Adobe Acrobat 11 Adobe Flash Player 16 Doro PDF 1.82 FreeMind Microsoft Internet Explorer Microsoft Office 2016
VMware tools	Release 10.0.9.3917699	Release 10.0.9.3917699	Release 10.0.9.3917699
VMware View Agent	Release 7.0.1 - 3989057	Release 7.0.1 - 3989057	Release 7.0.1 - 3989057

* For 2000 Persistent Desktops, we were limited to 3GB of RAM given our HyperFlex node configuration with 512GB of total memory. By adding memory to each HyperFlex node, for example eight additional 32GB DIMMs per node, we could allocate up to 5GB of RAM per VM at the same user density. By using 64GB DIMMs in all three memory channels, we could support 2000 VMs in a sixteen node HyperFlex cluster with 10GB of RAM per virtual desktops.

Prepare Microsoft Windows 10 and Server 2012 R2 with Microsoft Office 2016

Prepare your master image for one or more of the following use cases:

- VMware Horizon 7 Linked Clones
- VMware Horizon 7 Instant Clones
- VMware Horizon 7 Full clones
- VMware Horizon 7 RDSH Virtual Machines

Include Microsoft Office 2016 and other applications used by all pool users in your organization into your master image.

Apply Microsoft updates to your master images.

For this study, we added Login VSI target software to enable the use the Login VSI Knowledge Worker workload to benchmark end user experience for each use case.

Optimization of Base Windows 10 or Server 2012 R2 Guest OS

Select the links below to optimize windows 10 for VDI deployment:

http://www.vmware.com/content/dam/digitalmarketing/vmware/en/pdf/whitepaper/vmware-viewoptimizationguidewindows7-en-white-paper.pdf

VMware Optimization tool for HVD or HSD deployment: <u>https://labs.vmware.com/flings/vmware-os-optimization-tool</u>

Virtual Desktop Agent Software Installation for Horizon

To install the Virtual Desktop Agent software for Horizon, complete the following steps:

1. For each master image created, open the Horizon View Agent Installer, VMware-viewagent-7.0.1-3989057.exe. Click Next to install.

늻 VMware Horizon Agent		×
	Welcome to the Installation Wizard for VMware Horizon Agent	
	The installation wizard will install VMware Horizon Agent on your computer. To continue, click Next.	
vMware Horizon™ Agent	Copyright © 1998-2016 VMware, Inc. All rights reserved. The product is protected by U.S. and international copyright and intellectual property laws. VMware products are covered by one or more patents listed at http://www.vmware.com/go/patents.	iis
Ċ `PC ⊚IP`		
Product version: 7.0.1-3989057	x64 < Back Next > Cancel	

2. Review and accept the EULA Agreement. Click Next.



3. Select Network protocol configuration, click Next.

😸 VMware Horizon Agent	×
Network protocol configuration Select the communication protocol	P
Specify the protocol to be used to configure this Horizon Agent instance:	
IPv4 This agent will be configured to choose the IPv4 protocol for est IPv6 all connections.	tablishing
< Back Next >	Cancel

4. Based on the Desktop pool you want to create, select either View Composer Agent or Instant Clone Agent installation. Do not install both features on the same master image.

5. Enable installation of the VMware Horizon View Composer Agent for linked-clone VDI virtual machines.

Select the p	up program features you want installe	ı. 🖓
lick on an ico	 Core USB Redirection Real-Time Audio-Video VMware Horizon View Compose VMware Horizon Instant Clone Client Drive Redirection Virtual Printing vRealize Operations Desktop A 	feature is installed. Feature Description VMware Horizon View Composer Agent RDSH installs: This machine can be used as the parent image for provisioning Automated Farms This feature requires 1703KB on your hard drive.
nstall to:		Change

6. Disable the Horizon View Composer Agent and enable the Horizon Instant Clone Agent for Instant Clone floating assigned desktop pool creation.

Select the program features you want installed.	
Core USB Redirection Real-Time Audio-Video VMware Horizon View Compose VMware Horizon Instant Clone Client Drive Redirection Virtual Printing vRealize Operations Desktop A v	Feature Description Horizon Instant Clone Agent should only be installed on a virtual machine running on VMware vSphere 2015 U1 or later. It cannot be co-installed with Horizon View Composer Agent. This feature requires 3175KB on your hard drive.
stall to:	Change

Prior to installing the Horizon View Agent on a Microsoft Server 2012 R2 virtual machine, you must add the Remote Desktop Services role and the Remote Desktop Session Host role service.

7. To add Remote Desktop Services role on Windows Server OS from the Server Manager, use the Add Roles and Features wizard:



8. Add Remote Desktop Session Host services.



9. Click Install.

Confirm installation	on selections	DESTINATION SERVE W2K12-RDS
Before You Begin Installation Type Server Selection Server Roles	To install the following roles, role services, or features on set Restart the destination server automatically if required Optional features (such as administration tools) might be d been selected automatically. If you do not want to install th their check boxes.	elected server, click Install. lisplayed on this page because they have nese optional features, click Previous to clea
Features Remote Desktop Services Role Services Confirmation Results	Remote Desktop Services Remote Desktop Session Host Remote Server Administration Tools Role Administration Tools Remote Desktop Services Tools Remote Desktop Licensing Diagnoser Tools	;
	Export configuration settings Specify an alternate source path	

閿	VMware Horizo	on Agent
Cust Sel	tom Setup lect the program features you want installed.	
Click	on an icon in the list below to change how a featu	re is installed.
In second se	Core Core Core Core Core Core Core Core	This feature requires 262MB on your hard drive.
Instal C:\Pr	III > IIII > III > IIII > III > IIII	Change
	Help Space < Bac	k Next > Cancel
		Windows Server 2012 R2

10. View Agent is will report as Install in "Desktop Mode" if Remote Desktop Services not installed.

岁 VMwa	re Horizon Ag	ent	x
Desktop OS Configuration The following information is used to cor feature	nfigure the VMware	Horizon 7 Desktop	6
an an antist film bands and	a kalihat		n tekni Abu
The Remote Desktop Session Host role is Agent in RDS mode restart the installer a	not installed on this fter configuring the	operating system. T Remote Desktop Se	To configure the ssion Host role.
Please check the box to continue installing	g VMware Horizon A	Agent in 'desktop mod	de'.
Install VMware Horizon Agent in 'deski	top mode'		
	< Back	Next >	Cancel

11. Add FQDN or IP address for Connection Server Instance to register the RDSH server.

i	VMware Horizo	n Agent 🛛 🗙
Register with Enter the Ho	Horizon 7 Connection Server	chine will connect to.
Enter the serve administrator lo	er name of a Horizon 7 Connection Serv gin credentials to register this machine	ver (standard or replica instance) and with the Horizon 7 Connection Server.
vh-conn01.vdi	ab-hc.local	(hostname or IP address)
Authentication	Authenticate as the currently lo Specify administrator credential Username: Password:	gged on user s (Domain\User)
	< Bad	k Next > Cancel

12. Click Install.

🛃 VMware Horizon Agent		×
Ready to Install the Program		P
VMware Horizon Agent will be installed C:\Program Files\VMware\VMware Vie Click Install to begin the installation or	f in: w\Agent\ Cancel to exit the wizard.	
	< Back Install	Cancel

13. Click Finish and restart the VM.

🛃 VMware Horizon Agent	X
	Installer Completed
	The installer has successfully installed VMware Horizon Agent. Click Finish to exit the wizard.
vMware Horizon™ Agent	
ĊPC@₽°	
	< <u>B</u> ack <u>Einish</u> Cancel

Install Additional Software

To install additional software required for your base windows image, complete the following steps:

- 1. For testing, we installed Office 2016 64bit version.
- 2. Log into the VSI Target software package to facilitate workload testing.
- 3. Install service packs and hot fixes required for the additional software components that were added.
- 4. Reboot or shut down the VM as required.

Create a Native Snapshot for Automated Desktop Pool Creation

To create a native snapshot for the automated desktop pool, complete the following steps:

- 1. Log into vCenter WebUI.
- 2. Select the master image for the automated desktop pool creation.
- 3. Right-click, select Cisco HX Data Platform > SnapshotNow.



4. Enter a name for the HX native snapshot.

Navigator I	VDI-CL Actions -				Take VM Nativ	e Snapshot for HX-Win10-PI	0	
Home 🕨 🔊	Summary Monitor Manage Related C	Objects			Name	NativeSnanshot	1	
	Tan Louis Objects Hacks Mathematica	ulana Data	tares Detector	Olusters Matur	Nume	Nutreonapshot	1	
🖵 🕜 vcsa6.vdilab-hc.local	Top Level Objects Hosts Vintual Machine	s vapps Datas	stores Datastore	Clusters Netwo	Description:			
→ HX-VDILAB		Actions -						
▶ 🕼 HX-Infra			Chathan	Description of Con-			le de	114 Deste ation
HX-Launcher	Name 17	State	Status	Provisioned Spa			node	HA Protection
VDI-CL >	HX-VVINTO-PI	Powered Off	Vormai	40.16 GB				(?) N/A
10.10.50.27								
10.10.50.28								
0.10.50.29								
0.10.50.30						OK Cancel		
■ 10.10.50.31 ■ 10.10.50.22						Caliber		
10.10.50.32								
□ 10.10.50.33								
= CENTRISCIPT								
stCtlVM-FCH1842V								
stCtIVM-FCH1936V								
stCtlVM-FCH1937V								
stCtlVM-FCH1937V								
stCtIVM-FCH1937V								
stCtIVM-FCH1937V								
stCtIVM-FCH1937V								
stCtIVM-FCH1938V								
🕨 🛅 (295) Virtual Machines								

Create Customization Specification for Virtual Desktops

To create Customization Specification for virtual desktops, complete the following steps:

vmware [®] vSphere Web Cli	ent ≜ ≣								
Navigator I	🚹 Home								
Policies and Profil 🕨 🔊	Home								
🕺 Home	Inventories								
vCenter Inventory Lists					0				
Hosts and Clusters			(III)	- 10	<u> </u>			0	
VMs and Templates	vCenter	Hosts and	VMs and	Storage	Networking	Content	Hybrid Cloud	vRealize	
Storage >	Inventory Lists	Clusters	lemplates			Libraries	Manager	Orchestrator	
Vetworking >	Monitoring								
Policies and Profiles									
🖓 Hybrid Cloud Manager 🛛 🔉	8			R		· · ·			
O vRealize Orchestrator >	Task Console	Event Console	Host Profiles	VM Storage	Customization	vRealize			
🍇 Administration 🔰 🗧				Policies	Specification Manager	Operations Manager			
😴 Tasks	Administration								
🔁 Log Browser									
Events			0						
🧭 Tags	Balaa	Sustam	Licensing	Customer					
Q New Search >	Rules	Configuration	Licensing	Experience					
Saved Searches				improvement					

1. On vCenter WebUI, select Customization Specification Manager.

2. Select VM Operating System as Windows for Windows based guest OS optimization. Enter a name.

Navigator	Ŧ	🔁 Customization Specification Man	ager		
🖣 Home 🕞 🔊		vCenter Server: vcsa6.vdilab-hc.local	•		
Policies and Profiles					
🚰 Customization Specifica		Name		Guest OS	Last Modified
🚰 VM Storage Policies	>	🔋 New VM Guest Customization Sp	ec		(?)
🔓 Host Profiles	>	1 Specify Properties 2 Set Registration Information	New Customization Spe Enter a name for the customize	cification tion specification and select the OS of the target.	
		3 Set Computer Name	Target VM Operating System:	Windows	•
		4 Enter Windows License 5 Set Administrator Password		Use custom SysPrep answer file	
		6 Time Zone	Customization Spec Name:		
		7 Run Once	Description:		
		8 Configure Network			
		9 Set Workgroup or Domain			
		10 Set Operating System Options			
		11 Ready to complete			
				Back	Next Finish Cancel

3. Provide name and organization details.

	New VM Guest Customization Spe	ec						(?) H
~	1 Specify Properties	Set Regist	ration Information	quest operating system				
	2 Set Registration Information	Linter the regis	suadon mormadon for ans copy of the	guest operating system.				
	3 Set Computer Name	Name:	Administrator]				
	4 Enter Windows License	Organization:	vdilab-hc					
	5 Set Administrator Password			•				
	6 Time Zone							
	7 Run Once							
	8 Configure Network							
	9 Set Workgroup or Domain							
1	0 Set Operating System Options							
1	1 Ready to complete							
					Back	Next	Finish	Cancel

4. Provide a computer name. For this solution, we selected the radio button for Use the virtual machine name.

New VM Guest Customization Sp	ec	? »
 1 Specify Properties 2 Set Registration Information 	Computer Name Enter a computer name that will identify this virtual machine on a network.	
 2 Set Registration Information 3 Set Computer Name 4 Enter Windows License 5 Set Administrator Password 6 Time Zone 7 Run Once 8 Configure Network 9 Set Workgroup or Domain 10 Set Operating System Options 11 Ready to complete 	 Enter a name: The name cannot exceed 15 characters. Append a numeric value to ensure uniqueness The name will be truncated if combined with the numeric value, it exceed 15 characters. Use the virtual machine name If the name exceeds 15 characters, it will be truncated. Enter a name in the Clone/Deploy wizard Generate a name using the custom application configured with the vCenter Server Argument: 	
	Back Next Finish	Cancel

5. Provide the product License key if required.

New VM Guest Customization Sp	ec	? ₩		
 ✓ 1 Specify Properties ✓ 2 Set Registration Information 	Enter Windows License Enter the Windows licensing information for this copy of the guest operating system. If this virtual machine does not require licensing information, leave these fields blank.			
 3 Set Computer Name 4 Enter Windows License 5 Set Administrator Password 6 Time Zone 7 Run Once 8 Configure Network 9 Set Workgroup or Domain 10 Set Operating System Options 11 Ready to complete 	ter Name ows License strator Password Product Key: Include Server License Information (Required for customizing a server guest OS) Server License Mode: Per seat • Per server Max connections: 5			
	Back Next Finish C	ancel		

6. Provide Password credentials.

New VM Guest Customization Sp	ec				(* §
 1 Specify Properties 2 Set Registration Information 	Set Administrator Password Enter the password and auto logon option for the administrator account.				
 2 Set Registration information 3 Set Computer Name 4 Enter Windows License 5 Set Administrator Password 6 Time Zone 7 Run Once 8 Configure Network 9 Set Workgroup or Domain 10 Set Operating System Options 11 Ready to complete 	Password: Confirm password: Automatically logo Number of times	******** mas Administrator to logon automatically:			
				Back Nex	tt Finish Cancel

7. Select the Timezone.



8. Add the commands to run when the first-time user logs in, if there are any.

🕒 New VM Guest Customization Spe	ec	? »
 1 Specify Properties 2 Set Registration Information 	Run Once Enter the commands to run the first time a user logs on.	
✓ 3 Set Computer Name	<enter a="" command="" new=""></enter>	Add
✓ 4 Enter Windows License		Delete
✓ 5 Set Administrator Password		Move Up
✓ 6 Time Zone		Move Down
✓ 7 Run Once		INDVE DOWN
8 Configure Network		
9 Set Workgroup or Domain		
10 Set Operating System Options		
11 Ready to complete		
	Back Next Finish	Cancel

9. Provide the network information whether to use the DHCP server to assign IP address, or manual configuration.

🔁 New VM Guest Customization Spec				? >>	
1 Specify Properties 2 Set Registration Information	Configure Network Use default network sett	ings or customize properties for each	network interface.		
 ✓ 3 Set Computer Name 	 Use standard network 	Use standard network settings for the guest operating system, including enabling DHCP on all network interfaces Manually select custom settings			
✓ 4 Enter Windows License	 Manually select custo 				
✓ 5 Set Administrator Password	• • / ×				
✓ 6 Time Zone	Description	IPv4 Address	IPv6 Address		
✓ 7 Run Once	NIC1	Use DHCP	Notused		
8 Configure Network					
9 Set Workgroup or Domain					
10 Set Operating System Options					
11 Ready to complete					
				inter Connect	
			Back Next Fir	Cancel	

10. Provide the domain name and user credentials.

New VM Guest Customization Sp	bec		? ₩
1 Specify Properties 2 Set Registration Information	Set Workgroup or Doma How will this virtual machine pa	aticipate in a network?	
 ✓ 3 Set Computer Name ✓ 4 Enter Windows License 	 Workgroup: Windows Server Domain; 	WORKGROUP	
 ✓ 5 Set Administrator Password ✓ 6 Time Zone 	Specify a user account the	at has permission to add a computer to the domain.	
 ✓ 7 Run Once ✓ 8 Configure Network 	Username: Password:	administrator	
9 Set Workgroup or Domain Set Operating System Options	Confirm Password:		
11 Ready to complete			
		Back Next Finish	Cancel

11. Select the checkbox Generate New Security ID (SID).

New VM Guest Customization Spe	ec	9 H
 1 Specify Properties 2 Set Registration Information 	Set Operating System Options Configure these optional parameters for the guest operating system.	
 3 Set Computer Name 4 Enter Windows License 	Generate New Security ID (SID) Select this item to generate a new security identity.	
 5 Set Administrator Password 6 Time Zone 		
 7 Run Once 8 Configure Network 		
Set Operating System Options		
✓ 11 Ready to complete		
	Back Next Finish Canc	el

- 12. Review and click Next to complete creating the Customization Specs.
- 13. Click Finish.

🕒 New VM Guest Customization Sp	ec		() ()
 1 Specify Properties 2 Set Registration Information 	Ready to complete Review your settings selections before finishing the wizard.		
 2 Set Registration Information 3 Set Computer Name 4 Enter Windows License 5 Set Administrator Password 6 Time Zone 7 Run Once 8 Configure Network 9 Set Workgroup or Domain 10 Set Operating System Options 11 Ready to complete 	Review your settings selections b Name: OS Type: Registration Info: Computer Name: Product Key: Server License Mode: Administrator Log In: Time Zone: Network Type: NIC1 IPv4 NIC1 IPv4 NIC1 IPv4 Windows Server Domain: Username: OS Options:	vefore finishing the wizard. Windows User: Administrator Organization: vdilab-hc Use Virtual Machine name Per Server (Maximum Connections: 5) Do not log in automatically as Administrator (GMT-08:00) Pacific Time (US & Canada) Custom Use DHCP Not used vdilab-hc.local administrator Generate new security ID	
		Back Next Finish	Cancel
VMware Horizon Farm and Pool Creation

RDSH Farm Creation

Before you can create an RDSH desktop pool, you must first create a RDSH Farm. To create a RDSH Farm, complete the following steps:

- 1. In the VMware Horizon Administration console, select Farms under the Resource node of the Inventory pane.
- 2. Click Add in the action pane to create a new RDSH Farm.

VMware Horizon 7 Administrator						
Updated 11/29/2016 1:55 PM 🥏 Sessions 0	Farms					
Problem vCenter VMs 0 Problem RDS Hosts 0	Add Edit Delete,	More Commands Access Grou	p			
System Health I III IIII IIIIIIIIIIIIIIIIIIIIIIIII	Filter 👻	Find Clear Access	Group: All 🔻			
Inventory	ID	Туре	RDS Hosts			
Signal Dashboard Signal Dashboard Signal Dashboard Signal Dashboard Catalog ▼ Resources Signal Dashboard Signal Dashboard Signal Dashboard Farms Signal Dashboard Signal Dashboard <td< th=""><th></th><th></th><th></th></td<>						
 View Configuration 						

3. Select either to create an Automated or Manual Farm. In this solution, we selected Automated Farm.

A Manual Farm requires a manual registration of each RDSH server to Horizon Connection or Replica Server instance.



- 4. Select the vCenter Server and Horizon Composer server that you will use to deploy the Horizon RDSH Farm.
- 5. Click Next.

Add Farm			
Туре	vCenter Server		
vCenter Server	View Composer linked clone	es	View Composer
Identification and Settings Provisioning Settings	vCenter Server	View Composer	View Composer linked clones
Storage Optimization vCenter Settings Advanced Storage Options	vcsa6.vdilab- hc.local(administrator@vs phere.local)	vh-comp.vdilab- hc.local	use less storage space than full virtual machines.
Guest Customization Ready to Complete			
			Supported Features
			✓ PCoIP
			✓ VMware Blast
			 Storage savings
	Description: None		 Recompose SysPrep guest customization
			< Back Next > Cancel

- 6. Enter the RDSH Farm ID, Access group, Default Display Protocol (Blast/PCoIP/RDP).
- 7. Select if users are allowed to change the default display protocol, Session timeout, Logoff Disconnected users, and select the checkbox to Enable HTML access.
- 8. Click Next.

Add Farm - HX-RDSHPool		
Туре	Identification and Settings	<u>•</u>
vCenter Server	General	
Identification and Settings Provisioning Settings	ID:	HX-RDSHPool
Storage Optimization	Description:	Windows server 2012 R2 RDS Pool
vCenter Settings		
Advanced Storage Options		
Ready to Complete		
	Access group:	VDI-User 🔹
	Farm Settings	
	Default display protocol:	VMware Blast 💌 📀
	Allow users to choose protocol:	Yes 🔻
	Empty session timeout (applications only):	Never 🛛 🔹
	When timeout occurs:	Disconnect 💌
	Log off disconnected sessions:	Never 🗸
	Allow HTML Access to desktops and applications on this farm:	Enabled ③
		Requires installation of HTML Access.
		< Back Next > Cancel

9. Select the provisioning settings, naming convention for RDSH server VM to deploy, and the number of VMs to deploy.

In this study, we deployed 64 RDSH virtual machines across our 8 node HyperFlex Cluster.

Add Farm - HX-RDSHPool		
Type vCenter Server	Provisioning Settings	Naming Pattern
Identification and Settings Provisioning Settings Storage Optimization vCenter Settings Advanced Storage Options Guest Customization Ready to Complete	Image: Stop Provisioning Image: Stop Provisioning on error Virtual Machine Naming Naming Pattern: HX-RDS Farm Sizing Max number of machines 64 Minimum number of ready(provisioned) machines during View Composer maintenance operations:	Virtual machines will be named according to the specified naming pattern. By default, View Manager appends a unique number to the specified pattern to provide a unique name for each virtual machine. To place this unique number elsewhere in the pattern, use '{n}'. (For example: vm-{n}-sales.). The unique number can also be made a fixed length. (For example: vm- {n:fixed=3}-sales). See the help for more naming pattern syntax options.
	<	Back Next > Cancel .:



- 12. Select vCenter settings, for example; Master Image, snapshot, folder, Host or Cluster, resource pool, storage selection.
- 13. Click Next.

Add Farm - HX-RDSHPool			
Туре	vCenter Settings		
vCenter Server	Default Image		
Provisioning Settings	1 Parent VM:	/HX-VDILAB/vm/Discovered virtual mad	Browse
Storage Optimization vCenter Settings	2 Snapshot:	/SENTINEL/RDSHsnap00	Browse
Advanced Storage Options	Virtual Machine Location		
Ready to Complete	3 VM folder location:	/HX-VDILAB/vm	Browse
	Resource Settings		
	4 Host or cluster:	/HX-VDILAB/host/VDI-CL	Browse
	5 Resource pool:	/HX-VDILAB/host/VDI-CL/Resources	Browse
	6 Datastores:	1 selected	Browse
		< Back	Next > Cancel

14. For Step 6 Datastores: Browse and choose Unbounded for the Storage Overcommit field.

15. Click OK.

dd Farm -	- HX-RDSHPool							
Type vCenter Settings vCenter Server Default Image Identification and Settings								
Select Linked Clone Datastores								
Select t selecte	he linked clone datas d host or cluster can	stores to use for this be selected.	Automated	Farm. Only	/ datastore	s that can be	e used by the	
Show	w all datastores (inclu	uding local datastore	es) 🕐		Local data	store 🖳 S	hared datast	ore 🍣
	Datastore	Capacity (GB)	Free (GB)	FS Type	Drive Typ	Storage	• Overcommit	?
~	📃 HX-VDI	40,960.00	40,878.51	NFS		Unbounded		-
Data Ty	/pe	Selected Free Space	e (GB) Min R	ecommende	ed (GB) 509	% utilization (@	Max Recomm	ended (
Linked	l ciones	40,878.51	104.4	40	10.	1.00	122.00	
							ок	ancel .:
						< Back	Next >	Cance

16. In the Advanced Storage Options, select Use native NFS snapshot (VAAI).



- 18. Select the Active Directory Domain, the Active Directory OU into which the RDSH machines will be provisioned, and the Sysprep file created as part of the customization specific configuration performed earlier.
- 19. Click Next.

Add Farm - HX-RDSHPool					
Type vCenter Server	Guest Customization		÷		
Provisioning Settings	Domain:	Domain: vdilab-hc.local(administrator)			
Storage Optimization vCenter Settings	AD container:	OU=Computers,OU=LoginVS	Browse		
Advanced Storage Options	 Allow reuse of pre-existing 	g computer accounts 🛛 💿			
Guest Customization Ready to Complete	Using a customization specifi	cation (SysPrep)			
	Name	Guest OS	Description		
	Horizon-RDS	Windows			
	InfraVM-Specs	Windows			
	RDSH-Customization	Windows			
	Win10-Custom	Windows	Windows 10 customization f		
		<	Back Next > Cancel		

- 20. Review the pool creation information.
- 21. Click Finish.

Add Farm - HX-RDSHPool				
Туре	Ready to Complete	≜	1	
vCenter Server Identification and Settings	vCenter Server:	vcsa6.vdilab-hc.local(administrator@vsphere.local)		
Drovisioning Settings	Use View Composer:	Yes		
Storage Optimization	ID:	HX-RDSHPool		
vContor Sottings	Description:	Windows server 2012 R2 RDS Pool		
Advanced Storage Ontions	Access Group:	VDI-User		
Guest Customization	Default display protocol:	VMware Blast		
Ready to Complete	Allow users to choose protocol:	Yes		
	Empty session timeout (applications only):	Never		
	When timeout occurs:	Disconnect		
Log off disconnected sessions:		Never		
	Allow HTML Access to desktops and applications on this farm:	Disabled		
	Enable provisioning:	Yes	L	
	Stop provisioning on error:	Yes		
	Virtual Machine Naming:	Use a naming pattern	L	
	VM naming pattern:	HX-RDS	L	
	Default image:	HX-RDS-GI - RDSHsnap00		
	Virtual Machine Folder:	/HX-VDILAB/vm	Ł	
		< Back Finish Cancel		

The VMware Horizon Administration console displays the status of the provisioning task and pool settings:

VMware Horizon 7 Administrator						
Updated 11/29/2016 2:05 PM Sessions 0 Problem VCenter VMs 0 Problem RDS Hosts 0 Events 4 0 A 0 System Health 1 2 2	Farms Add Edit Delete Filter •	More Commands A Find Clear	ccess Group Access Group: All ▼			
47 0 0 0 Inventory	ID	Type	RDS Hosts			
Catalog Catal	HX-RDSHP00I	Automated				

Updated 11/29/2016 2135 PM	HX-RDSHPool						
Sessions 0 Problem vCenter VMs 0	Summary RDS Hosts RD	S Pools Sessions					
Events 0 1 0 1 0 System Health 1 0 0 0	Remove from farm) • More C	Commands					
	Filter 👻	Find Clear					5 E
Inventory					Franklad		
🔗 Dashboard	DNS Name	1 Type	Max number or connections	Agent version	Enabled	Status	
Strain Croups	hix-rds1.vdilab-nc.local	Windows Server 2012	Unlimited	7.0.1	*	Available	
Catalog	hords10.volidb-hc.local	Windows Server 2012 Windows Canvar 2012	Unimited	7.0.1		Available	
Application Pools	hv-rds12.vdiab-hc.iocal	Windows Server 2012	Unimited	7.0.1		Avaiable	
P ThinApps	hx-rds13.vdilab-hc.local	Windows Server 2012	Unlimited	7.0.1		Available	
T Resources	hx-rds14.vdilab-hc.local	Windows Server 2012	Unlimited	7.0.1		Available	
Farms	hx-rds15.vdilab-hc.local	Windows Server 2012	Unlimited	7.0.1	~	Available	
Machines	hx-rds16.vdilab-hc.local	Windows Server 2012	Unlimited	7.0.1	4	Available	
Monitoring	hx-rds17.vdilab-hc.local	Windows Server 2012	Unlimited	7.0.1	4	Available	
 Policies 	hx-rds18.vdilab-hc.local	Windows Server 2012	Unlimited	7.0.1	~	Available	
► View Configuration	hx-rds19.vdilab-hc.local	Windows Server 2012	Unlimited	7.0.1	~	Available	
	hx-rds2.vdilab-hc.local	Windows Server 2012	Unlimited	7.0.1	4	Available	
	hx-rds20.vdilab-hc.local	Windows Server 2012	Unlimited	7.0.1	~	Available	
	hx-rds21.vdilab-hc.local	Windows Server 2012	Unlimited	7.0.1	~	Available	
	hx-rds22.vdilab-hc.local	Windows Server 2012	Unlimited	7.0.1	~	Available	
	hx-rds23.vdilab-hc.local	Windows Server 2012	Unlimited	7.0.1	4	Available	
	hx-rds24.vdilab-hc.local	Windows Server 2012	Unlimited	7.0.1	~	Available	
	hk-rds25.vdilab-hc.local	Windows Server 2012	Unlimited	7.0.1	~	Available	
	hx-rds26.vdilab-hc.local	Windows Server 2012	Unlimited	7.0,1	~	Available	
	hx-rds27.vdilab-hc.local	Windows Server 2012	Unlimited	7.0.1	4	Available	
	hx-rds28.vdilab-hc.local	Windows Server 2012	Unlimited	7.0.1	~	Available	

Create the Horizon 7 RDS Published Desktop Pool

To create the Horizon 7 RDS Published Desktop Pool, complete the following steps:

- 1. In the Horizon Administrator console, select Desktop Pools in the Catalog node of the Inventory pane.
- 2. Click Add in the action pane.

VMware Horizon 7 Adm	inistrator		ñ		
Updated 11/29/2016 2:30 PM	Desktop Pools				
Sessions 0 Problem vCenter VMs 0 Problem RDS Hosts 6	Add Edit Clone	e) Delete) 💌 Entitleme	nts 🔻 Status 🔍 🕶 Ac	cess Group 🛛 🔻 More C	commands
System Health A 0	Filter 👻	Find Clear	Access Group: All	▼	
	ID	Display Name	Туре	Source	User Assi
Inventory					
🖓 Dashboard					
📇 Users and Groups					
▼ Catalog					
Desktop Pools					
Application Pools					
ThinApps					
▼ Resources					
Farms					
Macnines					
Monitoring					
 Policies 					
View Configuration					
· · · · · · · · · · · · · · · · · · ·					

- 3. Select RDS Desktop pool.
- 4. Click Next.



- 5. Enter Pool ID and Display name.
- 6. Click Next.

Add Desktop Pool - HXRDS-Poo	ol			(?
Desktop Pool Definition	Desktop Pool Identif	ication		
Type Setting	ID:	HXRDS-Pool		ID
Desktop Pool Identification	Display name:	HXRDS-Pool		The desktop pool ID is the unique name used to identify this
Desktop Pool Settings RDS Farm	Description:			desktop pool. Display Name
Select an RDS farm Ready to Complete				The display name is the name that users will see when they connect to View Client. If the display name is left blank, the ID will be used. Access groups can organize the desktop pools in your organization. They can also be used for delegated
				administration. Description
				This description is only shown on the Settings tab for a desktop pool within View Administrator.
			(< Back Next > Cancel

- 7. Accept the default settings on Desktop Pool Settings page.
- 8. Click Next.

Add Desktop Pool - HXRDS-Poo	bl	(?
Desktop Pool Definition	Desktop Pool Settings	
Type Setting Desktop Pool Identification Desktop Pool Settings RDS Farm Select an RDS farm Ready to Complete	General State: Connection Server restrictions:	Enabled V None Browse
	Adobe Flash Settings for Set	essions
	Adobe Flash quality:	Do not control 🗸 ③
	Adobe Flash throttling:	Disabled 🔻 💿
		< Back Next > Cancel

- 9. Click the "Select an RDS farm for this desktop pool" radio button.
- 10. Click the farm created in the previous section.
- 11. Click Next.

Add Desktop Pool - HXRDS-Poo	I				?			
Desktop Pool Definition	Select an RDS f	arm						
Type Setting	Create a new RDS farm							
Desktop Pool Identification Desktop Pool Settings RDS Farm	• Select an RDS farm for this desktop pool							
Select an RDS farm	Filtor -			Find	Cloar 🤊			
Ready to Complete	Flicel +			Find				
	Farm ID	Description	RDS Hosts	Max number of	Status			
	HX-RDSHPool	Windows server 2	64	Unlimited	No problem detect			
				< Back	lext > Cancel			

- 12. Review the pool settings.
- 13. Select the checkbox "Entitle users after this wizard finishes" to authorize users for the newly create RDSH desktop pool.
- 14. Click Finish.

Add Desktop Pool - HXRDS-Poo	bl		?
Desktop Pool Definition	Ready to Complete		
Туре		✓ Entitle users	after this wizard finishes
Setting			
Desktop Pool Identification	Type:	RDS Desktop Pool	
Desktop Pool Settings	Unique ID:	HXRDS-Pool	
RDS Farm	Display name:	HXRDS-Pool	
Select an RDS farm	Desktop pool state:	Enabled	
Ready to Complete	Connection Server restrictions:	None	
	Adobe Flash quality:	Do not control	
	Adobe Flash throttling:	Disabled	
	Description:		
	RDS Farm:	HX-RDSHPool	
	Number of RDS hosts in the farm:	64	
		< Back	Finish Cancel

15. Select the Users or Groups checkbox, use the search tools to locate the user or group to be authorized, highlight the user or group in the results box.

16. Click OK.

Add new users	and groups who can	use the selected poo	l(s).		
Add	emove		2		
Name	Dor	mains	Email		
	Find User or Group				_
	Туре:	Users	✓ Groups		
	Domain:	Entire Directory	•		
	Name/User name:	Contains 🛛 🔻	LoginVSI		
	Description:	Contains 🛛 🔻			
			Find		
	Name	User Name	Email	Description	In Folder
	LoginVSI	LoginVSI/vdilab-hc.			vdilab-hc.local/Logi

17. You now have a functional RDSH Farm and Desktop Pool with users identified who are authorized to utilize Horizon RDSH sessions.

VMware Horizon Linked-Clone Windows 10 Desktop Pool Creation

To create a VMware Horizon linked-clone Windows 10 Desktop Pool, complete the following steps:

- 1. In Horizon Administrator console, select Desktop Pools in the Catalog node of the Inventory pane.
- 2. Click Add in the action pane.
- 3. Select assignment type for pool.
- 4. Click Next.



- 5. Select Floating or Dedicated user assignment.
- 6. Click Next.



- 7. Select View Composer Linked Clones, highlight your vCenter and View Composer virtual machine.
- 8. Click Next.

Desktop Pool Definition	vCenter Server		
Туре	Full virtual machines		View Composer
User Assignment vCenter Server	 View Composer linked clones 		View Composer linked clones share the same base image and
Setting Desktop Pool Identification Desktop Pool Settings Provisioning Settings View Composer Disks Storage Optimization	O Instant clones	use less storage space than full virtual machines.	
	vCenter Server View Composer		The user profile for linked clones
	vcsa6.vdilab- hc.local(administrator@vsphere.lo cal)	vh-comp.vdilab- hc.local	can be redirected to persistent disks that will be unaffected by OS updates and refreshes.
vCenter Settings Advanced Storage Options Guest Customization			
Ready to Complete			Supported Features
			✓ PCoIP
			✓ VMware Blast
			✓ Storage savings
			 Recompose and refresh
			Push Image
			 QuickPrep guest customization
			✓ SysPrep guest customization
	Description: None		ClonePrep guest customization
			 Persona management

9. Enter pool identification details.

Desktop Pool Definition	Desktop Pool Ider	ntification		
Туре	ID:	LinkedClonePool		ID
User Assignment				The desktop pool ID is the unique
vCenter Server	Display name:	LinkedClonePool		name used to identify this
Setting	Access group:	VDI-User	•	desktop pool.
Desktop Pool Identification				Display Name
Desktop Pool Settings	Description:			The display name is the name
Provisioning Settings				that users will see when they
View Composer Disks				connect to View Client. If the
Storage Optimization				display name is left blank, the ID
vCenter Settings				will be used.
Advanced Storage Options				Access Group
Guest Customization				Access groups can organize the
Ready to Complete				desktop pools in your
				organization. They can also be
				used for delegated
				administration.
				Description
				This description is only shown of
				the Settings tab for a desktop
				pool within View Administrator.

11. Select Desktop Pool settings.



Be sure to scroll down in this dialogue to configure all options.

Add Desktop Pool - LinkedClon	ePool	?	
Desktop Pool Definition	Desktop Pool Settings		•
Туре	General		
User Assignment vCenter Server	State:	Enabled 🛛	
Setting Desktop Pool Identification	Connection Server restrictions:	None Browse	
Desktop Pool Settings	Remote Settings		
Provisioning Settings View Composer Disks	Remote Machine Power Policy:	Ensure machines are always powered on $ \bullet $	
Storage Optimization vCenter Settings	Automatically logoff after disconnect:	Never 🔹	
Guest Customization	Allow users to reset their machines:	No 🗸 🔻	
Ready to complete	Allow user to initiate separate sessions from different client devices:	No 🛛 🔻 😨	
	Delete or refresh machine on logoff:	Never 3	
	Remote Display Protocol		
	Default display protocol:	VMware Blast 🛛 🔻	
	Allow users to choose protocol:	Yes 🔻	
	3D Renderer:	Disabled Configure ?	
	Max number of monitors:	2 • 3	
		May require power-cycle of related virtual machines 👔	
	May recolution of any one-	< Back Next > Cancel	•

- 13. Select Provisioning Settings.
- 14. Click Next.



15. Select View Composer disk configuration.

Add Desktop Pool - LinkedClon	ePool	?
Desktop Pool Definition	View Composer Disks	
Type User Assignment vCenter Server	Disposable File Redirection 3 O Redirect disposable files to a non-persistent disk	Disposable File Redirection
vCenter Server Setting Desktop Pool Identification Desktop Pool Settings Provisioning Settings View Composer Disks Storage Optimization vCenter Settings Advanced Storage Options Guest Customization Ready to Complete	Network Disk size: 3072 MB (minimum 512 MB) Drive letter: Auto O not redirect disposable files	Use this option to redirect disposable files to a non- persistent disk that will be deleted automaticall y when a user's session ends.
	< Back Next >	Cancel



18. Select each of the six required vCenter Settings by using the Browse button next to each field.

Add Desktop Pool - LinkedClon	ePool	?
Desktop Pool Definition	vCenter Settings	
Type User Assianment	Default Image	
vCenter Server	1 Parent VM: /HX-VDILAB/vm/Discovered virtual mac Browse	
Setting Desktop Pool Identification Desktop Pool Settings Provisioning Settings	2 Snapshot: /SENTINEL/Snapshot01 Browse	
	Virtual Machine Location	
View Composer Disks	3 VM folder location: /HX-VDILAB/vm Browse	
vCenter Settings	Resource Settings	
Advanced Storage Options Guest Customization	4 Host or cluster: /HX-VDILAB/host/VDI-CL Browse	
Ready to Complete	5 Resource pool: /HX-VDILAB/host/VDI-CL/Resources Browse	
	6 Datastores: 1 selected Browse	
	< Back Next > C	ancel

19. For Datastore selection, select the correct datastore and set the Storage Overcommit as "Unbounded."

20. Click OK.

esktop P	ool Def	inition	vCenter Se	ttings					
Гуре			Default Im	age					
User Assignment		1 Par	Parent VM: //HX-//DILAB/vm/Discovered virtual mac Browse						
etting			che trit		/HX-VDILAB/VM/Discovered virtual mac				
Desktop Pool Identification		2 Sna	apshot:	/SENTINE	L/Snapsho	t01	Browse		
Deskto Select Linked Clone Datast		Datastores							
rovisi(
torag	Select t host or	he linked clo cluster can b	ne datastore: oe selected.	s to use for this	desktop po	ol. Only da	itastores th	hat can be used by the select	ed
Cente			<i>c</i>			FR	Local data	atoro 🗏 Charod datactoro	
dvanc	Show	w all datasto	res (including	local datastore	es) (?)			astore 👱 shared datastore	
Guest (Data	istore	Capacity (GB)	Free (GB)	FS Type	Drive Typ	Storage Overcommit 💿	
keady	\checkmark	📃 HX-VDI		40.960.00	40 746 14	NES			
		-		,	40,740.14	NI S		Unbounded	-
				,	40,740.14	NIS		Unbounded	•
					40,740.14	NI 5		Unbounded	•
		_			40,740.14			Unbounded	•
					40,740.14			Unbounded	•
					40,740.14			Unbounded	•
	Data Ty	/pe	Se	lected Free Space	€ (GB) Min R	ecommende	ed (GB) 504	Unbounded % utilization (C Max Recommend	ded (
	Data Ty Linked	/pe clones	Se 40	elected Free Space	e (GB) Min R 4,080	ecommende 0.00	ed (GB) 50° 20	Unbounded % utilization (C Max Recommend ,080.00 40,080.00	Jed (
	Data Ty Linked	/pe clones	S∈ 40	elected Free Space	∈ (GB) Min R 4,080	ecommende 0.00	ed (GB) 504 20	Unbounded % utilization (C Max Recommend ,080.00 40,080.00	ded (
	Data Ty Linked	/pe clones	Se 40	ected Free Space	e (GB) Min R 4,08(ecommende	ed (GB) 50° 20	Unbounded % utilization (C Max Recommend ,080.00 40,080.00 OK Cand	ded (
	Data Ty Linked	/pe clones	S∈ 40	elected Free Space	∈ (GB) Min R 4,080	ecommende 0.00	ed (GB) 504 20	Unbounded % utilization (© Max Recommend ,080.00 40,080.00 OK Cand	ded (
	Data Ty Linked	/pe clones	Se 40	elected Free Space	≤ (GB) Min R 4,080	ecommende 0.00	ed (GB) 50° 20	Unbounded % utilization (C Max Recommend ,080.00 40,080.00 OK Cand	ded (cel

22. Set the Advanced Storage Options using the settings in the following screen shot.

esktop Pool Definition	Advanced Storage Options		
Туре	Based on your resource selection, the followir	ng features are	View Storage Accelerator
User Assignment vCenter Server	recommended. Options that are not supporte hardware are disabled.	d by the selected	vSphere 5.x hosts can be
etting Desktop Pool Identification	☑ Use View Storage Accelerator		performance by caching certain desktop pool data.
Desktop Pool Settings	Disk Types: OS di	sks 🛛 🔻	View Storage Accelerator for
Provisioning Settings View Composer Disks Storage Optimization	Regenerate storage accelerator 7 after:	Days	this pool. View Storage Accelerator is most useful for shared disks that are read frequently, such as View
vCenter Settings	✓ Other Options		Composer OS disks.
Advanced Storage Options Guest Customization	Use native NFS snapshots (VAAI)		Native NFS Snapshots (VAAI)
Ready to complete	Initiate reclamation when unused space on VM exceeds:] GB	VAAI (vStorage API for Array Integration) is a hardware feature of certain storage arrays. It uses native spapshotting technology to
	Blackout Times Storage accelerator regeneration and VM disk reclamation do not occur during blackout time blackout policy applies to both operations.	space s. The same	provide linked clone functionality. Choose this option only if you have appropriate hardware devices.
			Disk Space Reclamation
	Day Time		With vSphere 5.x, virtual machines can be configured to use a space efficient disk format that supports reclamation of unused disk space (such as deleted files)

- 24. Select Guest optimization settings.
- 25. Select the Active Directory domain, browse to the Active Directory Container where the virtual machines will be provisioned and then choose either the QuickPrep or Sysprep option you would like to use. Highlight the Customization Spec previously prepared.

Add Desktop Pool - LinkedClon	nePool					?
Desktop Pool Definition	Guest Customization					
Туре						2
User Assignment	Domain:	vdilab-hc.local(administrator)	•		
vCenter Server						
Setting	AD container: OU=Users,OU=LoginVSI Browse					
Desktop Pool Identification	Allow reuse of pre-existin	a computer accou	ints 💿			
Desktop Pool Settings		g comparer accor				
View Composer Disks	🔘 Use QuickPrep					
Storage Optimization	Power-off script name:			(
vCenter Settings						
Advanced Storage Options	Power-off script parameters:			E	xample: p1 p2 p3	
Guest Customization	Post-synchronization script name:			6		
Ready to Complete						
	Post-synchronization script parameters:			E	xample: p1 p2 p3	
	• Use a customization spec	ification (SysPrep)			
	News		Current OC		De contratione	
	Name		Guest OS		Description	
	Horizon-RDS	Windo	WS			
	InfraVM-Specs	Windo	WS			
	RDSH-Customization	Windo	WS			
	Win10-Custom	Windo	WS	Windows	10 customization fo	or
	Win10-Persistent	Windo	ws			
				· Paulo)	Nexts	-
				< васк	Next > Canc	er j

- 27. Select the checkbox "Entitle users after pool creation wizard completion" if you would like to authorize users as part of this process. Follow instructions provided in the Create Horizon 7 RDS Desktop Pool to authorize users for the Linked Clone Pool.
- 28. Click Finish to complete the Linked Clone Pool creation process.

Desktop Pool Definition	Ready to Complete		
Type User Assignment	Entitle users after this wizard finishes		
vCenter Server	Type:	Automated	
Setting	User assignment:	Floating assignment	
Desktop Pool Identification	vCenter Server:	vcsa6.vdilab-hc.local(administrator@vsphere.local)	
Desktop Pool Settings	Use View Composer:	Yes	
Provisioning Settings	Unique ID:	LinkedClonePool	
View Composer Disks Storage Optimization vCenter Settings Advanced Storage Options	Display name:	LinkedClonePool	
	Access Group:	VDI-User	
	Desktop pool state:	Enabled	
	Remote Machine Power	Ensure machines are always powered on	
Guest Customization	Policy:		
Ready to Complete	Automatic logoff after disconnect:	Never	
	Connection Server restrictions:	None	
	Allow users to reset their machine:	No	
	Allow user to initiate separate sessions from different client devices:	No	
	Delete or refresh machine on logoff:	Never	
	Default display protocol:	VMware Blast	
	Allow users to choose protocol:	Yes	
	3D Renderer:	Disabled	
	Max number of monitors:	2	
		< Back Finish Cance	

VMware Horizon Instant-Clone Windows 10 Desktop Pool Creation

To create the VMware Horizon Instant-Clone Windows 10 Desktop Pool, complete the following steps:

- 1. In Horizon Administrator console, select Desktop Pools in the Catalog node of the Inventory pane.
- 2. Click Add in the action pane.
- 3. Select Automated assignment type for pool.
- 4. Click Next.



- 5. Select Floating or Dedicate user assignment.
- 6. Click Next.



7. Select Instant Clones, highlight your vCenter server, then click Next.



- 8. Enter pool identification details.
- 9. Click Next.

Add Desktop Pool - InstantClonePool (?)						
Desktop Pool Definition	Desktop Pool Identification					
Туре	ID:	InstantClonePool	ID			
User Assignment	Display name:	InstantCloneDeel	The desktop pool ID is the unique			
vCenter Server	bibpidy name.	Instanccionepoor	name used to identify this deskton pool			
Desktop Pool Identification	Access group:	VDI-User 🗸 🔻	Display Namo			
Desktop Pool Settings	Description:					
Provisioning Settings Storage Optimization vCenter Settings Guest Customization			The display name is the name that users will see when they connect to View Client. If the display name is left blank, the ID will be used.			
Ready to Complete			Access Group			
			Access groups can organize the desktop pools in your organization. They can also be used for delegated administration.			
			Description			
			This description is only shown on the Settings tab for a desktop pool within View Administrator.			
< Back Next > Cancel						

10. Select Desktop Pool settings.

Be sure to scroll down to choose the Acrobat Flash settings.

11. Click Next.

么

Add Desktop Pool - InstantClonePool				
Desktop Pool Definition	Desktop Pool Settings	<u>*</u>		
Type User Assignment vCenter Server Setting Desktop Pool Identification	General State: Connection Server restrictions:	Enabled Vone Browse		
Desktop Pool Settings	Remote Settings			
Provisioning Settings Storage Optimization vCenter Settings Guest Customization Ready to Complete	Automatically logoff after disconnect:	Never		
	Allow user to initiate separate sessions from different client devices:	No 🛛 🔻 💈		
	Remote Display Protocol			
	Default display protocol:	VMware Blast 🛛 🔻		
	Allow users to choose protocol:	Yes 🛛 🔻		
	3D Renderer:	Disabled 🔻 Configure 🔇		
	Max number of monitors:	2 🔻		
		May require power-cycle of related virtual machines 👔		
	Max resolution of any one monitor:	2560x1600 🔻 🔇		
		May require power-cycle of related virtual machines ③		
	HTML Access:	Enabled ③		
		Requires installation of HTML Access.		
	Adobe Flash Settings for Sessions			
		< Back Next > Cancel		

- 12. Select provisioning settings.
- 13. Click Next.
| Add Desktop Pool - InstantClo | nePool | | | ? |
|-------------------------------|--|--------------------------|------|--|
| Desktop Pool Definition | Provisioning Settings | | | |
| Туре | Basic | | | Naming Pattern |
| User Assignment | Enable provisioning | | | Virtual machines will be |
| vCenter Server | Stop provisioning on error | | | named according to the
specified naming pattern. |
| Desktop Pool Identification | Virtual Machine Naming | | | By default, View Manager |
| Desktop Pool Settings | Use a naming pattern | | | appends a unique number
to the specified pattern to |
| Provisioning Settings | Naming Pattern: | W10-IC | | provide a unique name for |
| Storage Optimization | | W10-1C | | each virtual machine. |
| Center Settings | Desktop Pool Sizing | | | To place this unique |
| Ready to Complete | Max number of machines: | pattern, use '{n}'. (For | | |
| | Number of spare (powered on) machines: | | | example: vm-{n}-sales.). |
| | | | | The unique number can |
| | | | | also be made a fixed
length. (For example: vm- |
| | Provision machines on dem | and | | {n:fixed=3}-sales). |
| | Min number of machines: | 1 | | See the help for more |
| | Provision all machines up-fr | ont | | naming pattern syntax |
| | | | | options. |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | < Ba | ck Next > Cancel |

14. Click Next.



15. Select the vCenter Settings and browse for each of the six required inputs.

16. Click Next.

Add Desktop Pool - LinkedClon	ePool		?
Desktop Pool Definition	vCenter Settings		
Туре	Default Image		
User Assignment vCenter Server	1 Parent VM:	/HX-VDILAB/vm/Discovered virtual mac	Browse
Setting Desktop Pool Identification	2 Snapshot:	/SENTINEL/Snapshot01	Browse
Desktop Pool Settings Provisioning Settings	Virtual Machine Location		
View Composer Disks	3 VM folder location:	/HX-VDILAB/vm	Browse
vCenter Settings	Resource Settings		
Advanced Storage Options Guest Customization	4 Host or cluster:	/HX-VDILAB/host/VDI-CL	Browse
Ready to Complete	5 Resource pool:	/HX-VDILAB/host/VDI-CL/Resources	Browse
	6 Datastores:	1 selected	Browse
		< 8	Back Next > Cancel

17. For Datastore selection, select the datastore with the storage overcommit as "Unbounded".

18. Click OK.

Add Desktop Pool - InstantClor	nePool						?
Desktop Pool Definition	vCenter Sett	vCenter Settings					
Туре	Default Ima	Default Image					
User Assignment	Dara	-		1 15.	1.11		
vCenter Server	1 Pare		/HX-VDILAB	/vm/Disco	vered virtu	ial mac	wse
Setting Desktop Pool Identification	2 Snap	shot:	/SENTINEL/	Snapshot)1	Bro	wse
Desktop Pool Settings	Virtual Mach	ine Location					
Provisioning Settings	2 VM fr	older location:		lym		Pro	WSO
Storage Optimization	0		/HA-VDILAD	/ VIII			wse
Guest Cl Select Instant Clor	ne Datastores						
Ready to							
host or cluster can	be selected.	es to use for thi	is desktop p	ool. Only d	atastores	that can be u	sed by the selected
				Ē			🦡 🗌
Show all datast	ores (including	local datastore	es) 🕐	변활	Local dat	astore 💆 S	nared datastore 🧒
Dat	tastore	Capacity (GB)	Free (GB)	FS Type	Drive Typ	Storag	e Overcommit
✓ 및 HX-VDI	[40,960.00	40,746.14	NFS		Unbounded	
Data Type	Se	elected Free Space	e (GB) Min R	ecommende	ed (GB) 50	% utilization (6	Max Recommended (
Instant clones	40	,746.14	4,080	0.00	20	0,080.00	40,080.00
							OK Cancel
	_	_		_	_		

- 19. Select Guest Customization.
- 20. Browse to your Active Directory Domain and to the AD container into which you want your Instant Clone machines provisioned.
- 21. Click Next.

Add Desktop Pool - InstantClo	nePool	(?)
Desktop Pool Definition	Guest Customization	
Туре		2
User Assignment vCenter Server	Domain:	vdilab-hc.local(administrator) 🗸
Setting	AD container:	OU=Computers OU=LoginVSI Browse
Desktop Pool Identification Desktop Pool Settings	Use ClonePrep	blowsen
Provisioning Settings Storage Optimization	Power-off script name:	3
vCenter Settings	Power-off script	Example: p1 p2 p3
Guest Customization	parameters:	
Ready to Complete	Post-synchronization script name:	(2)
	Post-synchronization script parameters:	Example: p1 p2 p3
		< Back Next > Cancel

- 22. Review the summary of the pool configuration.
- 23. Select the checkbox "Entitle users after pool creation wizard completion" to authorize users or groups for the new pool.
- 24. Click Finish.

Desktop Pool Definition	Ready to Complete	
Type User Assignment		 Entitle users after this wizard finishes
vCenter Server	Type:	Automated
Setting	User assignment:	Floating assignment
Desktop Pool Identification	vCenter Server:	vcsa6.vdilab-hc.local(administrator@vsphere.local)
Desktop Pool Settings	Use View Composer:	No
Provisioning Settings	Unique ID:	InstantClonePool
Storage Optimization	Display name:	InstantClonePool
vCenter Settings	Access Group:	VDI-User
Guest Customization	Desktop pool state:	Enabled
Ready to Complete	Automatic logoff after disconnect:	Never
	Connection Server restrictions:	None
	Allow user to initiate separate sessions from different client devices:	No
	Default display protocol:	VMware Blast
	Allow users to choose protocol:	Yes
	3D Renderer:	Disabled
	Max number of monitors:	2
	Max resolution of any one monitor:	2560x1600
	HTML Access:	Disabled
	Adobe Flash quality:	Disabled
	Enable provisioning:	Yes
	Stop provisioning on error:	Yes
		< Back Finish Cancel

25. Follow the instructions provided in the Create Horizon 7 RDS Desktop Pool to authorize users for the Linked Clone Pool.

VMware Horizon Persistent Windows 10 Desktop Pool Creation

To create the VMware Horizon Persistent Windows 10 Desktop Pool, complete the following steps:

- 1. In Horizon Administrator console, select Desktop Pools in the Catalog node of the Inventory pane.
- 2. Click Add in the action pane.
- 3. Select assignment type for pool.
- 4. Click Next.



- 5. Select the Dedicated radio button.
- 6. Select the Enable automatic assignment checkbox if desired.
- 7. Click Next.



- 8. Select the Full Virtual Machines radio button and highlight your vCenter and Composer.
- 9. Click Next.



- 10. Enter the pool identification details.
- 11. Click Next.



- 12. Select Desktop Pool settings.
- 13. Click Next.

Add Desktop Pool - W10-Persis	stent		?
Desktop Pool Definition	Desktop Pool Settings		-
Type User Assianment	General	· · · · · · · · · · · · · · · · · · ·	
vCenter Server	State:	Enabled -	
Setting Desktop Pool Identification	Connection Server restrictions:	None Browse	
Desktop Pool Settings	Remote Settings		
Provisioning Settings Storage Optimization	Remote Machine Power Policy:	Ensure machines are always powered on $ \star$ (?)	
vCenter Settings Advanced Storage Options	Automatically logoff after disconnect:	Never 🗸 🔻	::
Ready to Complete	Allow users to reset their machines:	No 🗸	
	Remote Display Protocol		
	Default display protocol:	VMware Blast 🛛 🔻	
	Allow users to choose protocol:	Yes 🛛 🕶	
	3D Renderer:	Disabled Configure 3	
	Max number of monitors:	2 🗸	h
		May require power-cycle of related virtual machines 👔	
	Max resolution of any one monitor:	1920x1200 🔻 💿	
		May require power-cycle of related virtual machines (🤉	
	HTML Access:	Enabled 📀	
		Requires installation of HTML Access.	
		< Back Next > Cancel)

- 14. Select the provisioning settings to meet your requirements.
- 15. Click Next.

Add Desktop Pool - W10-Persis	stent			?		
Desktop Pool Definition	Provisioning Settings					
Туре	Basic			Naming Pattern		
User Assignment	 Enable provisioning 			Virtual machines will be		
vCenter Server Setting	Stop provisioning on erro	r		named according to the specified naming pattern.		
Desktop Pool Identification	Virtual Machine Naming			By default, View Manager		
Desktop Pool Settings	Specify names manually			to the specified pattern to		
Provisioning Settings Storage Optimization	0 names entered	Enter names		provide a unique name for each virtual machine.		
vCenter Settings	Start machines in mai	ntenance mode		To place this unique		
Advanced Storage Options	# Unassigned machines k	ept powered on:	1	number elsewhere in the		
Guest Customization Ready to Complete	 Use a naming pattern 			example: vm-{n}-sales.).		
Ready to complete	Naming Pattern:	W10-PI		The unique number can		
	Desktop Pool Sizing			also be made a fixed length. (For example: vm-		
	Max number of machines:	1000	{n:fixed=3}-sales).			
	Number of spare (powered o	1000	See the help for more naming pattern syntax			
	Provisioning Timing	options.				
	Provision machines on de	emand				
	Min number of machines:		1			
	Provision all machines up	-front				
			< Ba	ack Next > Cancel		

16. Click Next.



- 17. Select each of the five vCenter Settings.
- 18. Click Next.



19. For Datastore selection, select the datastore with storage overcommit as "Unbounded."

20. Click OK.

Add D	esktop F	Pool - W10-Persis	stent						?
Desk	top Pool	Definition	vCenter Settings						
Туре			Virtual Machine 1	Femplate					
Use	r Assignr	ment	Template		P/vm/Discovoro	d virtual ma	Brown		
vCe Sotti	nter Serv	ver		/HA-VDILA	b/viii/Discovere	u virtuai ma	BIOWS		
Des	Calast	Datastanas	Virtual Machine I	acation					
Des	Select	Datastores							_
Pro	Select	the datastores to	o use for this deskto	op pool. Only datastor	es that can be	used by the	selected l	nost or	
Sto	cluster	can be selected.							
vCe					🗐 Local da	atastore 👤	Shared o	latastore	2
Gue			Datastore		Capacity (GB)	Free (GB)	FS Type	Drive Type	
Rea	~	■ HX-VDI			40,960.00	40,746.06	NFS		•
		Springpath	DS-FCH1842V1JG		3.50	0.44	VMFS5	Non-SSD	
		🗐 Springpath	DS-FCH1936V0GE		3.50	0.44	VMFS5	Non-SSD	8
		🗐 Springpath	DS-FCH1937V2JT		3.50	0.44	VMFS5	Non-SSD	
		🗐 Springpath	DS-FCH1937V2JU		3.50	0.44	VMFS5	Non-SSD	
		🗐 Springpath	DS-FCH1937V2JV		3.50	0.44	VMFS5	Non-SSD	•
	Free s	space selected:	40,746.06	(A minimum of 44,000	.00 GB is recom	mended for	new virtua	al machines)
			,.						<u></u>
							ОК	Cancel	
l									<u> </u>
						<	Back	Vext >	Cancel .:

- 21. Select Advance Storage Options and enable the View Storage Accelerator.
- 22. Click Next.



- 23. Select Guest optimization settings.
- 24. Click Next.

Add Desktop Pool - W10-Persis	stent			?
Desktop Pool Definition	Guest Customization			
Type User Assignment vCenter Server Setting Desktop Pool Identification Desktop Pool Settings	 None - Customizatio Do not power on Use this customization 	n will be dor virtual mach on specificat	ne manually ines after creation ion:	3
Provisioning Settings Storage Optimization vCenter Settings	Name Horizon-RDS	Guest OS	Description	2
Advanced Storage Options	InfraVM-Specs	Windows		
Ready to Complete	RDSH-Customization	Windows		
	Win10-Custom	Windows	Windows 10 customization for Horizon testbed.	
	Win10-Persistent	Windows		
			< Back Next >	Cancel

- 25. Review the summary of the pool you are creating.
- 26. Select the checkbox "Entitle users after pool creation wizard completion" to authorize users for the pool.
- 27. Click Finish.

Desktop Pool Definition	Ready to Complete	
Туре		Entitle users after this wizard finishes
User Assignment		
vCenter Server	Type:	Automated
Setting	User assignment:	Dedicated assignment
Desktop Pool Identification	Assign on first login:	Yes
Desktop Pool Settings	vCenter Server:	vcsa6.vdilab-hc.local(administrator@vsphere.local)
Provisioning Settings	Use View Composer:	No
Storage Optimization	Unique ID:	W10-Persistent
vCenter Settings	Display name:	W10-Persistent
Advanced Storage Options	Access Group:	VDI-User
Guest Customization	Desktop pool state:	Enabled
Ready to Complete	Remote Machine Power Policy:	Ensure machines are always powered on
	Automatic logoff after disconnect:	Never
	Connection Server restrictions:	None
	Allow users to reset their machine:	No
	Default display protocol:	VMware Blast
	Allow users to choose protocol:	Yes
	3D Renderer:	Disabled
	Max number of monitors:	2
	Max resolution of any one monitor:	1920x1200
	HTML Access:	Disabled
	Adobe Flash quality:	Disabled

28. Follow the instructions provided in the Create Horizon 7 RDS Desktop Pool to authorize users for the Linked Clone Pool.

Test Setup and Configurations

In this project, we tested a single Cisco HyperFlex cluster running eight Cisco UCS HX240c-MS4S Rack Servers and eight Cisco UCS B200 M4 Blade Servers in a single Cisco UCS domain. This solution is tested to illustrate linear scalability for each workload studied.



Cisco HyperFlex and VMware Horizon 7, Reference Architecture

Hardware Components:

• 2 x Cisco UCS 6248UP Fabric Interconnects

- 2 x Cisco Nexus 9372PX Access Switches
- 8 x Cisco UCS HX240c-M4X Rack Servers (2 Intel Xeon processor E5-2690 v4 CPUs at 2.6 GHz, with 512 GB of memory per server [32 GB x 16 DIMMs at 2400 MHz]).
- Cisco VIC 1227 mLOM
- 12G modular SAS HBA Controller
- 120GB 2.5" 6G SATA SSD drive
- 1.6TB 2.5" 6G SATA SSD drive
- 23 x 1.2TB 2.5" 12G 10K RPM SAS drive
- 8 x Cisco UCS B200 M4 Blade Servers (2 Intel Xeon processor E5-2690 v4 CPUs at 2.6 GHz, with 512 GB of memory per server [32 GB x 16 DIMMs at 2400 MHz]).
- Cisco VIC 1340 mLOM
- 2 x 64GB SD card

Software components:

- Cisco UCS firmware 3.1(2b)
- Cisco HyperFlex data platform 1.8.1c
- VMware vSphere 6.0
- VMware Horizon 7 Hosted Virtual Desktops and Hosted Shared Desktops
- VMware Horizon View Composer Server
- v-File Server for User Profiles
- Microsoft SQL Server 2012
- Microsoft Windows 10
- Microsoft Windows 2012 R2
- Microsoft Office 2016
- Login VSI 4.1.5.115

Testing Methodology and Success Criteria

All validation testing was conducted on-site within the Cisco labs in San Jose, California.

The testing results focused on the entire process of the virtual desktop lifecycle by capturing metrics during the desktop boot-up, user logon and virtual desktop acquisition (also referred to as ramp-up,) user workload execution (also referred to as steady state), and user logoff for the RDSH Servers Session under test.

Test metrics were gathered from the virtual desktop, storage, and load generation software to assess the overall success of an individual test cycle. Each test cycle was not considered passing unless all of the planned test users completed the ramp-up and steady state phases (described below) and unless all metrics were within the permissible thresholds as noted as success criteria.

Three successfully completed test cycles were conducted for each hardware configuration and results were found to be relatively consistent from one test to the next.

You can obtain additional information and a free test license from http://www.loginvsi.com.

Testing Procedure

The following protocol was used for each test cycle in this study to insure consistent results.

Pre-Test Setup for Testing

All machines were shut down utilizing the VMware Horizon 7 Administrator Console.

All Launchers for the test were shut down. They were then restarted in groups of 10 each minute until the required number of launchers was running with the Login VSI Agent **at a "waiting for test to start" state.**

Test Run Protocol

To simulate severe, real-world environments, Cisco requires the log-on and start-work sequence, known as Ramp Up, to complete in 48 minutes. Additionally, we require all sessions started, whether 60 single server users or 2000 full scale test users to become active within two minutes after the last session is launched.

In addition, Cisco requires that the Login VSI Benchmark method is used for all single server and scale testing. This assures that our tests represent real-world scenarios. For each of the three consecutive runs on single server tests, the same process was followed. Complete the following steps:

- 1. Time 0:00:00 Start PerfMon Logging on the following systems:
 - Infrastructure and VDI Host Blades used in test run
 - All Infrastructure VMs used in test run (AD, SQL, View Connection brokers, image mgmt., etc.)
- 2. Time 0:00:10 Start Storage Partner Performance Logging on Storage System.
- 3. Time 0:05: Boot RDS Machines using VMware Horizon 7 Administrator Console.
- 4. Time 0:06 First machines boot.
- 5. Time 0:35 Single Server or Scale target number of RDS Servers registered on XD.

No more than 60 Minutes of rest time is allowed after the last desktop is registered and available on VMware Horizon 7 Administrator Console dashboard. Typically a 20-30 minute rest period for Windows 7 desktops and 10 minutes for RDS VMs is sufficient.

- 6. Time 1:35 Start Login VSI 4.1.5 Office Worker Benchmark Mode Test, setting auto-logoff time at 900 seconds, with Single Server or Scale target number of desktop VMs utilizing sufficient number of Launchers (at 20-25 sessions/Launcher).
- 7. Time 2:23 Single Server or Scale target number of desktop VMs desktops launched (48 minute benchmark launch rate).
- 8. Time 2:25 All launched sessions must become active.

All sessions launched must become active for a valid test run within this window.

- 9. Time 2:40 Login VSI Test Ends (based on Auto Logoff 900 Second period designated above).
- 10. Time 2:55 All active sessions logged off.

All sessions launched and active must be logged off for a valid test run. The VMware Horizon 7 Administrator Dashboard must show that all desktops have been returned to the registered/available state as evidence of this condition being met.

- 11. Time 2:57 All logging terminated; Test complete.
- 12. Time 3:15 Copy all log files off to archive; Set virtual desktops to maintenance mode through broker; Shutdown all Windows 7 machines.
- 13. Time 3:30 Reboot all hypervisors.
- 14. Time 3:45 Ready for new test sequence.

Success Criteria

Our "pass" criteria for this testing follows is Cisco will run tests at a session count level that effectively utilizes the blade capacity measured by CPU utilization, memory utilization, storage utilization, and network utilization. We will use Login VSI version 4.1.5 to launch Knowledge Worker workloads. The number of launched sessions must equal active sessions within two minutes of the last session launched in a test as observed on the VSI Management console.

The VMware Horizon Connection Server Dashboard will be monitored throughout the steady state to make sure of the following:

- All running sessions report In Use throughout the steady state
- No sessions move to unregistered, unavailable or available state at any time during steady state

Within 20 minutes of the end of the test, all sessions on all launchers must have logged out automatically and the Login VSI Agent must have shut down. Stuck sessions define a test failure condition.

Cisco requires three consecutive runs with results within +/-1% variability to pass the Cisco Validated Design performance criteria. For white papers written by partners, two consecutive runs within +/-1% variability are accepted. (All test data from partner run testing must be supplied along with proposed white paper.)

We will publish Cisco Validated Designs with our recommended workload following the process above and will note that we did not reach a VSImax dynamic in our testing.

The purpose of this testing is to provide the data needed to validate VMware Horizon 7 Hosted Shared Desktop with VMware Horizon 7 Composer provisioning using Microsoft Windows Server 2012 R2 sessions on Cisco UCS HX240c-M4SX and Cisco UCS B200 M4 servers.

The information contained in this section provides data points that a customer may reference in designing their own implementations. These validation results are an example of what is possible under the specific environment conditions outlined here, and do not represent the full characterization of VMware products.

Four test sequences, each containing three consecutive test runs generating the same result, were performed to establish single blade performance and multi-blade, linear scalability.

VSImax 4.1.x Description

The philosophy behind Login VSI is different to conventional benchmarks. In general, most system benchmarks are steady state benchmarks. These benchmarks execute one or multiple processes, and the measured execution time is the outcome of the test. Simply put: the faster the execution time or the bigger the throughput, the faster the system is according to the benchmark.

Login VSI is different in approach. Login VSI is not primarily designed to be a steady state benchmark (however, if needed, Login VSI can act like one). Login VSI was designed to perform benchmarks for SBC or VDI workloads through system saturation. Login VSI loads the system with simulated user workloads using well known desktop applications like Microsoft Office, Internet Explorer and Adobe PDF reader. By gradually increasing the amount of simulated users, the system will eventually be saturated. Once the system is saturated, the response time of the applications will increase significantly. This latency in application response times show a clear indication whether the system is (close to being) overloaded. As a result, by nearly overloading a system it is possible to find out what its true maximum user capacity is.

After a test is performed, the response times can be analyzed to calculate the maximum active session/desktop capacity. Within Login VSI this is calculated as VSImax. When the system is coming closer to its saturation point, response times will rise. When reviewing the average response time it will be clear the response times escalate at saturation point.

This VSImax is the "Virtual Session Index (VSI)". With Virtual Desktop Infrastructure (VDI) and Terminal Services (RDS) workloads this is valid and useful information. This index simplifies comparisons and makes it possible to understand the true impact of configuration changes on hypervisor host or guest level.

Server-Side Response Time Measurements

It is important to understand why specific Login VSI design choices have been made. An important design choice is to execute the workload directly on the target system within the session instead of using remote sessions. The scripts simulating the workloads are performed by an engine that executes workload scripts on every target system, and are initiated at logon within the simulated user's desktop session context.

An alternative to the Login VSI method would be to generate user actions client side through the remoting protocol. These methods are always specific to a product and vendor dependent. More importantly, some protocols simply do not have a method to script user actions client side.

For Login VSI the choice has been made to execute the scripts completely server side. This is the only practical and platform independent solutions, for a benchmark like Login VSI.

Calculating VSImax v4.1.x

The simulated desktop workload is scripted in a 48-minute loop when a simulated Login VSI user is logged on, performing generic Office worker activities. After the loop is finished it will restart automatically. Within each loop the response times of sixteen specific operations are measured in a regular interval: sixteen times in within each loop. The response times of these five operations are used to determine VSImax.

The five operations from which the response times are measured are:

• Notepad File Open (NFO)

Loading and initiating VSINotepad.exe and opening the openfile dialog. This operation is handled by the OS and by the VSINotepad.exe itself through execution. This operation seems almost instant from an end-user's point of view.

• Notepad Start Load (NSLD)

Loading and initiating VSINotepad.exe and opening a file. This operation is also handled by the OS and by the VSINotepad.exe itself through execution. This operation seems almost instant from an end-user's point of view.

• Zip High Compression (ZHC)

This action copy's a random file and compresses it (with 7zip) with high compression enabled. The compression will very briefly spike CPU and disk IO.

• Zip Low Compression (ZLC)

This action copy's a random file and compresses it (with 7zip) with low compression enabled. The compression will very briefly disk IO and creates some load on the CPU.

• CPU

Calculates a large array of random data and spikes the CPU for a short period of time.

These measured operations within Login VSI do hit considerably different subsystems such as CPU (user and kernel), Memory, Disk, the OS in general, the application itself, print, GDI, etc. These operations are specifically short by nature. When such operations become consistently long: the system is saturated because of excessive queuing on any kind of resource. As a result, the average response times will then escalate. This effect is clearly visible to end-users. If such operations consistently consume multiple seconds the user will regard the system as slow and unresponsive.



Figure 42 Sample of a VSI Max Response Time Graph, Representing a Normal Test

Figure 43 Sample of a VSI Test Response Time Graph with a Clear Performance Issue



When the test is finished, VSImax can be calculated. When the system is not saturated, and it could complete the full test without exceeding the average response time latency threshold, VSImax is not reached and the amount of sessions ran successfully.

The response times are very different per measurement type, for instance Zip with compression can be around 2800 ms, while the Zip action without compression can only take 75ms. This response time of these actions are weighted before they are added to the total. This ensures that each activity has an equal impact on the total response time.

In comparison to previous VSImax models, this weighting much better represent system performance. All actions have very similar weight in the VSImax total. The following weighting of the response times are applied.

The following actions are part of the VSImax v4.1 calculation and are weighted as follows (US notation):

- Notepad File Open (NFO): 0.75
- Notepad Start Load (NSLD): 0.2
- Zip High Compression (ZHC): 0.125
- Zip Low Compression (ZLC): 0.2
- CPU: 0.75

This weighting is applied on the baseline and normal Login VSI response times.

With the introduction of Login VSI 4.1 we also created a new method to calculate the base phase of an environment. With the new workloads (Taskworker, Powerworker, etc.) enabling 'base phase' for a more reliable baseline has become obsolete. The calculation is explained below. In total 15 lowest VSI response time samples are taken from the entire test, the lowest 2 samples are removed and the 13 remaining samples are averaged. The result is the Baseline. The calculation is as follows:

- Take the lowest 15 samples of the complete test
- From those 15 samples remove the lowest 2
- Average the 13 results that are left is the baseline

The VSImax average response time in Login VSI 4.1.x is calculated on the amount of active users that are logged on the system.

Always a 5 Login VSI response time samples are averaged + 40% of the amount of "active" sessions. For example, if the active sessions is 60, then latest 5 + 24 (=40% of 60) = 31 response time measurement are used for the average calculation.

To remove noise (accidental spikes) from the calculation, the top 5% and bottom 5% of the VSI response time samples are removed from the average calculation, with a minimum of 1 top and 1 bottom sample. As a result, with 60 active users, the last 31 VSI response time sample are taken. From those 31 samples the top 2 samples are removed and lowest 2 results are removed (5% of 31 = 1.55, rounded to 2). At 60 users the average is then calculated over the 27 remaining results.

VSImax v4.1.x is reached when the VSIbase + a 1000 ms latency threshold is not reached by the average VSI response time result. Depending on the tested system, VSImax response time can grow 2 - 3x the baseline average. In end-user computing, a 3x increase in response time in comparison to the baseline is typically regarded as the maximum performance degradation to be considered acceptable.

In VSImax v4.1.x this latency threshold is fixed to 1000ms, this allows better and fairer comparisons between two different systems, especially when they have different baseline results. Ultimately, in VSImax v4.1.x, the performance of the system is not decided by the total average response time, but by the latency is has under load. For all systems, this is now 1000ms (weighted).

The threshold for the total response time is: average weighted baseline response time + 1000ms.

When the system has a weighted baseline response time average of 1500ms, the maximum average response time may not be greater than 2500ms (1500+1000). If the average baseline is 3000 the maximum average response time may not be greater than 4000ms (3000+1000).

When the threshold is not exceeded by the average VSI response time during the test, VSImax is not hit and the amount of sessions ran successfully. This approach is fundamentally different in comparison to previous VSImax methods, as it was always required to saturate the system beyond VSImax threshold.

Lastly, VSImax v4.1.x is now always reported with the average baseline VSI response time result. For example: "The VSImax v4.1 was 125 with a baseline of 1526ms". This helps considerably in the comparison of systems and gives a more complete understanding of the system. The baseline performance helps to understand the best performance the system can give to an individual user. VSImax indicates what the total user capacity is for the system. These two are not automatically connected and related:

When a server with a very fast dual core CPU, running at 3.6 GHZ, is compared to a 10 core CPU, running at 2,26 GHZ, the dual core machine will give and individual user better performance than the 10 core machine. This is indicated by the baseline VSI response time. The lower this score is, the better performance an individual user can expect.

However, the server with the slower 10 core CPU will easily have a larger capacity than the faster dual core system. This is indicated by VSImax v4.1.x, and the higher VSImax is, the larger overall user capacity can be expected.

With Login VSI 4.1.x a new VSImax method is introduced: VSImax v4.1. This methodology gives much better insight in system performance and scales to extremely large systems.

Test Results

Boot Storms

A key performance metric for desktop virtualization environments is the ability to boot the virtual machines quickly and efficiently to minimize user wait time for their desktop.

As part of Cisco's virtual desktop test protocol, we shut down each virtual machine at the conclusion of a benchmark test. When we run a new test, we cold boot all 2000 desktops and measure the time it takes for the 2000th virtual machine to register as available in the Horizon Administrator console.

The Cisco HyperFlex HX240cM4SX and Cisco UCS B200 M4 hybrid cluster running Data Platform version 1.8(1c) software can accomplish this task in 11 minutes as shown in the following charts:







Figure 45 2000 Horizon 7 Full-Clone Windows 10 with Office 2016 Boot and Register as Available in less than 11 minutes

Recommended Maximum Workload and Configuration Guidelines

Eight Node HX240c-M4SX Rack Server and Eight Node Cisco UCS B200 M4 HyperFlex Cluster

For VMware Horizon 7 RDS Hosted Shared Desktop use cases, the recommended maximum workload was determined based on both Login VSI Knowledge Worker workload end user experience measures and HX240c-M4SX and B200 M4 server operating parameters.

This recommended maximum workload approach allows you to determine the server N+1 fault tolerance load the blade can successfully support in the event of a server outage for maintenance or upgrade.

Our recommendation is that the Login VSI Average Response and VSI Index Average should not exceed the Baseline plus 2000 milliseconds to insure that end user experience is outstanding. Additionally, during steady state, the processor utilization should average no more than 90-95%.

Memory should never be oversubscribed for Desktop Virtualization workloads.



Callouts have been added throughout the data charts to indicate each phase of testing.

Test Phase	Description
Boot	Start all RDS or VDI virtual machines at the same time.
Login	The Login VSI phase of test is where sessions are launched and start executing the work- load over a 48 minutes duration.
Steady state	The steady state phase is where all users are logged in and performing various workload tasks such as using Microsoft Office, Web browsing, PDF printing, playing videos, and compressing files.
Logoff	Sessions finish executing the Login VSI workload and logoff.

The recommended maximum workload for a HyperFlex cluster configured on HX240c-M4SX and B200 M4 nodes with E2690 v4 processors and 512GB of RAM for Windows Server 2012 R2 RDS Hosted Sessions and persistent/non-persistent Hosted Virtual Desktop users is 2400 sessions and 2000 Windows 10 with Office 2016 virtual desktops respectively.

RDSH Server Pool Testing on Sixteen Node Cisco HyperFlex Cluster

RDS Farm configured with 128 Windows 2012 R2 server in automated desktop pool hosting 2400 User Sessions on 8 HX240c-M4SX and 8 B200 M4 Servers.

Test result highlights include:

- 0.513 second baseline response time
- 0.798 second average response time with 2400 desktop sessions running
- Average CPU utilization of 70 percent during steady state
- Average of 200 GB of RAM used out of 512 GB available
- 2500Mbps peak network utilization per host.
- Average Read Latency 3.7ms/Max Read Latency 17ms
- Average Write Latency 10.7ms/Max Write Latency 19.2ms
- 12200 peak I/O operations per second (IOPS) per cluster at steady state
- 400MBps peak throughput per cluster at steady state



Figure 46 Login VSI Analyzer Chart for 2400 Users RDSH Server Desktop Test

Figure 47 Sample ESXi host CPU Core Utilization Running 2400 User Test with 128 RDSH Server VMs on 16 Nodes





Figure 48 Sample ESXi Host Memory Usage in Mbytes running 2400 User Test with 128 RDSH Server VMs on 16 Node

Figure 49 Sample ESXi Host Network Adapter (VMNICs) Mbits Received/ Transmitted Per Sec Running 2400 User Test with 128 RDSH Server VMs on 16 Node



Figure 50 HyperFlex Cluster WebUI Performance Chart for Knowledge Worker Workload Running 2400 User Test on RDSH Server Windows Server 2012 R2



Figure 51 vCenter WebUI reporting HyperFlex cluster De-duplication and Compression savings for 128 RDSH Server VMs running Windows Server 2012 R2 supporting 2400 User sessions



2000 Windows 10 Instant-clone Desktop Pool testing on Sixteen Node Cisco HyperFlex Cluster

Travis Wood from VMware describes Instant Clones this way in his <u>blog</u> on the subject. Horizon 7 has introduced a new method of provisioning with Instant Clones. Instant Clones are similar to linked clones in that all desktops read from a replica disk and write to their own disk, but Instant Clone takes it one step further by doing the same thing with memory. Instant Clones utilize a new feature of Horizon 7 where desktop VMs are forked (that is, Instant Clones are created) off a running VM–instead of cloning a powered-off VM–which provides savings for provisioning, updates, and memory utilization.

Instant Clones are convenient for virtual desktop infrastructure administrators, because these desktops don't need Refresh, Recompose and Rebalance operations. The reason is that after the user logs out the VM, his desktop is deleted, and linked clone recomposition is not needed.

Instant Clone provisioning time is generally one third of the time for the same size desktop pool provisioned as linked clones with the Horizon Composer. In this study, we provisioned 2000 Instant Clones in 22 minutes.

Floating assigned automated Instant-clone desktop pool with 2000 Windows 10 VMs hosting 2000 User Sessions on 8 x HX240c-M4SX and 8 x Cisco UCS B200 M4Servers.

Test result highlights include:

- 0.628 second baseline response time
- 0.955 second average response time with 2000 desktops running
- Average CPU utilization of 80 percent during steady state
- Average of 320 GB of RAM used out of 512 GB available
- 3100Mbps peak network utilization per host.
- Average Read Latency 2.0ms/Max Read Latency 4.9ms
- Average Write Latency 5.0ms/Max Write Latency 9.1ms
- 30000 peak I/O operations per second (IOPS) per cluster at steady state
- 526MBps peak throughput per cluster at steady state





Figure 53 Sample ESXi host CPU Core Utilization Running 2000 Windows 10 Instant-Clone Virtual Desktops





Figure 54 ESXi Host Memory Usage in Mbytes Running 2000 Windows 10 Instant-Clone Virtual Desktops

Figure 55 ESXi Host Network Adapter (VMNICs) Mbits Received/Transmitted Per Sec Running 2000 Windows 10 Instant-Clone Virtual Desktops




Figure 56 HyperFlex Cluster WebUI Performance Chart for Knowledge Worker Workload Running 2000 User Test on Instant-Clone Windows 10

Figure 57 vCenter WebUI Reporting HyperFlex Cluster Deduplication and Compression Savings for 2000 Instant-Clone VMs Running Windows 10/Office 2016 Supporting 2000 Users

Navigator C3HX-VDI Actions * Clisco HX-Data Pla Cetting Starter Summary Monitor Manage Cdisco HX-Data CatHX-VDI Cetting Starter Summary Nonitor Manage Version: 1.6(1c) Model: HX-VDI-CL Converged Nodes 8 & CONTR Converged Nodes 8 & CONTR VC Cutster: PLX-VDI-CL COOW Undows 10 Instant clone Desktop pool via Horizon 7 Resiliency Status Operational Status Online Performance Performance Performance V Converged Nodes H2320017 3:03 31 PM Performance Performance Performance Converged Nodes H2320017 3:03 31 PM Performance Performance Performance V Compute Nodes Is Controllers online B Controllers online B Controllers online Performance V Compute Nodes Is Used Is Used Is Used Is Used Is Used Is Used	l Help
Clisco HX Data Pla Cetting Startet Summary Monitor Manage Clisco HX Data Cetting Startet Summary Monitor Manage Clisco HX Data Cetting Startet Summary Monitor Manage Clisco HX Data Cetting Startet Summary Monitor Manage Version: Lat(1) Mode: HX XUI-CL 2000 Windows 10 Instant clone Desktop pool via Horizon 7 ConvErget Nodes 8 Converget Nodes 8 Converget Nodes Converget Nodes Performance • Status • Healthy Ital Ital Performance Performance Performance • Compute Nodes 8 Hosts online 8 Controllers online Ital Ital	
C3-HXXDI Units Wess. I (11) Weision: 1.8(15) Mode: HX240C-M45X,UCSB-8200-M4 Yerion: HX240C-M45X,UCSB-8200-M4 Yerion: HX240C-M45X and 8 x B200 M4 - 16 Node HX cluster running v1.8.1c Upgrade Cluster Yo Custer: HXXDI-CL 2000 Windows 10 Instant clone Desktop pool via Horizon 7 Deduplication and Compression Saving Status Operational Status Operational Status Operating 1 232017 330.31 PM Last Update Compute Nodes B Hosts online Compute Nodes Gontrollers online Used	
Status Operational Status Online Resiliency Status Otal Converged Nodes S Hords Sonline Compute Nodes Compute Nodes Total Total Total Used	ALTHY
Operational Status Online P Resiliency Status Heatthy Last Updated 1/23/2017 3:30:31 PM Converged Nodes 8 Hoots Sonline Compute Nodes 8 Hoots Sonline Compute Nodes 8 Capacity Total Used Used	
Resiliency Status Healthy Last Updated 1/23/2017 3:30:31 PM Converged Nodes B Hosts online B Controllers online Compute Nodes Total Free Used	
Last Updated 1/23/2017 3:30:31 PM Converged Nodes 8 Hosts online 8 Controllers online Compute Nodes	
Competiged Nodes 8 Hosts online 8 Controllers online Compute Nodes Capacity Total Total Used	
Capacity Total Free Used	
Capacity Total Free Used	
Total Free Used	
Usable Capacity 61.60 TB	
Used 1.15 TB	
Free 60.44 TB	
Provisioned 70.00 TB	
Over Provisioned 8.40 TB	
- Savings	
Total Savings 87.70%	
Compression 57.49%	
Deduplication 71.07%	
	*

2000 Windows 10 Full Clone Desktop Pool Testing on Sixteen Node Cisco HyperFlex Cluster

2000 User Dedicated assignment automated pool Windows 10 with Office 2016 full clone desktops on 8 x HX240c-M4SX and 8 x B200 M4 Server HyperFlex Cluster.

Test result highlights include:

- 0.650 second baseline response time
- 0.993 second average response time with 2000 desktops running
- Average CPU utilization of 80 percent during steady state
- Average of 320GB of RAM used out of 512 GB available per node
- 2500Mbps peak network utilization per host.
- Average Write Latency 8.4ms/Max Write Latency 23.5ms
- Average Read Latency 5.6ms/Max Read Latency 12.1ms
- 13200 peak I/O operations per second (IOPS) at steady state
- 343MBps peak throughput at steady state

Figure 58 Login VSI Analyzer Chart for 2000 User Full-Clone Desktops









Figure 60 Sample ESXi Host Memory Usage in Mbytes Running 2000 User Full-Clone Windows 10 Virtual Desktops

Figure 61 Sample ESXi Host Network Adapter (VMNICs) Mbits Received /Transmitted Per Sec Running 2000 User Full-Clone Windows 10 Virtual Desktops





Figure 62 HyperFlex Cluster WebUI Performance Chart for Knowledge Worker Workload Running 2000 User Test on Full Clone Windows 10 Virtual Desktops

Figure 63 vCenter WebUI reporting HyperFlex cluster De-duplication and Compression savings for 2000 Full-Clone VMs running Windows 10/Office 2016 supporting 2000 Users.

vmware [,] vSphere Web Clie	ent nt≣					Updated at 9:23 AM 💍 Administrator@VSPHERE.LOCAL	- I Help - I Q Search	
Navigator I	C3-HX-VDI Actions	· ·						
✓ vCenter Inventory L → 10	Summary Monitor	Manage						
留 Cisco HX Data Platform							0700405	
	Tota	1X-VDI (1) INodes: 16					FREE DOUD IB	j j
E. C3-HA-VDI	Data	istores: 1	8 Node HX	240c-M4SX + 8 Node B2	00 M4 - 16 Node HX cluster running v1.8	.1c	USED 2.64 TB CAPACITY 61.60 TB	1
	Mod	el: HX240C-M4SX.UCSB-B	200-M4				OPERATIONAL STATUS ONLINE	
	VC	Dester BI HX-VDECI	2000 Full C	lone Dedicated assignm	ent Desktop pool via Horizon 7		CONVERGED NODES 8 CONTROLLERS 16	6
		norade Cluster					RESILIENCY STATUS HEALTHY	:
		pgrade elaster	Total Savin	gs by Deduplication and	Compression		2 HOST FAILURE(S) CAN BE TOLERATED	1
								-
		C	 Performance 	0				
	Operational Status	 Online 	* IOPS		•			
	▶ Resiliency Status	Healthy	Current	653.70/7319.90				
	Last Updated	3/9/2017 9:23:58 AM	PastHour	32000 - Read - Write				
	Converged Nodes	8 Hosts online 6 8 Controllers online		§ 10000				
				8000 - 0008				
	Hosts	Host Status		8:25 8:45 9:05 9:2				
	HX-B200M4-01	 Online 						
	HX-B200M4-02	 Online 	Current	12.72/85.58 (MBps)				
	HX-B200M4-03	 Online 	Past Hour	1200 - Read = Write 🗆				
	HX-B200M4-04	 Online 		800 -				
	HX-B200M4-05	 Online 		400 -				
	HX-B200M4-06	 Online 						
	HX-B200M4-07	 Online 		8:25 8:45 9:05 9:2				
	HX-B200M4-08	Online	* Latency					
	 Capacity 		Current	0.71/0.40 (msec)				
	Total		Past Hour	€ 40				
		Free		U 30				
		Used		10 - MAN				
	Usable Capacity	61.60 TB		0				
	Used	2.54 TB			9			
	Free	59.05 TB						
	Provisioned	70.00 TB						
	Over Provisioned	8.40 TB						
			1					
	Total Savings	97.52%						
	Compression	38.34%						
	Deduplication	95.98%						
		4	5					

Summary

This Cisco HyperFlex solution addresses urgent needs of IT by delivering a platform that is cost effective and simple to deploy and manage. The architecture and approach used provides for a flexible and high-performance system with a familiar and consistent management model from Cisco. In addition, the solution offers numerous enterprise-class data management features to deliver the next-generation hyperconverged system.

Only Cisco offers the flexibility to add compute only nodes to a hyperconverged cluster for compute intensive workloads like desktop virtualization. This translates to lower cost for the customer, since no hyperconvergence licensing is required for those nodes.

Delivering responsive, resilient, high performance VMware Horizon 7 provisioned Windows 10 Virtual Machines and Windows Server for hosted Apps or desktops has many advantages for desktop virtualization administrators.

Virtual desktop end-user experience, as measured by the Login VSI tool in benchmark mode, is outstanding with Intel Broadwell E5-2600 v4 processors and Cisco 2400Mhz memory. In fact, we have set the industry standard in performance for Desktop Virtualization on a hyper-converged platform.

About the Authors

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Hardik is a subject matter expert on Cisco HyperFlex, Cisco Unified Computing System, Cisco Nexus Switching, VMware vSphere and VMware Horizon end user computing. Hardik is a member of the Cisco's Computer Systems Product Group team.

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- Bhumik Patel, VMware Alliance Team, VMware, Inc.

Appendix A - Cisco Nexus 9372 Switch Configuration

Switch A Configuration

!Command: show running-config !Time: Fri Mar 24 17:17:40 2017

version 7.0(3)I2(2d) switchname XXXXXXXXXXXX class-map type network-qos class-fcoe match qos-group 1 class-map type network-gos class-all-flood match qos-group 2 class-map type network-qos class-ip-multicast match qos-group 2 vdc XXXXXXXXXX id 1 limit-resource vlan minimum 16 maximum 4094 limit-resource vrf minimum 2 maximum 4096 limit-resource port-channel minimum 0 maximum 511 limit-resource u4route-mem minimum 248 maximum 248 limit-resource u6route-mem minimum 96 maximum 96 limit-resource m4route-mem minimum 58 maximum 58 limit-resource m6route-mem minimum 8 maximum 8

feature telnet

cfs eth distribute

feature interface-vlan

feature hsrp

feature lacp

feature dhcp

feature vpc

feature lldp

clock protocol ntp vdc 1

no password strength-check username admin password 5 \$1\$MSJwTJtn\$Bo0IrVnESUVxLcbRHg86j1 role network-admin ip domain-lookup no service unsupported-transceiver class-map type qos match-all class-fcoe policy-map type qos jumbo class class-default set gos-group 0 copp profile strict snmp-server user admin network-admin auth md5 0x71d6a9cf1ea007cd3166e91a6f3807e5 priv 0x71d6a9cf1ea007cd3166e91a6f3807e5 localizedkey rmon event 1 log trap public description FATAL(1) owner PMON@FATAL rmon event 2 log trap public description CRITICAL(2) owner PMON@CRITICAL rmon event 3 log trap public description ERROR(3) owner PMON@ERROR rmon event 4 log trap public description WARNING(4) owner PMON@WARNING rmon event 5 log trap public description INFORMATION(5) owner PMON@INFO ntp server 10.10.40.2 ntp peer 10.10.40.3

ntp server 171.68.38.66 use-vrf management

ntp logging

ntp master 8

vlan 1,40-44

vlan 40

name InBand-Mgmt-C1

vlan 41

name Infra-Mgmt-C1

vlan 42

name StoragelP-C1

vlan 43

name vMotion-C1

vlan 44

name VM-Data-C1

service dhcp

ip dhcp relay

ip dhcp relay information option

ipv6 dhcp relay

vrf context management

ip route 0.0.0.0/0 10.29.132.1

vpc domain 40

role priority 1000

peer-keepalive destination 10.29.132.20 source 10.29.132.19

interface Vlan1

no shutdown

ip address 10.29.132.2/24

interface Vlan40

no shutdown ip address 10.10.40.2/24 hsrp version 2 hsrp 40 preempt priority 110 ip 10.10.40.1

ip dhcp relay address 10.10.41.21

ip dhcp relay address 10.10.41.22

interface Vlan41

no shutdown

ip address 10.10.41.2/24

hsrp version 2

hsrp 41

preempt

priority 110

ip 10.10.41.1

interface Vlan42

no shutdown

ip address 10.10.42.2/24

hsrp version 2

hsrp 42

preempt

priority 110

ip 10.10.42.1

interface Vlan43

no shutdown

ip address 10.10.43.2/24

hsrp version 2

hsrp 43

preempt

priority 110

ip 10.10.43.1

interface Vlan44

no shutdown

ip address 10.44.0.2/20

hsrp version 2

hsrp 44

preempt

priority 110

ip 10.44.0.1

ip dhcp relay address 10.10.41.21

ip dhcp relay address 10.10.41.22

interface port-channel10

description vPC-PeerLink

switchport mode trunk

switchport trunk allowed vlan 1,40-44

spanning-tree port type network

service-policy type qos input jumbo vpc peer-link interface port-channel11 description FI-Uplink-K22 switchport mode trunk switchport trunk allowed vlan 1,40-44 spanning-tree port type edge trunk mtu 9216 service-policy type qos input jumbo vpc 11

interface port-channel12 description FI-Uplink-K22 switchport mode trunk switchport trunk allowed vlan 1,40-44 spanning-tree port type edge trunk mtu 9216 service-policy type qos input jumbo vpc 12

interface Ethernet1/1

switchport mode trunk

switchport trunk allowed vlan 1,40-44

channel-group 10 mode active

interface Ethernet1/2 switchport mode trunk switchport trunk allowed vlan 1,40-44 channel-group 10 mode active interface Ethernet1/3

switchport mode trunk

switchport trunk allowed vlan 1,40-44

channel-group 10 mode active

interface Ethernet1/4

switchport mode trunk

switchport trunk allowed vlan 1,40-44

channel-group 10 mode active

interface Ethernet1/5

switchport mode trunk

switchport trunk allowed vlan 1,40-44

mtu 9216

channel-group 11 mode active

interface Ethernet1/6

switchport mode trunk

switchport trunk allowed vlan 1,40-44

mtu 9216

channel-group 11 mode active

interface Ethernet1/7

switchport mode trunk

switchport trunk allowed vlan 1,40-44

mtu 9216

channel-group 12 mode active

interface Ethernet1/8 switchport mode trunk switchport trunk allowed vlan 1,40-44 mtu 9216 channel-group 12 mode active interface Ethernet1/9 interface Ethernet1/10

interface Ethernet1/12

interface Ethernet1/13

interface Ethernet1/14

interface Ethernet1/15

interface Ethernet1/16

interface Ethernet1/17

interface Ethernet1/18

interface Ethernet1/19

interface Ethernet1/20

interface Ethernet1/21

interface Ethernet1/22

interface Ethernet1/23

interface Ethernet1/24

interface Ethernet1/25

switchport mode trunk

switchport trunk allowed vlan 1,40-44

spanning-tree port type edge trunk

interface Ethernet1/26

switchport mode trunk switchport trunk allowed vlan 1,40-44 spanning-tree port type edge trunk

interface Ethernet1/27 switchport mode trunk switchport trunk allowed vlan 1,40-44 spanning-tree port type edge trunk

interface Ethernet1/28 switchport mode trunk switchport trunk allowed vlan 1,40-44

spanning-tree port type edge trunk

interface Ethernet1/29 switchport mode trunk switchport trunk allowed vlan 1,40-44 spanning-tree port type edge trunk

interface Ethernet1/30 switchport mode trunk switchport trunk allowed vlan 1,40-44 spanning-tree port type edge trunk

interface Ethernet1/31 switchport mode trunk switchport trunk allowed vlan 1,40-44 spanning-tree port type edge trunk

interface Ethernet1/32 switchport mode trunk switchport trunk allowed vlan 1,40-44 spanning-tree port type edge trunk

interface Ethernet1/33

interface Ethernet1/34

interface Ethernet1/35

interface Ethernet1/36

interface Ethernet1/37

interface Ethernet1/38

interface Ethernet1/39

interface Ethernet1/40

interface Ethernet1/41

interface Ethernet1/42

interface Ethernet1/43

interface Ethernet1/44

interface Ethernet1/45

interface Ethernet1/46

interface Ethernet1/47

interface Ethernet1/48

interface Ethernet1/49

interface Ethernet1/50

interface Ethernet1/51

interface Ethernet1/52

interface Ethernet1/53

interface Ethernet1/54

interface mgmt0

vrf member management

ip address 10.29.132.19/24

clock timezone PST -8 0

clock summer-time PDT 2 Sunday March 02:00 1 Sunday November 02:00 60

line console

line vty

boot nxos bootflash:/nxos.7.0.3.I2.2d.bin

Switch B Configuration

!Command: show running-config

!Time: Fri Mar 24 17:18:36 2017

version 7.0(3)I2(2d) switchname XXXXXXXX class-map type network-qos class-fcoe match qos-group 1 class-map type network-qos class-all-flood match qos-group 2 class-map type network-qos class-ip-multicast match qos-group 2

vdc XXXXXXXXX id 1

limit-resource vlan minimum 16 maximum 4094 limit-resource vrf minimum 2 maximum 4096 limit-resource port-channel minimum 0 maximum 511 limit-resource u4route-mem minimum 248 maximum 248 limit-resource u6route-mem minimum 96 maximum 96 limit-resource m4route-mem minimum 58 maximum 58 limit-resource m6route-mem minimum 8 maximum 8

feature telnet

cfs eth distribute

feature interface-vlan

feature hsrp

feature lacp

feature dhcp

feature vpc

feature lldp

clock protocol ntp vdc 1

no password strength-check

username admin password 5 \$1\$jEwHqUvM\$gpOec2hramkyX09KD3/Dn. role network-admin

ip domain-lookup

no service unsupported-transceiver

class-map type qos match-all class-fcoe

policy-map type qos jumbo

class class-default

set qos-group 0

copp profile strict

snmp-server user admin network-admin auth md5 0x9046c100ce1f4ecdd74ef2f92c4e83f9 priv 0x9046c100ce1f4ecdd74ef2f92c4e83f9 localizedkey rmon event 1 log trap public description FATAL(1) owner PMON@FATAL rmon event 2 log trap public description CRITICAL(2) owner PMON@CRITICAL rmon event 3 log trap public description ERROR(3) owner PMON@ERROR rmon event 4 log trap public description WARNING(4) owner PMON@WARNING

rmon event 5 log trap public description INFORMATION(5) owner PMON@INFO ntp peer 10.10.40.2 ntp server 10.10.40.3 ntp server 171.68.38.66 use-vrf management ntp logging

ntp master 8

vlan 1,40-44

vlan 40

name InBand-Mgmt-C1

vlan 41

name Infra-Mgmt-C1

vlan 42

name StorageIP-C1

vlan 43

name vMotion-C1

vlan 44

name VM-Data-C1

service dhcp

ip dhcp relay

ip dhcp relay information option ipv6 dhcp relay vrf context management ip route 0.0.0.0/0 10.29.132.1 vpc domain 40 role priority 2000 peer-keepalive destination 10.29.132.19 source 10.29.132.20

interface Vlan1

no shutdown

ip address 10.29.132.3/24

interface Vlan40

no shutdown

ip address 10.10.40.3/24

hsrp version 2

hsrp 40

preempt

priority 110

ip 10.10.40.1

ip dhcp relay address 10.10.41.21

ip dhcp relay address 10.10.41.22

interface Vlan41

no shutdown

ip address 10.10.41.3/24

hsrp version 2

hsrp 41

preempt

priority 110

ip 10.10.41.1

interface Vlan42

no shutdown

ip address 10.10.42.3/24

hsrp version 2

hsrp 42

preempt

priority 110

ip 10.10.42.1

interface Vlan43

no shutdown

ip address 10.10.43.3/24

hsrp version 2

hsrp 43

preempt

priority 110

ip 10.10.43.1

interface Vlan44

no shutdown

ip address 10.44.0.3/20

hsrp version 2

hsrp 44

preempt

priority 110

ip 10.44.0.1

ip dhcp relay address 10.10.41.21

ip dhcp relay address 10.10.41.22

interface port-channel10

description vPC-PeerLink

switchport mode trunk

switchport trunk allowed vlan 1,40-44

spanning-tree port type network

service-policy type qos input jumbo vpc peer-link

interface port-channel11

description FI-Uplink-K22 switchport mode trunk switchport trunk allowed vlan 1,40-44 spanning-tree port type edge trunk mtu 9216 service-policy type qos input jumbo vpc 11

interface port-channel12 description FI-Uplink-K22 switchport mode trunk switchport trunk allowed vlan 1,40-44 spanning-tree port type edge trunk mtu 9216 service-policy type qos input jumbo vpc 12

interface Ethernet1/1

switchport mode trunk

switchport trunk allowed vlan 1,40-44

channel-group 10 mode active

interface Ethernet1/2

switchport mode trunk switchport trunk allowed vlan 1,40-44 channel-group 10 mode active

interface Ethernet1/3

switchport mode trunk switchport trunk allowed vlan 1,40-44 channel-group 10 mode active

interface Ethernet1/4 switchport mode trunk switchport trunk allowed vlan 1,40-44 channel-group 10 mode active

interface Ethernet1/5

switchport mode trunk switchport trunk allowed vlan 1,40-44 mtu 9216 channel-group 11 mode active interface Ethernet1/6 switchport mode trunk switchport trunk allowed vlan 1,40-44 mtu 9216 channel-group 11 mode active

interface Ethernet1/7 switchport mode trunk switchport trunk allowed vlan 1,40-44 mtu 9216 channel-group 12 mode active

interface Ethernet1/8 switchport mode trunk switchport trunk allowed vlan 1,40-44 mtu 9216 channel-group 12 mode active

interface Ethernet1/9

interface Ethernet1/10

interface Ethernet1/11

interface Ethernet1/12

interface Ethernet1/13

interface Ethernet1/14

interface Ethernet1/15

interface Ethernet1/16

interface Ethernet1/17

interface Ethernet1/18

interface Ethernet1/19

interface Ethernet1/20

interface Ethernet1/21

interface Ethernet1/22

interface Ethernet1/23

interface Ethernet1/24

interface Ethernet1/25

switchport mode trunk

switchport trunk allowed vlan 1,40-44

spanning-tree port type edge trunk

interface Ethernet1/26

switchport mode trunk

switchport trunk allowed vlan 1,40-44 spanning-tree port type edge trunk

interface Ethernet1/27 switchport mode trunk

switchport trunk allowed vlan 1,40-44

spanning-tree port type edge trunk

interface Ethernet1/28

switchport mode trunk

switchport trunk allowed vlan 1,40-44

spanning-tree port type edge trunk

interface Ethernet1/29

switchport mode trunk switchport trunk allowed vlan 1,40-44 spanning-tree port type edge trunk

interface Ethernet1/30 switchport mode trunk switchport trunk allowed vlan 1,40-44 spanning-tree port type edge trunk

interface Ethernet1/31 switchport mode trunk switchport trunk allowed vlan 1,40-44 spanning-tree port type edge trunk interface Ethernet1/32 switchport mode trunk switchport trunk allowed vlan 1,40-44 spanning-tree port type edge trunk

interface Ethernet1/33

interface Ethernet1/34

interface Ethernet1/35

interface Ethernet1/36

interface Ethernet1/37

interface Ethernet1/38

interface Ethernet1/39

interface Ethernet1/40

interface Ethernet1/41

interface Ethernet1/42

interface Ethernet1/43

interface Ethernet1/44

interface Ethernet1/45

interface Ethernet1/46

interface Ethernet1/47

interface Ethernet1/48

switchport access vlan 40

interface Ethernet1/49

interface Ethernet1/50

interface Ethernet1/51

interface Ethernet1/52

interface Ethernet1/53

interface Ethernet1/54

interface mgmt0

vrf member management

ip address 10.29.132.20/24

clock timezone PST -8 0

clock summer-time PDT 2 Sunday March 02:00 1 Sunday November 02:00 60

line console

Appendix A – Cisco Nexus 9372 Switch Configuration

line vty

boot nxos bootflash:/nxos.7.0.3.I2.2d.bin

The following charts delineate performance parameters for the 16-node cluster during a Login VSI 4.1 2000 Horizon 7 Instant Clone benchmark test.

The CPU and memory charts show all 16 **nodes' performance on a single chart. Individual charts for each** node are included for network throughput for clarity.

The performance charts indicates that the HyperFlex hybrid nodes running Data Platform version 1.8(1c) were operating consistently from node to node and well within normal operating parameters for hardware in this class. The data also supports the even distribution of the workload across all 16 servers.







Figure 65 Memory Utilization by Node



Figure 66 Network Utilization: Mbits Received/Second by Node




Appendix C – Cisco HyperFlex HX240c-M4SX and Cisco UCS B200 M4 16-Node Cluster Horizon 7 Full Clone In-Flight Performance Metrics

The following charts delineate performance parameters for the 16-node cluster during a Login VSI 4.1 2000 Horizon 7 Instant Clone benchmark test.

The CPU and memory charts show all 16 nodes' performance on a single chart. Individual charts for each node are included for network throughput for clarity.

The performance charts indicates that the HyperFlex hybrid nodes running Data Platform version 1.8(1c) were operating consistently from node to node and well within normal operating parameters for hardware in this class. The data also supports the even distribution of the workload across all 16 servers.

Appendix C – Cisco HyperFlex HX240c-M4SX and Cisco UCS B200 M4 16-Node Cluster Horizon 7 Full Clone In-Flight Performance Metrics



Figure 68 Percent CPU Core Utilization by Node

Appendix C – Cisco HyperFlex HX240c-M4SX and Cisco UCS B200 M4 16-Node Cluster Horizon 7 Full Clone In-Flight Performance Metrics



Figure 69 Memory Utilization by Node







Figure 71 Network Utilization: Mbits Transmitted/Second for 16 Node

Appendix D – Cisco HyperFlex HX240c-M4SX and Cisco UCS B200 M4 16-Node Cluster Horizon 7 RDSH Sessions In-Flight Performance Metrics

The following charts delineate performance parameters for the 16-node cluster during a Login VSI 4.1 2000 Horizon 7 Instant Clone benchmark test.

The CPU and memory charts show all 16 nodes' performance on a single chart. Individual charts for each node are included for network throughput for clarity.

The performance charts indicates that the HyperFlex hybrid nodes running Data Platform version 1.8(1c) were operating consistently from node to node and well within normal operating parameters for hardware in this class. The data also supports the even distribution of the workload across all 16 servers.

Appendix D – Cisco HyperFlex HX240c-M4SX and Cisco UCS B200 M4 16-Node Cluster Horizon 7 RDSH Sessions In-Flight Performance Metrics



Figure 72 Percent CPU Core Utilization by Node

Appendix D – Cisco HyperFlex HX240c-M4SX and Cisco UCS B200 M4 16-Node Cluster Horizon 7 RDSH Sessions In-Flight Performance Metrics



Figure 73 Memory Utilization by Node







