Cisco UCS Integrated Infrastructure for Big Data with Cloudera for Enterprise Data Hub

With optional guidelines for Scaling with Cisco Application Centric Infrastructure (ACI)

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Cisco Validated Design

Building Architectures to Solve Business Problems

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Cisco UCS Integrated Infrastructure for Big Data with Cloudera for Enterprise Data Hub

Audience

This document describes the architecture and deployment procedures of Cloudera on Cisco UCS Integrated Infrastructure for Big Data with Application Centric Infrastructure (ACI). The intended audience of this document includes, but is not limited to, sales engineers, field consultants, professional services, IT managers, partner engineering and customers who want to deploy Cloudera on Cisco UCS Integrated Infrastructure for Big Data with Application Centric Infrastructure (ACI).

Introduction

Hadoop has become a strategic data platform embraced by mainstream enterprises as it offers the fastest path for businesses to unlock value in big data while maximizing existing investments. Cloudera is the leading provider of enterprise-grade Hadoop infrastructure software and services, and the leading contributor to the Apache Hadoop project overall. Cloudera provides an enterprise-ready Hadoop-based solution known as Cloudera Enterprise, which includes their market leading open source Hadoop distribution (CDH), their comprehensive management system (Cloudera Manager), and technical support. The combination of Cisco UCS Servers along with Application Centric Infrastructure (ACI) and Cloudera provides industry-leading platform for Hadoop based applications.

This solution is based on Cisco UCS Integrated Infrastructure for Big Data with Application Centric Infrastructure (ACI), with multiple Cisco UCS Fabric Interconnect domains. Each Fabric Interconnect domain consists of 5 racks of servers (total of 80 Cisco UCS C240 M4 servers) along with a pair of Fabric Interconnect. These domains are inter-connected through ACI.

Cisco UCS Integrated Infrastructure for Big Data

The Cisco UCS solution for Cloudera is based on Cisco UCS Integrated Infrastructure for Big Data, a highly scalable architecture designed to meet a variety of scale-out application demands with seamless data integration and management integration capabilities built using the following components:

Corporate Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

Cisco UCS 6200 Series Fabric Interconnects

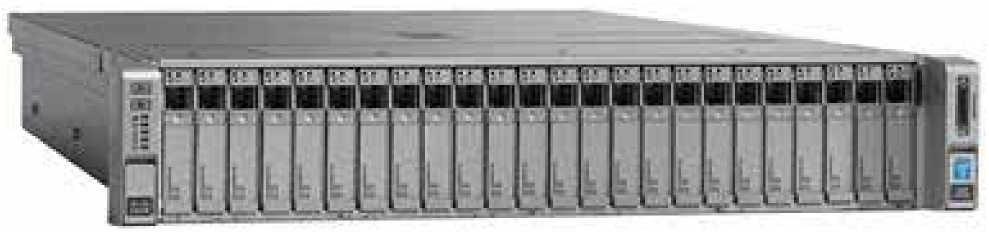
Cisco UCS 6200 Series Fabric Interconnects provide high-bandwidth, low-latency connectivity for servers, with integrated, unified management provided for all connected devices by Cisco UCS Manager. Deployed in redundant pairs, Cisco fabric interconnects offer the full active-active redundancy, performance, and exceptional scalability needed to support the large number of nodes that are typical in clusters serving big data applications. Cisco UCS Manager enables rapid and consistent server configuration using service profiles, automating ongoing system maintenance activities such as firmware updates across the entire cluster as a single operation. Cisco UCS Manager also offers advanced monitoring with options to raise alarms and send notifications about the health of the entire cluster.

Figure 1 Cisco UCS 6296UP 96-Port Fabric Interconnect

Cisco UCS C-Series Rack Mount Servers

Cisco UCS C-Series Rack Mount C220 M4 High-Density Rack servers (Small Form Factor Disk Drive Model) and Cisco UCS C240 M4 High-Density Rack servers (Small Form Factor Disk Drive Model) are enterprise-class systems that support a wide range of computing, I/O, and storage-capacity demands in compact designs. Cisco UCS C-Series Rack-Mount Servers are based on Intel Xeon E5-2600 v3 product family and 12-Gbps SAS throughput, delivering significant performance and efficiency gains over the previous generation of servers. The servers use dual Intel Xeon processor E5-2600 v3 series CPUs and support up to 768 GB of main memory (128 or 256 GB is typical for big data applications) and a range of disk drive and SSD options. 24 Small Form Factor (SFF) disk drives are supported in performance-optimized option and 12 Large Form Factor (LFF) disk drives are supported in capacity-optimized option, along with 4 Gigabit Ethernet LAN-on-motherboard (LOM) ports. Cisco UCS virtual interface cards 1227 (VICs) designed for the M4 generation of Cisco UCS C-Series Rack Servers are optimized for high-bandwidth and low-latency cluster connectivity, with support for up to 256 virtual devices that are configured on demand through Cisco UCS Manager.

Figure 2 Cisco UCS C240 M4 Rack Server



Cisco UCS Virtual Interface Cards (VICs)

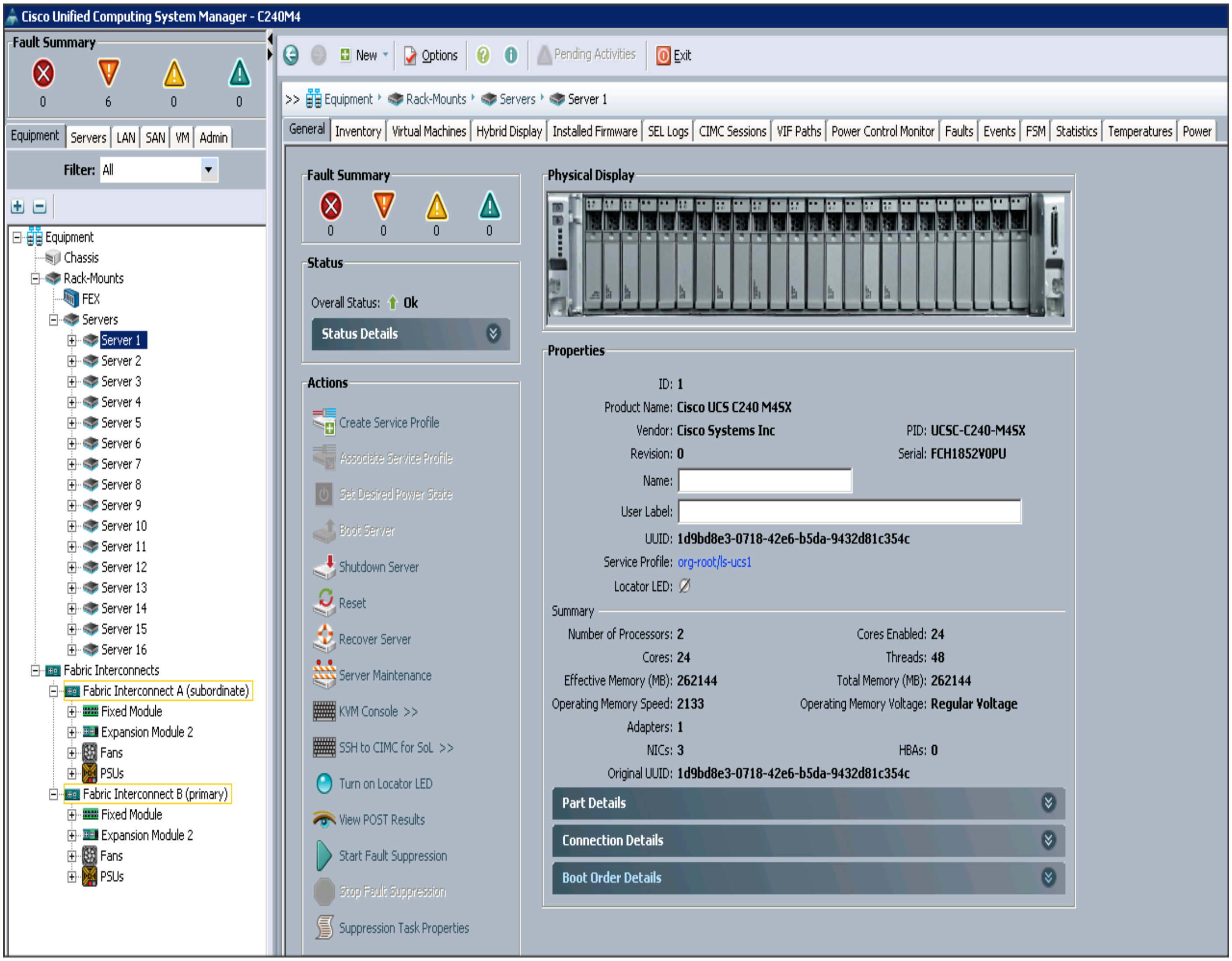
Cisco UCS Virtual Interface Cards (VICs), unique to Cisco, Cisco UCS Virtual Interface Cards incorporate next-generation converged network adapter (CNA) technology from Cisco, and offer dual 10-Gbps ports designed for use with Cisco UCS C-Series Rack-Mount Servers. Optimized for virtualized networking, these cards deliver high performance and bandwidth utilization and support up to 256 virtual devices. The Cisco UCS Virtual Interface Card (VIC) 1227 is a dual-port, Enhanced Small Form-Factor Pluggable (SFP+), 10 GigabitEthernet Ethernet and Fiber Channel over Ethernet (FCoE)-capable, PCI Express (PCIe) modular LAN on motherboard (mLOM) adapter. It is designed exclusively for the M4 generation of Cisco UCS C-Series Rack Servers and the C3160 dense storage servers.

Figure 3 Cisco UCS VIC 1227

Cisco UCS Manager

Cisco UCS Manager resides within the Cisco UCS 6200 Series Fabric Interconnects. It makes the system self-aware and self-integrating, managing all of the system components as a single logical entity. Cisco UCS Manager can be accessed through an intuitive graphical user interface (GUI), a command-line interface (CLI), or an XML application-programming interface (API). Cisco UCS Manager uses service profiles to define the personality, configuration, and connectivity of all resources within Cisco UCS, radically simplifying provisioning of resources so that the process takes minutes instead of days. This simplification allows IT departments to shift their focus from constant maintenance to strategic business initiatives.

Figure 4 Cisco UCS Manager



Overall Status: Ok

ID: 1
Product Name: Cisco UCS C240 M4SX
Vendor: Cisco Systems Inc PID: UCSC-C240-M4SX
Revision: 0 Serial: FCH1852V0PU
Name:
User Label:
UUID: 1d9bd8e3-0718-42e6-b5da-9432d81c354c
Service Profile: org-root/ls-ucs1
Locator LED:

Number of Processors: 2 Cores Enabled: 24
Cores: 24 Threads: 48
Effective Memory (MB): 262144 Total Memory (MB): 262144
Operating Memory Speed: 2133 Operating Memory Voltage: Regular Voltage
Adapters: 1
NICs: 3 HBAs: 0
Original UUID: 1d9bd8e3-0718-42e6-b5da-9432d81c354c

Cloudera's Distribution Including Apache Hadoop (CDH) 5.3.2

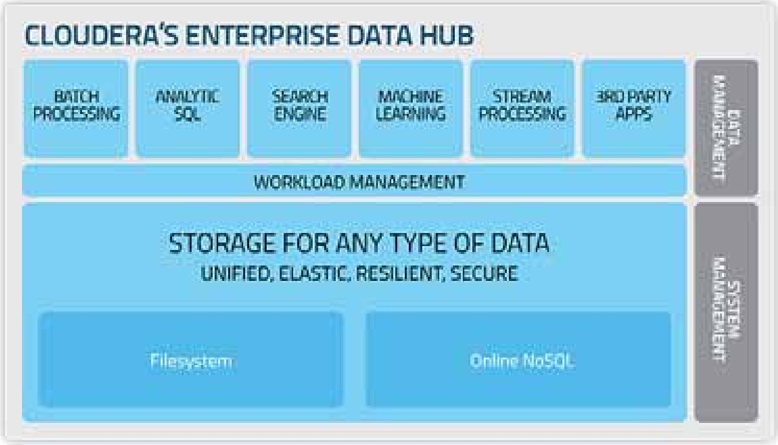
Built on the transformative Apache Hadoop open source software project, Cloudera Enterprise is an hardened distribution of Apache Hadoop and related projects that are designed to meet the demanding needs of enterprise customers. Cloudera is one of the largest contributors to the Hadoop ecosystem, and has created a rich suite of complementary open source projects that are included in Cloudera Enterprise.

All the facets of integration and the entire solution is thoroughly tested and documented. The readily available pre-integrated solution in CDH helps in building your Hadoop deployment model with ease. CDH provides a coherent and practical solution to solve real business problems.

Cloudera Enterprise, with Apache Hadoop at the core, is:

- **Unified** – one integrated system, bringing diverse users and application workloads to one pool of data on common infrastructure; no data movement required
- **Secure** – perimeter security, authentication, granular authorization, and data protection
- **Governed** – enterprise-grade data auditing, data lineage, and data discovery
- **Managed** – native high-availability, fault-tolerance and self-healing storage, automated backup and disaster recovery, and advanced system and data management
- **Open** – Apache-licensed open source to ensure your data and applications remain yours, and an open platform to connect with all of your existing investments in technology and skills

Figure 5 Enterprise Data Hub Architecture by Cloudera



Cloudera provides a scalable, flexible, integrated platform that makes it easy to manage rapidly increasing volumes and varieties of data in your enterprise. Industry-leading Cloudera products and solutions enable you to deploy and manage Apache Hadoop and related projects, manipulate and analyze your data, and keep that data secure and protected.

Cloudera provides the following products and tools:

- CDH—The Cloudera distribution of Apache Hadoop and other related open-source projects, including Cloudera Impala and Cloudera Search. CDH also provides security and integration with numerous hardware and software solutions.
  - Cloudera Impala—A massively parallel processing SQL engine for interactive analytics and business intelligence. Its highly optimized architecture makes it ideally suited for traditional BI-style queries with joins, aggregations, and subqueries. It can query Hadoop data files from a variety of sources, including those produced by MapReduce jobs or loaded into Hive tables. The YARN and Llama resource management components let Impala coexist on clusters running batch workloads concurrently with Impala SQL queries. You can manage Impala alongside other Hadoop components through the Cloudera Manager user interface, and secure its data through the Sentry authorization framework.
  - Cloudera Search—Provides near real-time access to data stored in or ingested into Hadoop and HBase. Search provides near real-time indexing, batch indexing, full-text exploration and navigated drill-down, as well as a simple, full-text interface that requires no SQL or

programming skills. Fully integrated in the data-processing platform, Search uses the flexible, scalable, and robust storage system included with CDH. This eliminates the need to move large data sets across infrastructures to perform business tasks.

- Cloudera Manager—A sophisticated application used to deploy, manage, monitor, and diagnose issues with your CDH deployments. Cloudera Manager provides the Admin Console, a web-based user interface that makes administration of your enterprise data simple and straightforward. It also includes the Cloudera Manager API, which you can use to obtain cluster health information and metrics, as well as configure Cloudera Manager.
- Cloudera Navigator—An end-to-end data management tool for the CDH platform. Cloudera Navigator enables administrators, data managers, and analysts to explore the large amounts of data in Hadoop. The robust auditing, data management, lineage management, and life cycle management in Cloudera Navigator allow enterprises to adhere to stringent compliance and regulatory requirements.

Cisco Application Centric Infrastructure (ACI) Overview

ACI provides network the ability to deploy and respond to the needs of applications, both in the data center and in the cloud. The network must be able to deliver the right levels of connectivity, security, compliance, firewalls, and load balancing, and it must be able to do this dynamically and on-demand.

This is accomplished through centrally defined policies and application profiles. The profiles are managed by new Application Policy Infrastructure Controller [APIC] and distributed to switches like the Cisco Nexus 9000 Series. Cisco Nexus 9000 Series Switches and the Cisco Application Policy Infrastructure Controller (APIC) are the building blocks for ACI.

ACI is software-defined networking (SDN) plus a whole lot more. Most SDN models stop at the network. ACI extends the promise of SDN—namely agility and automation—to the applications themselves. Through a policy-driven model, the network can cater to the needs of each application, with security, network segmentation, and automation at scale. And it can do so across physical and virtual environments, with a single pane of management.

The ACI fabric supports more than 64,000 dedicated tenant networks. A single fabric can support more than one million IPv4/IPv6 endpoints, more than 64,000 tenants, and more than 200,000 10G ports. The ACI fabric enables any service (physical or virtual) anywhere with no need for additional software or hardware gateways to connect between the physical and virtual services and normalizes encapsulations for Virtual Extensible Local Area Network (VXLAN) / VLAN / Network Virtualization using Generic Routing Encapsulation (NVGRE).

The ACI fabric decouples the endpoint identity and associated policy from the underlying forwarding graph. It provides a distributed Layer 3 gateway that ensures optimal Layer 3 and Layer 2 forwarding. The fabric supports standard bridging and routing semantics without standard location constraints (any IP address anywhere), and removes flooding requirements for the IP control plane Address Resolution Protocol (ARP) / Generic Attribute Registration Protocol (GARP). All traffic within the fabric is encapsulated within VXLAN.

Architectural Benefits of using Fabric Interconnect with Cisco ACI

UCS Servers are connected directly to Fabric Interconnect (FI) which in-turn connects to ACI (N9K switches). This mode allows using the UCS Manager capabilities in FI for provisioning the servers within a domain. This topology can scale up to 5760 servers for a fully populated pair of Nexus 9508s with all the eight linecards; details of which are discussed in “Scaling section”. Benefits of ACI architecture are discussed in the next section.

Centralized Management for the Entire Network

Cisco ACI treats the network as a single entity rather than a collection of switches. It uses a central controller to implicitly automate common practices such as Cisco ACI fabric startup, upgrades, and individual element configuration. The Cisco Application Policy Infrastructure Controller (Cisco APIC) is this unifying point of automation and management for the Application Centric Infrastructure (ACI) fabric. This architectural approach dramatically increases the operational efficiency of networks, by reducing the time and effort needed to make modifications to the network and, also, for root cause analysis and issue resolution.

Performance Oriented Fabric

The Cisco ACI Fabric incorporates numerous capabilities that can help provide performance improvements to applications.

Dynamic Load Balancing (DLB): The ACI fabric provides several load balancing options for balancing the traffic among the available uplinks. Static hash load balancing is the traditional load balancing mechanism used in networks where each flow is allocated to an uplink based on a hash of its 5-tuple. This load balancing gives a distribution of flows across the available links that is roughly even. Usually, with a large number of flows, the even distribution of flows results in an even distribution of bandwidth as well. However, if a few flows are much larger than the rest, static load balancing might give suboptimal results. Dynamic load balancing (DLB) adjusts the traffic allocations according to congestion levels. It measures the congestion across the available paths and places the flows on the least congested paths, which results in an optimal or near optimal placement of the data.

Dynamic Packet Prioritization (DPP), while not a load balancing technology, uses some of the same mechanisms as DLB in the switch. DPP configuration is exclusive of DLB. DPP prioritizes short flows higher than long flows; a short flow is less than approximately 15 packets. Short flows are more sensitive to latency than long ones. DPP can improve overall application performance.

Together these technologies enable performance enhancements to applications, including Big Data workloads. More information on these technologies and results associated with performance analysis can be found in the following paper that recently won the best paper award at ACM SIGCOMM 2014:

Application-Centric Policy Model

The Cisco ACI policy model is designed top down using a promise theory model to control a scalable architecture of defined network and service objects. This model provides robust repeatable controls, multitenancy, and minimal requirements for detailed knowledge by the control system known as the Cisco APIC. The model is designed to scale beyond current needs to the needs of private clouds, public clouds, and software-defined data centers.

The policy enforcement model within the fabric is built from the ground up in an application-centric object model. This provides a logical model for laying out applications, which will then be applied to the fabric by the Cisco APIC. This helps to bridge the gaps in communication between application requirements and the network constructs that enforce them. The Cisco APIC model is designed for rapid provisioning of applications on the network that can be tied to robust policy enforcement while maintaining a workload anywhere approach.

Multi-Tenant and Mixed Workload Support

Cisco ACI is built to incorporate secure multi-tenancy capabilities. The fabric enables customers to host multiple concurrent Big Data workloads on a shared infrastructure. ACI provides the capability to enforce proper isolation and SLA’s for workloads of different tenants. These benefits extend beyond multiple Big Data workloads – Cisco ACI allows the same cluster to run a variety of different application workloads, not just Big Data, with the right level of security and SLA for each workload.

Extensibility and Openness

ACI supports an open ecosystem embracing open APIs, open source, and open standards. This provides the broadest choice in data center management and infrastructure. ACI supports embracing open APIs, open source, and open standards. This provides the broadest choice in data center management and infrastructure.

Easy Migration to 40Gbps in the Network

Cisco QSFP BiDi technology removes 40-Gbps cabling cost barriers for migration from 10-Gbps to 40-Gbps connectivity in data center networks. Cisco QSFP BiDi transceivers provide 40-Gbps connectivity with immense savings and simplicity compared to other 40-Gbps QSFP transceivers. The Cisco QSFP BiDi transceiver allows organizations to migrate the existing 10-Gbps cabling infrastructure to 40 Gbps at no cost and to expand the infrastructure with low capital investment. Together with Cisco Nexus 9000 Series Switches, which introduce attractive pricing for networking devices, Cisco QSFP BiDi technology provides a cost-effective solution for migration from 10-Gbps to 40-Gbps infrastructure.

Cisco ACI Building blocks

Cisco ACI consists of:

- The Cisco Nexus 9000 Series Switches.
- A centralized policy management and Cisco Application Policy Infrastructure Controller (APIC).

Cisco Nexus 9000 Series Switches

The 9000 Series Switches offer both modular (9500 switches) and fixed (9300 switches) 1/10/40/100 Gigabit Ethernet switch configurations designed to operate in one of two modes:

- Cisco NX-OS mode for traditional architectures and consistency across the Cisco Nexus portfolio.
- ACI mode to take full advantage of the policy-driven services and infrastructure automation features of ACI.

The ACI-Ready Cisco Nexus 9000 Series provides:

- Accelerated migration to 40G: zero cabling upgrade cost with Cisco QSFP+ BiDi Transceiver Module innovation.
- Switching platform integration: Nexus 9000 Series enables a highly scalable architecture and is software upgradable to ACI.
- Streamline Application Management: Drastically reduce application deployment time and get end to end application visibility.

This architecture consists of Cisco Nexus 9500 series switches acting as the spine and Cisco Nexus 9300 series switches as leaves.

Cisco Nexus 9508 Spine Switch

The Cisco Nexus 9508 Switch offers a comprehensive feature set, high resiliency, and a broad range of 1/10/40 Gigabit Ethernet line cards to meet the most demanding requirements of enterprise, service provider, and cloud data centers. The Cisco Nexus 9508 Switch is an ACI modular spine device enabled by a non-blocking 40 Gigabit Ethernet line card, supervisors, system controllers, and power supplies.

The Cisco Nexus 9500 platform internally uses a Clos fabric design that interconnects the line cards with rear-mounted fabric modules. The Cisco Nexus 9500 platform supports up to six fabric modules, each of which provides up to 10.24-Tbps line-rate packet forwarding capacity. All fabric cards are directly connected to all line cards. With load balancing across fabric cards, the architecture achieves optimal bandwidth distribution within the chassis.

Figure 6 Cisco Nexus 9508 Switch

ACI Spine Line Card for Cisco Nexus 9508

There are multiple spine line cards supported on Nexus 9508. This architecture uses

N9K-X9736PQ: 40 Gigabit Ethernet ACI Spine Line Card.

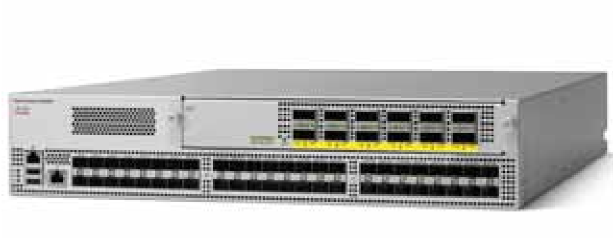
- 36-port 40 Gigabit Ethernet QSFP+ line card
- Non-blocking
- Designed for use in an ACI spine switch role
- Works only in ACI mode
- Cannot mix with non-spine line cards
- Supported in 8-slot chassis

Figure 7 Cisco N9K-X9736PQ Linecard

Cisco Nexus 9396 Leaf Switch

The Cisco Nexus 9396PX Switch delivers comprehensive line-rate layer 2 and layer 3 features in a two-rack-unit (2RU) form factor. It supports line rate 1/10/40 GE with 960 Gbps of switching capacity. It is ideal for top-of-rack and middle-of-row deployments in both traditional and Cisco Application Centric Infrastructure (ACI)–enabled enterprise, service provider, and cloud environments.

Figure 8 Cisco Nexus 9396PX Switch



Cisco Application Policy Infrastructure Controller (APIC)

The Application Centric Infrastructure is a distributed, scalable, multitenant infrastructure with external end-point connectivity controlled and grouped through application-centric policies. The APIC is the unified point of automation, management, monitoring, and programmability for the Cisco Application Centric Infrastructure. The APIC supports the deployment, management, and monitoring of any application anywhere, with a unified operations model for physical and virtual components of the infrastructure. The APIC programmatically automates network provisioning and Control that is based on the application requirements and policies. It is the central control engine for the broader cloud network; it simplifies management and allows flexibility in how application networks are defined and automated. It also provides northbound REST APIs. The APIC is a distributed system that is implemented as a cluster of many controller instances.

Figure 9 APIC Appliance

ACI Topology

ACI topology is spine-leaf architecture. Each leaf is connected to each spine. It uses internal routing protocol; Intermediate System to Intermediate System (IS-IS) to establish IP connectivity throughout the fabric among all the nodes including spine and leaf. To transport tenant traffic across the IP fabric, integrated VxLAN overlay is used. The broadcast ARP traffic coming from the end point or hosts to the leaf are translated to unicast ARP in the fabric.

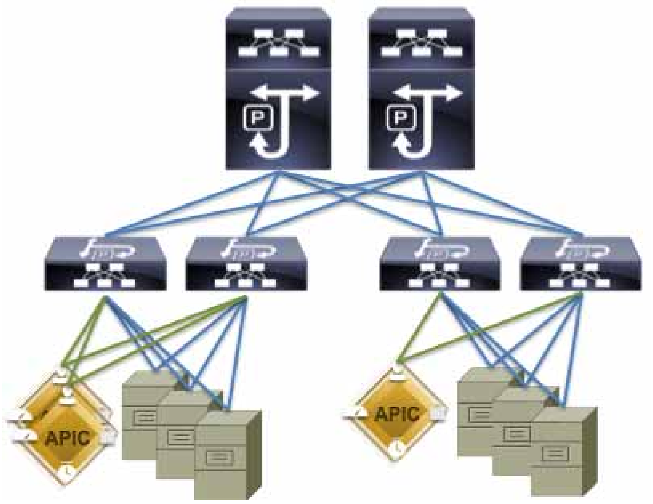
The forwarding is done as a host based forwarding. In the leaf layer the user information such as username, IP address, locations, policy groups etc., are decoupled from the actual forwarding path and encode them into the fabric VxLAN header and is forwarded to the desired destination.

Each spine has the complete forwarding information about the end hosts that are connected to the fabric and on every leaf have the cached forwarding information. The leaf only needs to know the hosts it needs to talk to. For example if Server Rack-1 has to send some information to Server Rack-2, When packet comes in the ingress leaf (LEAF_1) it will encapsulate the information into the VxLAN header and forward that information to LEAF_2. If the LEAF_1 does not have information about the LEAF_2, it uses Spine as a proxy and since Spine has all the complete information about the entire end host connected to the fabric, it will resolve the egress leaf and forward the packet to the destination.

To the outside world, routing protocols can be used to learn outside prefixes or static routing can be used instead. The outside learned routes will be populated into the fabric or to the other leafs with Multiprotocol BGP (M-BGP). In M-BGP topology the spine nodes acts as route reflectors.

The Network topology of ACI is as depicted below:

Figure 10 Network topology based on Cisco ACI



The Cisco ACI infrastructure incorporates the following components:

- Two Cisco Nexus 9508 Spine Switch
  - ACI Spine Line Card for Nexus 9508
- Cisco Nexus 9396 Leaf Switch for Data Traffic
- Cisco APIC-L1-Cluster with three APIC-L1 appliances

Solution Overview

This CVD describes architecture and deployment procedures for Cloudera (CDH 5.3.2) on 160 Cisco UCS C240 M4 server based on Cisco UCS Integrated Infrastructure for Big Data with two domains (each Fabric-Interconnect domain has 80 servers under a pair of Fabric Interconnect) interconnected through ACI. The Cisco UCS Integrated Infrastructure with ACI brings together a highly scalable architecture designed to meet a variety of scale-out application demands with seamless data integration and management integration capabilities.

Note System Architecture and Scaling sections discussed below describe three Cisco UCS Fabric Interconnect domains under a pair for Cisco Nexus 9396.

Further, the CVD describes in detail the process of creating the Application Network Profile in the ACI for Big Data application. Application Network Profiles (Application Network Profile is a collection of EPGs, their connections, and the policies that define those connections described in detail later) are the logical representation of an application (here Big Data) and its interdependencies in the network fabric.

Application Network Profiles are designed to be modeled in a logical way that matches the way that applications are designed and deployed. The configuration and enforcement of policies and connectivity is handled by the system rather than manually by an administrator.

The current version of the Cisco UCS Integrated Infrastructure for Big Data offers the following configuration depending on the compute and storage requirements:

Table 1 Compute Nodes used for the Big Data Cluster with ACI

Performance Optimized	Capacity Optimized
16 Cisco UCS C240 M4 Rack Servers (SFF), each with: 2 Intel Xeon processors E5-2680 v3 CPUs 256 GB of memory Cisco 12-Gbps SAS Modular Raid Controller with 2-GB flash-based write cache (FBWC) 24 1.2-TB 10K SFF SAS drives (460 TB total) 2 120-GB 6-Gbps 2.5-inch Enterprise Value SATA SSDs for Boot Cisco UCS VIC 1227 (with 2 10 GE SFP+ ports)	16 Cisco UCS C240 M4 Rack Servers (LFF), each with: 2 Intel Xeon processors E5-2620 v3 CPUs 128 GB of memory Cisco 12-Gbps SAS Modular Raid Controller with 2-GB FBWC 12 4-TB 7.2K LFF SAS drives (768 TB total) 2 120-GB 6-Gbps 2.5-inch Enterprise Value SATA SSDs for Boot Cisco UCS VIC 1227 (with 2 10 GE SFP+ ports)

This CVD uses Performance Optimized configuration.

Note This CVD describes the install process of CDH 5.3.2 for a 160 node (3 Master nodes in High Availability + 157 Data node) of Performance Optimized Cluster configuration.

The Performance cluster configuration consists of the following:

- Four Cisco UCS 6296UP Fabric Interconnects
- 160 UCS C240 M4 Rack-Mount servers (16 per rack)
- Ten Cisco R42610 standard racks
- Eighteen Vertical Power distribution units (PDUs) (Country Specific)
- Two Cisco Nexus 9508 Spine Switch
  - ACI Spine Line Card for Nexus 9508
- Cisco Nexus 9396 Leaf Switch for Data Traffic
- Cisco APIC-L1-Cluster with three APIC-L1 appliances

Table 2 Hardware Component Details

Hardware	Role	Quantity
NK-C9508	Spine	2

Table 2 Hardware Component Details

N9K-X9736PQ	36 ports 40 Gig QSFP+ Line Card for the Spine	2
N9K-C9396PX	Leaf	2
UCS FI 6296UP	Fabric Interconnect	4
APIC-L1	APIC Appliance	3
UCS C240 M4	Rack Server	160
QSFP-H40G	40 Gig connectivity	26
SFP-H10GB	10 Gig Connectivity	320(Servers) +3 (APICs) + 56 (FI Uplink)

Note For more details on Connecting Application Centric Infrastructure (ACI) to Outside Layer 2 and 3 Networks can be found at: http://www.cisco.com/c/en/us/solutions/collateral/data-center-virtualization/application-centric-infrastructure/white-paper-c07-732033.html

Physical Layout for the Solution

Physical Layout for the solution is as shown in the following table. Each rack consists of two vertical PDUs. The solution consists of 5 Cisco R42610 racks. The Nexus 9396 leaf switch and the Fabric Interconnect is distributed across rack1 and rack2, the APIC appliances are distributed across rack2 to rack4. Similarly, nexus 9508 spine switch is mounted in rack2 for easier caballing between the spine and leaf switches. The rest of the spaces in the 5 racks are used for mounting 80 servers. All the Switches and UCS Servers are dual connected to vertical PDUs for redundancy; thereby, ensuring availability during power source failure.

For second pod, only two FI's are required in this domain because the uplink from the FI is connected to the leaf switches in pod1 and rest of the space is used to mount another 80 servers.

Table 3 Rack 1-5

Slot	Rack 1	Rack 2	Rack 3	Rack 4	Rack 5
1	N9K-C9396PX	N9K-C9396PX	APIC-L1	APIC-L1	UCS C240M4
2					
3	FI-A	FI- B	UCS C240M4	UCS C240M4	UCS C240M4
4					
5	UCS C240M4	APIC-L1	UCS C240M4	UCS C240M4	UCS C240M4
6					
7	UCS C240M4		UCS C240M4	UCS C240M4	UCS C240M4
8					
9	UCS C240M4		UCS C240M4	UCS C240M4	UCS C240M4
10					

Table 3 Rack 1-5

11	UCS C240M4		UCS C240M4	UCS C240M4	UCS C240M4
12					
13	UCS C240M4		UCS C240M4	UCS C240M4	UCS C240M4
14					
15	UCS C240M4		UCS C240M4	UCS C240M4	UCS C240M4
16					
17	UCS C240M4	N9k-C9508	UCS C240M4	UCS C240M4	UCS C240M4
18					
19	UCS C240M4		UCS C240M4	UCS C240M4	UCS C240M4
20					
21	UCS C240M4		UCS C240M4	UCS C240M4	UCS C240M4
22					
23	UCS C240M4		UCS C240M4	UCS C240M4	UCS C240M4
24					
25	UCS C240M4		UCS C240M4	UCS C240M4	UCS C240M4
26					
27	UCS C240M4		UCS C240M4	UCS C240M4	UCS C240M4
28					
29	UCS C240M4		UCS C240M4	UCS C240M4	UCS C240M4
30		N9k-C9508			
31	UCS C240M4		UCS C240M4	UCS C240M4	UCS C240M4
32					
33	UCS C240M4		UCS C240M4	UCS C240M4	UCS C240M4
34					
35	UCS C240M4		UCS C240M4	UCS C240M4	UCS C240M4
36					
37	UCS C240M4		UCS C240M4	UCS C240M4	UCS C240M4
38					
39	UCS C240M4		UCS C240M4	UCS C240M4	UCS C240M4
40					
41	UCS C240M4		UCS C240M4	UCS C240M4	UCS C240M4
42					

Table 4 *Rack 1-5*

Slot	Rack 1	Rack 2	Rack 3	Rack 4	Rack 5
1		FI-C	FI-D		
2					
3					
4					
5					
6					
7					
8					
9					
10					
11	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4
12					
13	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4
14					
15	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4
16					
17	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4
18					
19	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4
20					
21	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4
22					
23	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4
24					
25	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4
26					
27	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4
28					
29	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4
30					
31	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4
32					
33	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4
34					

Table 4 Rack 1-5

35	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4
36					
37	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4
38					
39	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4
40					
41	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4	UCS C240M4
42					

Note Number of servers in a Rack can be reduced to 16 or less based on the power requirements.

Software Distributions and Versions

The software distribution's required versions are listed below.

Cloudera Enterprise

The Cloudera software for Cloudera Distribution for Apache Hadoop is version 5.3.2. For more information on CDH, visit: www.cloudera.com

Red Hat Enterprise Linux (RHEL)

The operating system supported is Red Hat Enterprise Linux 6.5. For more information on RHEL, visit: http://www.redhat.com

Software Versions

The software versions tested and validated in this document are shown in Table 5.

Table 5 Software Component Details

Layer	Component	Version or Release
Network	Cisco ACI OS	11.0 (2m)
	APIC OS	1.0 (1e)
	Cisco UCS 6296UP	UCS 2.2(3d)A
	Cisco UCS VIC1227 Firmware	4.0(1d)
	Cisco UCS VIC1227 Driver	2.1.1.66
Compute	Cisco UCS C240-M4	C240M4.2.0.3d
Storage	LSI SAS 3108	24.5.0-0020
Software	Red Hat Enterprise Linux Server	6.5 (x86_64)
	CDH	5.3.2
	UCS Manager	2.2(3d)

Note

- The latest drivers can be downloaded from the link below: https://software.cisco.com/download/release.html?mdfid=283862063&flowid=25886&softwareid=283853158&release=1.5.7d&relind=AVAILABLE&rellifecycle=&reltype=latest
- The Latest Supported RAID controller Driver is already included with the RHEL 6.5 operating system.
- C240/C220 M4 Rack Servers are supported from UCS firmware 2.2(3d) onwards.

System Architecture

The ACI fabric consists of three major components: the Application Policy Infrastructure Controller (APIC), spine switches, and leaf switches. These three components handle both the application of network policy and the delivery of packets.

The system architecture consists of 3 domains (3 pair of FIs) connecting to ACI having two Cisco Nexus 9508 switches acting as a Spine and two Cisco Nexus 9396 as the leaf switches and three APIC-L1 as an APIC appliance.

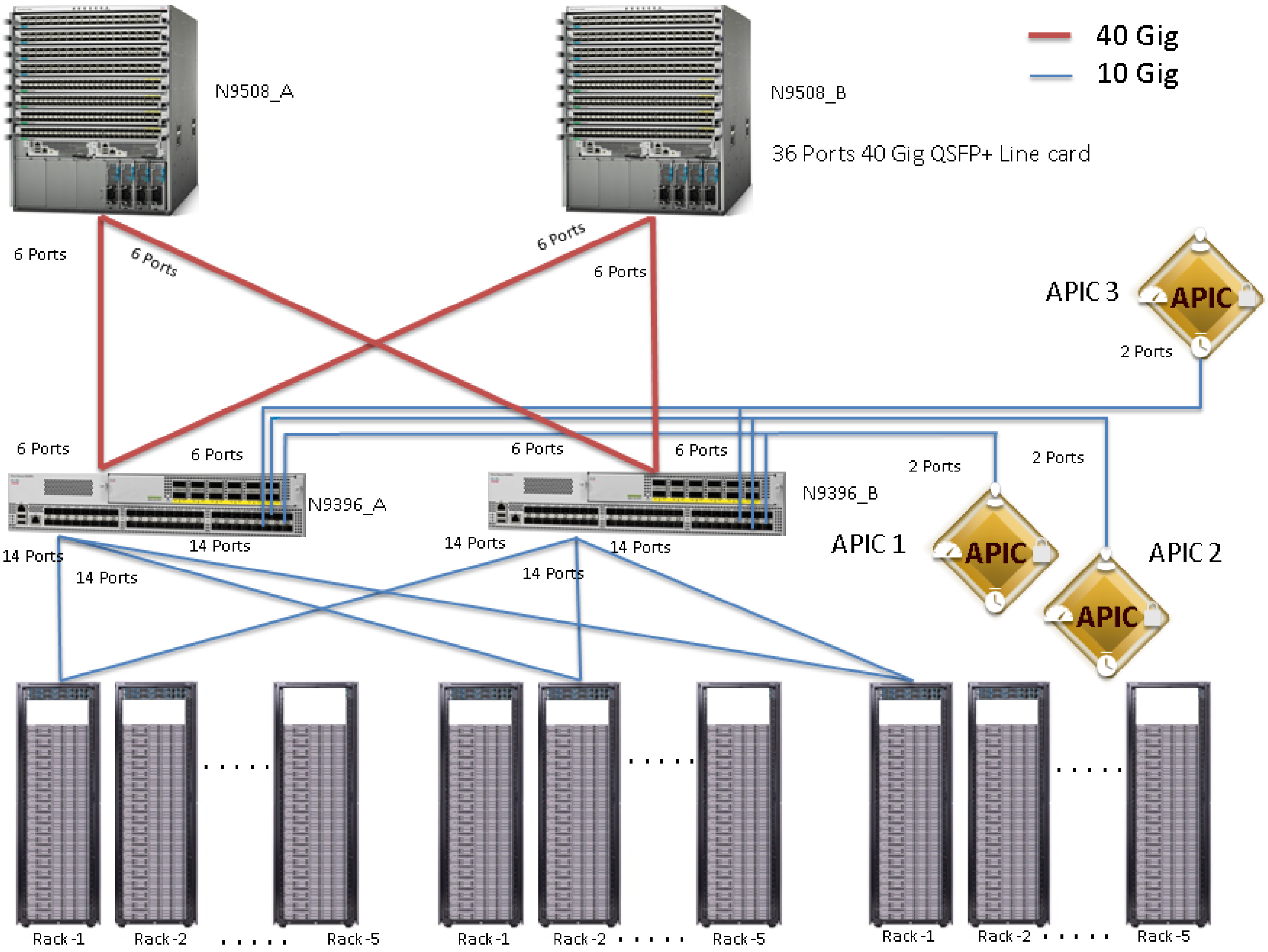
System architecture can be explained as:

- The 80 server are rack mounted and are connected to a pair of Cisco UCS FIs representing a domain through 10GE link (dual 10GE link to a pair of FI).
- 3 such domains are connected to a pair of Nexus 9396 which is the ACI Fabric leaf nodes. Here 10GEx14 links from each FI are connected to Nexus 9396. This is done through a port-channel of 7 ports connected to each of the Nexus 9396.

- Nexus 9396 receives the 14x10GE from each pair of FI as a vPC (Virtual Port-Channel), that is, all the 7 ports set from each of the FIs as an uplink to the leaf. There are 6 vPC for the 3 domains in each of 9396 connecting to the 3 pair of FIs.
- Each leaf is connected to Spines via 12 x 40 Gig connectivity cables.
- The three APIC's are connected to two leaves (Nexus 9396) via 10 Gig SFP cable.

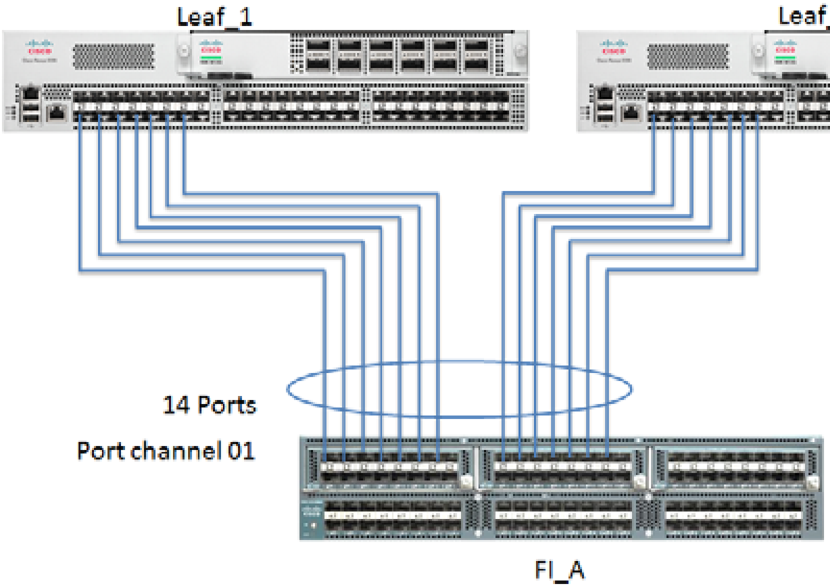
The figure below shows the overall system architecture and physical layout of the solution.

Figure 11 System Architecture



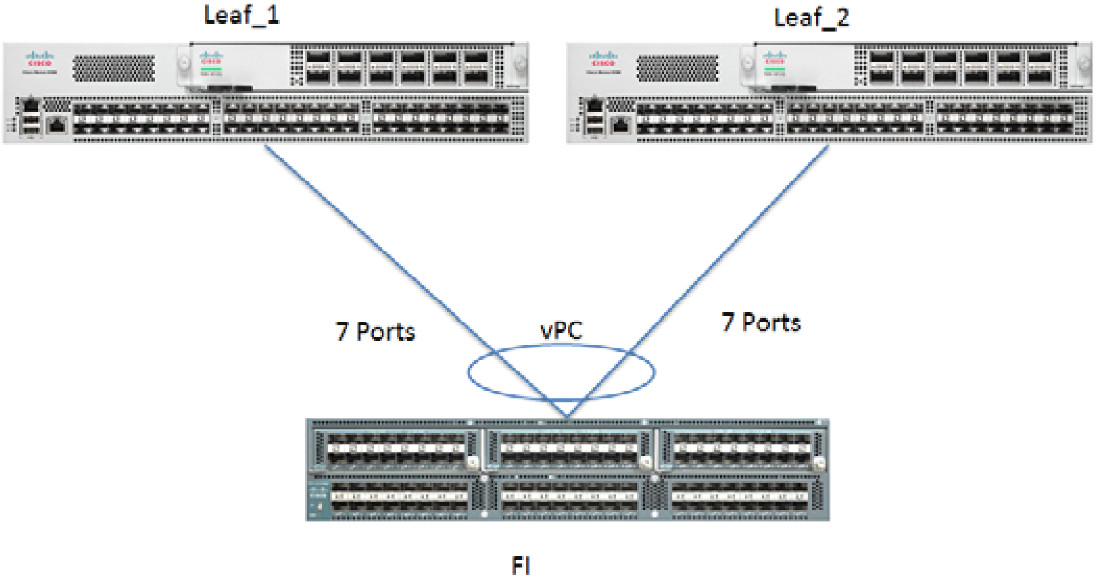
The figure below show the connectivity between the leaf switches and fabric interconnect, where port channeling has been configured on Fabric Interconnect. This port channeling helps to aggregate the bandwidth towards the uplink leaf switches.

Figure 12 Fabric Interconnect Connectivity



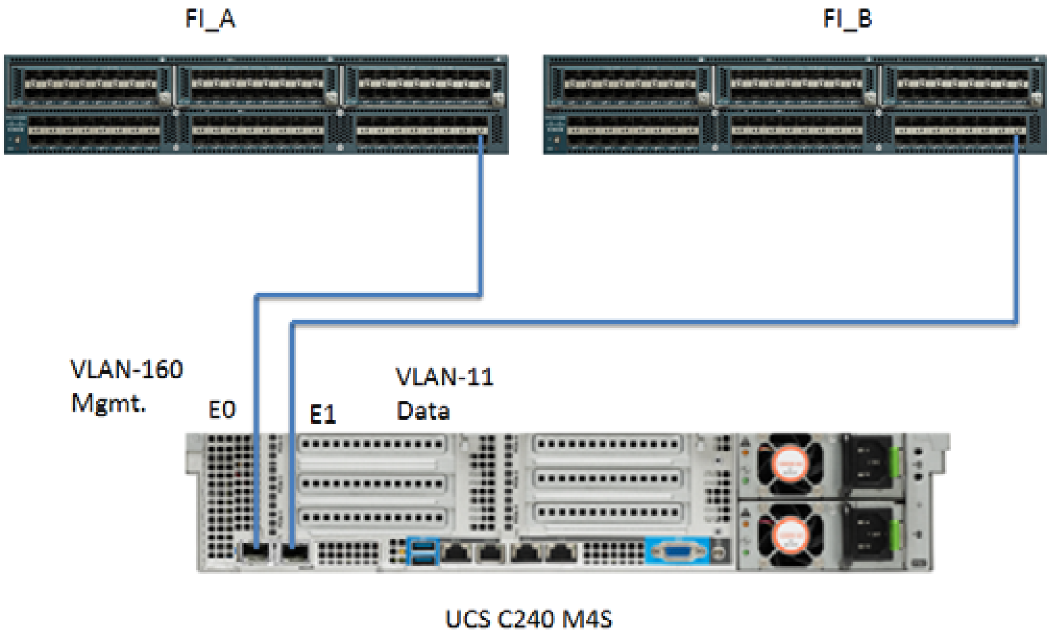
The figure below show the connectivity between the leaf switches and fabric interconnect, where vPC has been configured on leaf switches through the APIC. These vPC ports are the same ports that were configured as port-channel in fabric interconnect.

Figure 13 vPC Connectivity



The figure below shows the connectivity between the one C240 M4 servers and two Fabric Interconnects.

Figure 14 Cisco UCS C240 M4 Server Connectivity



Scaling the Architecture

Here the UCS Servers are directly connected to Cisco UCS Fabric Interconnect (FI) which in-turn connects to leaf switches (Nexus 9396). This mode allows using the UCS Manager capabilities in FI for provisioning the servers. Up to 5 Racks (each with 16 servers) are connected to a Pair of FI forming a single domain and three such domains are connected to a pair of Leaf 9396 (every domain or pair of Cisco FI has 14 uplinks to Nexus 9396). This topology has no network over-subscription within a domain (80 servers under a pair of FI). The over-subscription ratio between domains is 5.7:1 and can scale up to 5760 servers for a fully populated pair of Nexus 9508 with all the 8 line cards in use.

Figure 15 Scaling Architecture

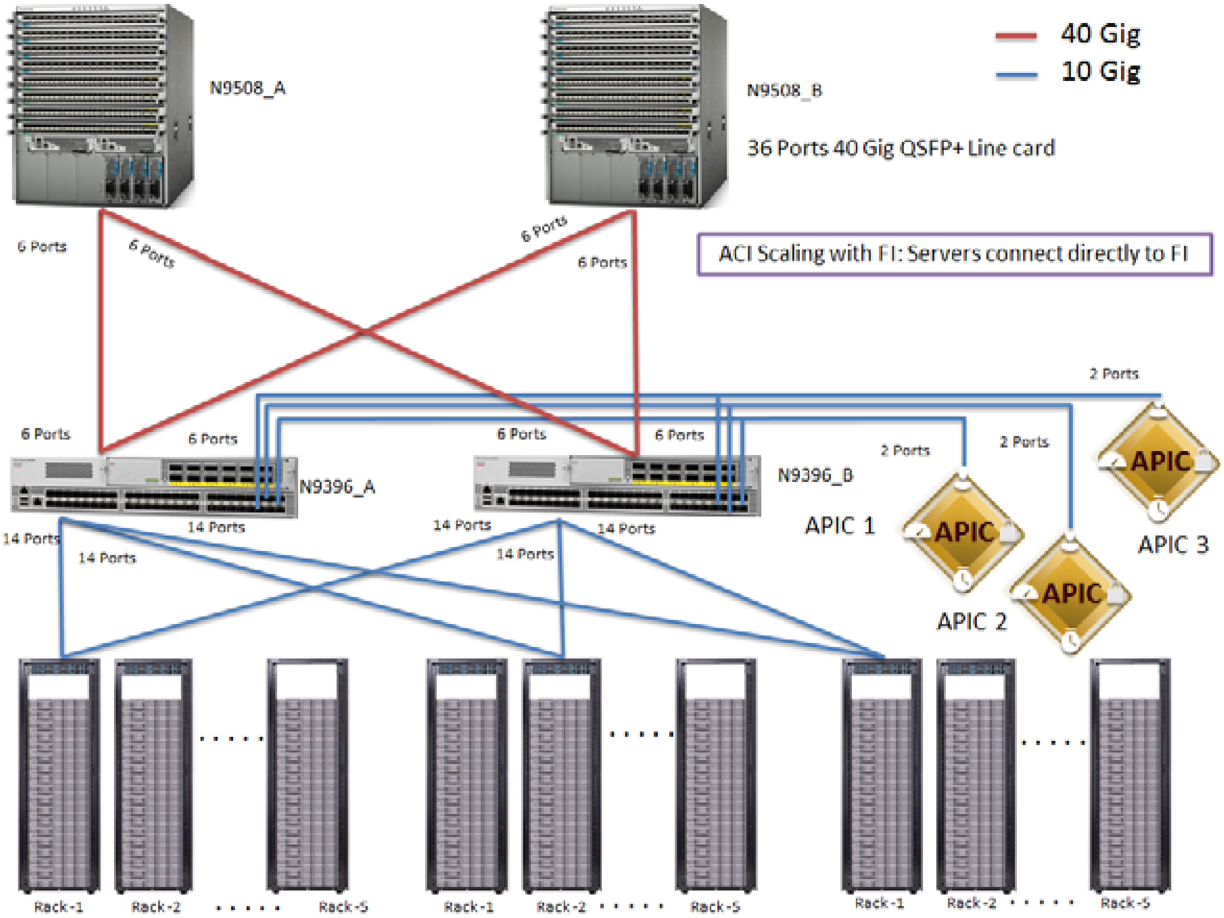


Table 6 Cisco Nexus 9508 – Cisco Nexus 9396PX Connectivity

SPINE	Line Card Pair	Ports Used	POD	Servers	LEAF
N9508_A	Line Card 1	1-6			9396_1A
	Line Card 1	7-12	1	240	9396_1B
	Line Card 1	13-18			9396_2A
	Line Card 1	19-24	2	480	9396_2B
	Line Card 1	25-30			9396_3A
	Line Card 1	31-36	3	720	9396_3B
	…	…	…	…	…
	Line Card 8	1-6			9396_22A
	Line Card 8	7-12	22	5280	9396_22B
	Line Card 8	13-18			9396_23A
	Line Card 8	19-24	23	5520	9396_23B
	Line Card 8	25-30			9396_24A
	Line Card 8	31-36	24	5760	9396_24B
N9508_B	Line Card 1	1-6			9396_1A
	Line Card 1	7-12	1	240	9396_1B
	Line Card 1	13-18			9396_2A
	Line Card 1	19-24	2	480	9396_2B
	Line Card 1	25-30			9396_3A
	Line Card 1	31-36	3	720	9396_3B
	…	…	…	…	….
	Line Card 8	1-6			9396_22A
	Line Card 8	7-12	22	5280	9396_22B
	Line Card 8	13-18			9396_23A
	Line Card 1	19-24	23	5520	9396_23B
	Line Card 8	25-30			9396_24A
	Line Card 8	31-36	24	5760	9396_24B

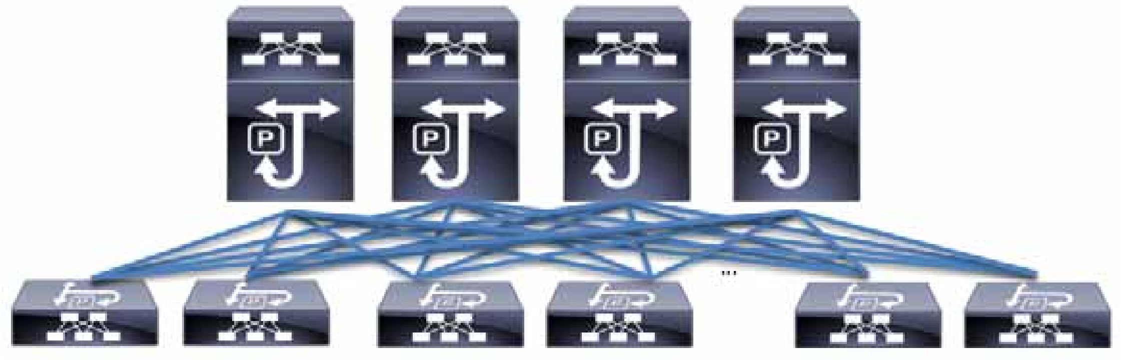
Table 7 Cisco Nexus 9396 - Cisco Fabric Interconnect Connectivity

LEAF	Ports Used	FI	Servers
9396_1A	1-14	FI_1A	1-80
9396_1A	15-28	FI_2A	81-160
9396_1A	29-42	FI_3A	161-240
9396_1A	43	APIC	
	44-48	Unused	
9396_1B	1-14	FI_1B	1-80
9396_1B	15-28	FI_2B	81-160
9396_1B	29-42	FI_3B	161-240
9396_1B	43	APIC	
	44-48	Unused	

Scaling the Architecture Further with Additional Spines Switches

The physical network of the Cisco Application Centric Infrastructure is built around leaf-spine architecture. It is possible to scale this infrastructure, immensely, by adding additional Spine switches. The ACI infrastructure supports up to 12 spine switches.

Figure 16 Cisco ACI Fabric with Multiple Spine Switches



With a 12-spine design, each leaf switch can be connected up to 12 spine switches. Allowing for tens of thousands of servers to be part of this infrastructure – being interconnected by a non-blocking fabric.

Network Configuration

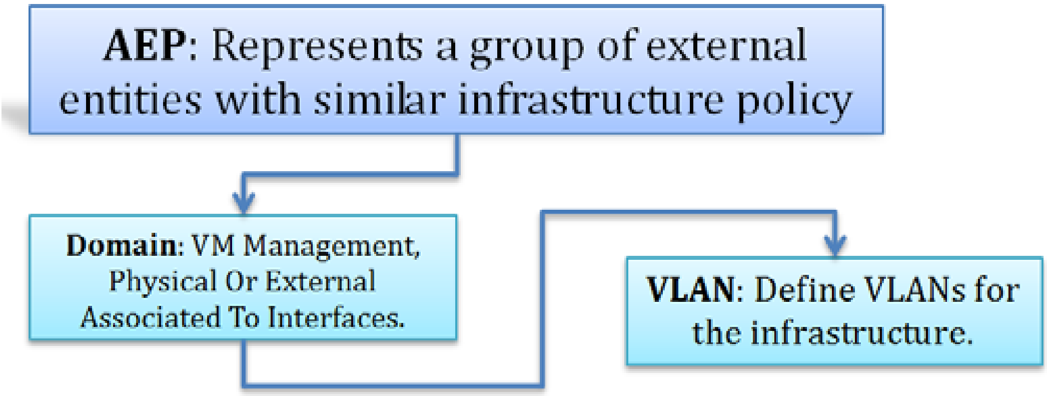
The network configuration includes configuring the APIC, leaf, spine switches and Fabric Interconnect and deploying various application profiles and policies. In order to achieve this we first need to register the connected Nexus 9K switches to the APIC so that these switches become the part of the ACI fabric. Once the switch is registered the communication between the spine and leaf are completed.

The admin is the only account enabled by default after the APIC is configured and it is always a good practice to create other user accounts with different privilege levels to make the APIC and the network secure. For this purpose we create a local or remote user depending on requirement.

Adding a management access is required in the ACI to let ACI know about any physical or virtual domain that is connected to it. By adding management access, APIC will control the physical interface and assign the policies to this interface. This is achieved by configuring Attachable Access Entity Profile (AEP). AEP requires having the domain and vlan pool that the ACI fabric will be using to communicate with various devices attached to it.

Note For more detail on AEP please refer “Adding Management Access” section.

Figure 17 Attachable Access Entity Profile for Communication with Other Devices


AEP: Represents a group of external entities with similar infrastructure policy
Domain: VM Management, Physical Or External Associated To Interfaces.
VLAN: Define VLANs for the infrastructure.

In this CVD, two pair of FIs representing two domains are connected to the pair of leaf switch. The uplink in the FIs is connected to the leaf via the port channeling (created in FI) and vPC is created at the leaf switches. The vPC allows single device to use a PortChannel across two upstream devices, eliminating Spanning Tree Protocol blocked ports which in turns provides a loop-free topology. With the use of vPC provides high availability and link-level resiliency.

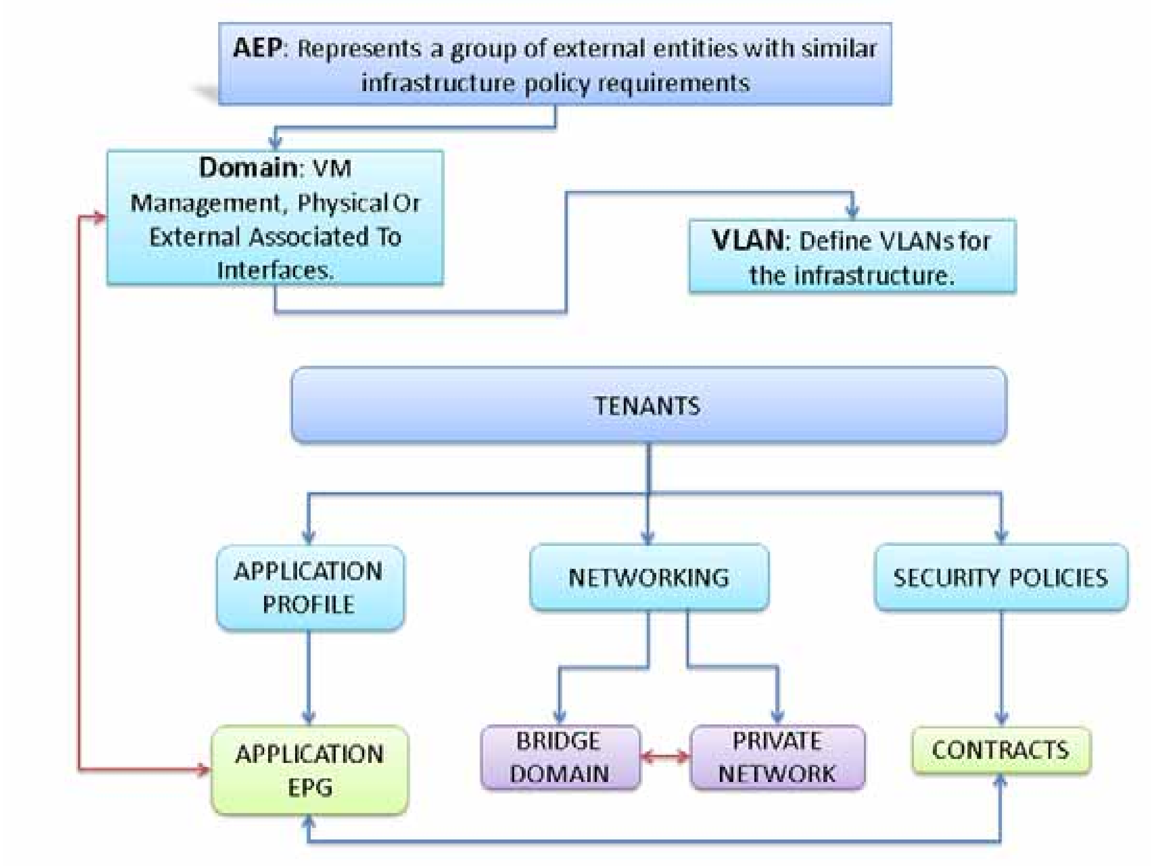
Depending on the number of VLANs created in the FI, to trunk these vlans across the ACI fabric an Attachable Entity Profile (AEP) is required. An AEP provisions the VLAN pool (and associated VLANs) on the leaf, these VLAN pools are defined under the domain created within the AEP. A domain could be various external entities such as bare metal servers, hypervisors, VM management, Layer 2 or Layer 3 domains. The VLANs are not actually enabled on the port. No traffic flows unless an EPG is deployed on the port. An EPG acts as a separate entity which is analogous to VLAN. A tenant needs to be created before an EPG is defined.

A tenant contains policies that enable qualified users domain-based access control. Application profile, security policies and network are the elements of Tenants. An EPG for each VLAN is created under the application profile. Since EPG represent VLANs, a switch virtual interface (SVI) is needed to provide the Layer 3 processing for packets from all switch ports associated with the VLAN. A bridge domain needs to be created which acts as switch virtual interface (SVI) for this purpose. Now, for the inter-Vlan communication, contracts need to be created to achieve communication among each EPG. Contracts are policies that enable inter-End Point Group (inter-EPG) communication. These policies are the rules that specify communication between application tiers.

Note For more details on Tenant please refer to the "Adding Tenant" section.

The relationship between the AEP, its elements and tenants is show in the flowchart below.

Figure 18 Flowchart Showing AEP, AEP Elements and Tenants


AEP: Represents a group of external entities with similar infrastructure policy requirements
Domain: VM Management, Physical Or External Associated To Interfaces.
VLAN: Define VLANs for the infrastructure.
TENANTS
APPLICATION PROFILE
NETWORKING
SECURITY POLICIES
APPLICATION EPG
BRIDGE DOMAIN
PRIVATE NETWORK
CONTRACTS

IP Address Assignment

The IP address schemes of UCS and ACI management are configured as out of band management access through the management switch.

APIC 10.0.130.71/24

DOMAIN - 1	DOMAIN - 2
UCSM 10.0.141.5/24	UCSM 10.0.141.10/24
FI-A 10.0.141.6/24	FI-C 10.0.141.8/24

DOMAIN - 1	DOMAIN - 2
FI-B 10.0.141.7/24	FI-D 10.0.141.9/24
KVM 10.0.141.11/24 – 10.0.141.90/24	KVM 10.0.141.91/24 – 10.0.141.170/24

Table 8 IP Address Assignment for Domain 1 and 2

VLAN	Domain - 1	Domain - 2
VLAN 160	10.0.145.45 - 124/24	10.0.145.125 -204 /24
VLAN 11	10.0.146.45 -124 /24	10.0.146.125 -204/24
VLAN 12	10.0.147.45 -124 /24	10.0.147.125 -204/24

Configuration of APIC

This section describes loading and configuring the APIC.

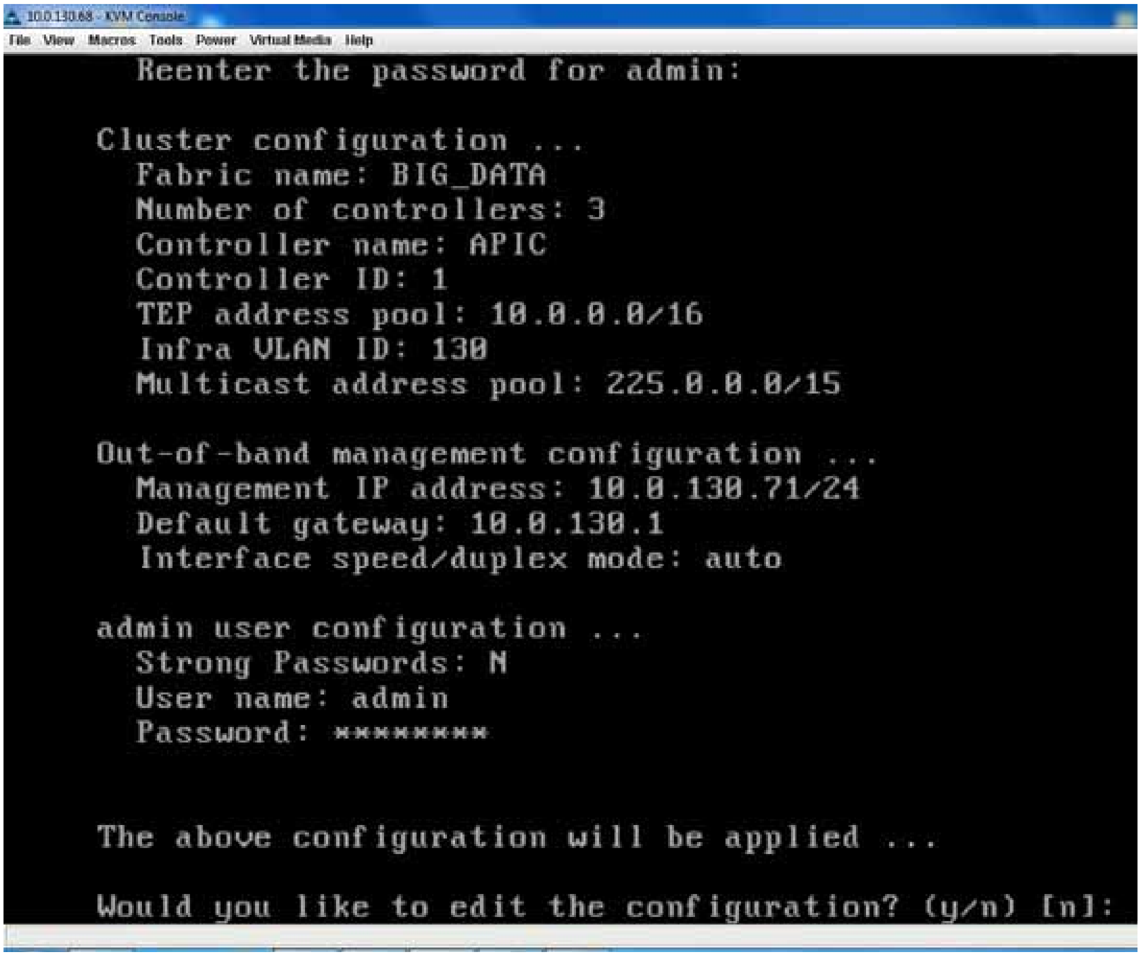
Once the APIC appliance is booted for the first time, the APIC console presents a series of initial setup options. For many options, you can press Enter to choose the default setting that is displayed in brackets. At any point in the setup dialog, you can restart the dialog from the beginning by pressing Ctrl-C.

Shown below is the initial configuration of the APIC.

```
Enter the fabric name [ACI Fabric1]:
Enter the number of controllers in the fabric (1-9) [3]:3
Enter the controller ID (1-3) [1]:1
Enter the controller name [apic1]:APIC_1
Enter address pool for TEP addresses [10.0.0.0/16]:
Enter the VLAN ID for infra network (1-4094) [4]: 130

Out-of-band management configuration...
Enter the IP address for out-of-band management: 10.0.130.71/24
Enter the IP address of the default gateway [None]: 10.0.130.1
Administrator user configuration...
Enable strong passwords? [Y]
Enter the password for admin:
```

Below is the screenshot of the configuration

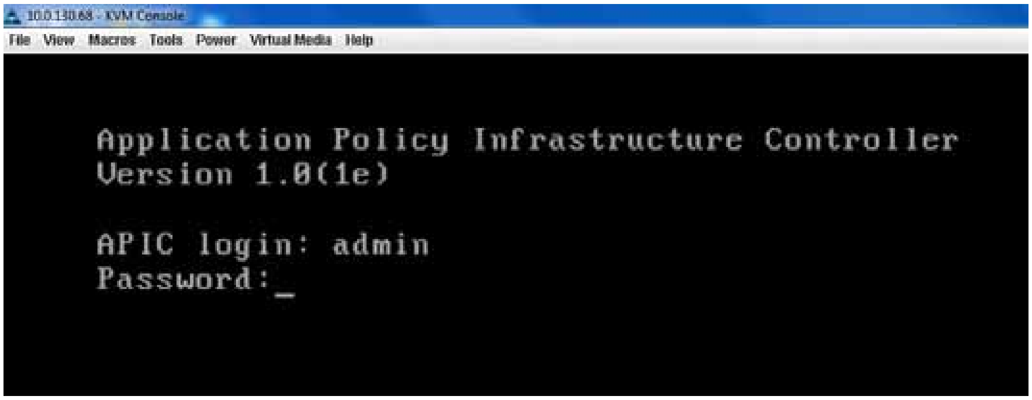
Figure 19 APIC Initial Configuration


10.0.130.68 - KVM Console
File View Macros Tools Power Virtual Media Help

```
    Reenter the password for admin:

  Cluster configuration ...
    Fabric name: BIG_DATA
    Number of controllers: 3
    Controller name: APIC
    Controller ID: 1
    TEP address pool: 10.0.0.0/16
    Infra VLAN ID: 130
    Multicast address pool: 225.0.0.0/15

  Out-of-band management configuration ...
    Management IP address: 10.0.130.71/24
    Default gateway: 10.0.130.1
    Interface speed/duplex mode: auto

  admin user configuration ...
    Strong Passwords: N
    User name: admin
    Password: ********


  The above configuration will be applied ...

  Would you like to edit the configuration? (y/n) [n]:
```

Once the configuration is completed, the APIC will Boot its APIC IOS Image and will ask for the login information. The default username is “admin” and the password is the one that was set during the initial configuration.

Figure 20 APIC Login Screen



10.0.130.68 - KVM Console
File View Macros Tools Power Virtual Media Help

```
Application Policy Infrastructure Controller
Version 1.0(1e)

APIC login: admin
Password:_
```

Switch Discovery with the APIC

The APIC is a central point of automated provisioning and management for all the switches that are part of the ACI fabric. A single data center might include multiple ACI fabrics, each with their own APIC cluster and Cisco Nexus 9000 Series switches that are part of the fabric. To ensure that a switch is managed only by a single APIC cluster, each switch must be registered with that specific APIC cluster that manages the fabric. The APIC discovers new switches that are directly connected to any switch it currently manages. Each APIC instance in the cluster first discovers only the leaf switch to which it is directly connected. After the leaf switch is registered with the APIC, the APIC discovers all spine switches that are directly connected to the leaf switch. As each spine switch is registered, that APIC discovers all the leaf switches that are connected to that spine switch. This cascaded discovery allows the APIC to discover the entire fabric topology in a few simple steps.

Switch Registration with the APIC Cluster

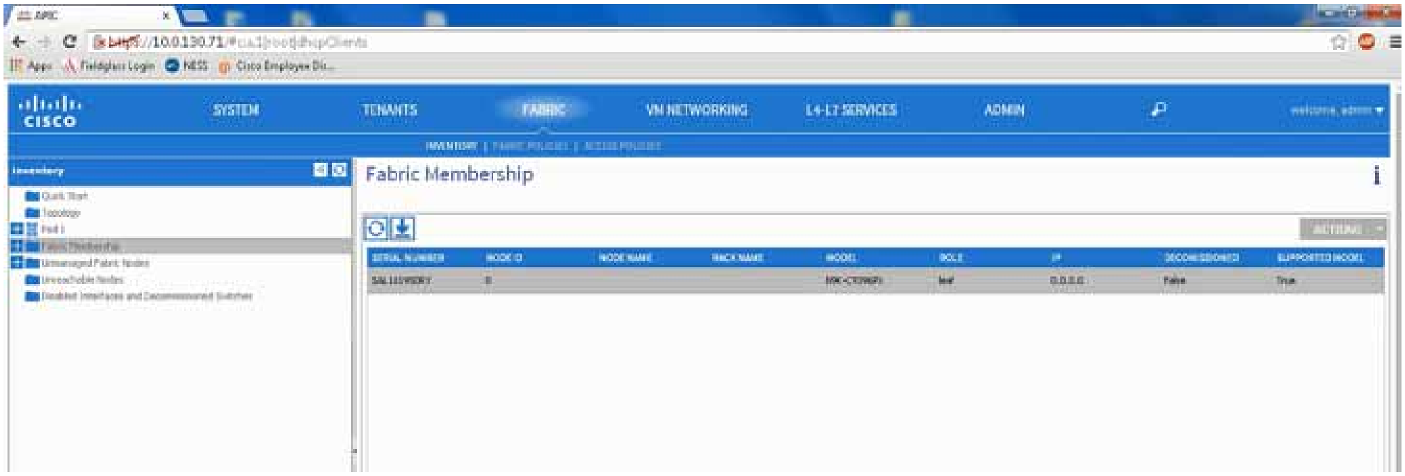
Once the switch is discovered by the APIC cluster it needs to be registered in the APIC to make it as a part of the fabric.

Prerequisite: All switches must be physically connected and booted with the correct ACI Image.

Using a web browser connect to the out-of-band management ip address [10.0.130.71] configured in the initial configuration.

1. On the menu bar, choose **FABRIC** > **INVENTORY**. In the Navigation pane, choose the appropriate pod.
2. In the Navigation pane, expand the pod, and click **Fabric Membership**. In the Work pane, in the Fabric Membership table, a single leaf switch is displayed with an ID of 0. It is the leaf switch that is connected to APIC.

Figure 21 Switch Discovery



Fabric Membership

SERIAL NUMBER	NODE ID	NODE NAME	RACK NAME	MODEL	ROLE	IP	DECOMISSIONED	SUPPORTED MODEL
SAL1819SORY	0			N9K-C9396PX	leaf	0.0.0.0	False	True

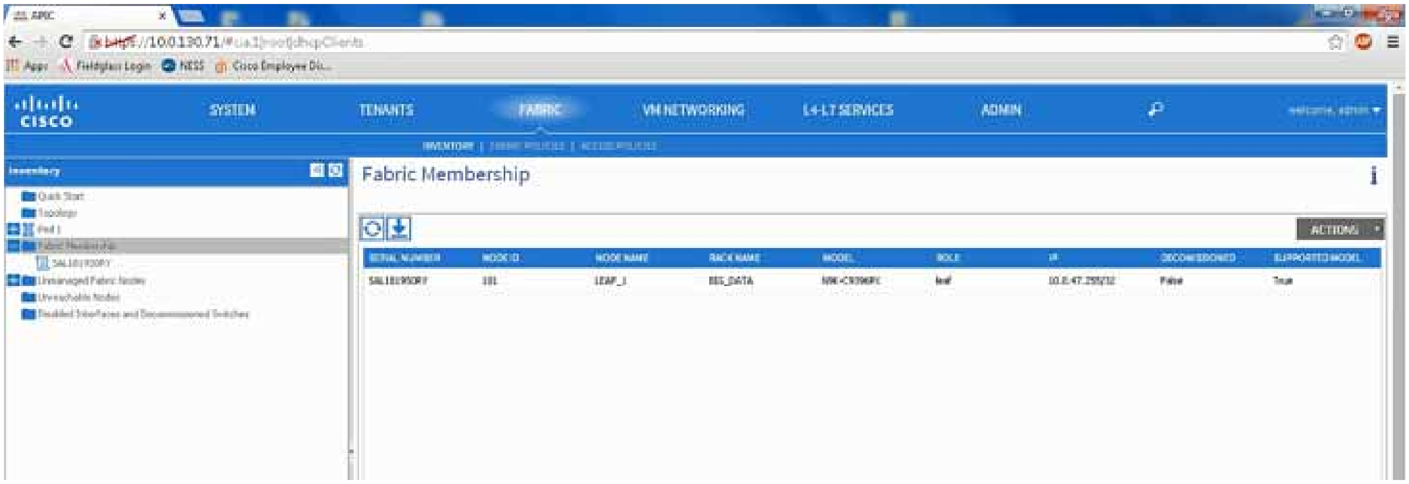
3. To configure the ID, double-click the leaf switch row, and perform the following actions:
   a. In the ID field, add the appropriate ID (leaf1 is ID 101, leaf2 is ID 102 and leaf3 is ID103).

      The ID must be a number that is greater than 100 because the first 100 IDs are for APIC appliance nodes.

   b. In the Switch Name field, add the name of the switch, and click **Update**. After an ID is assigned, it cannot be updated. The switch name can be updated by double-clicking the name and updating the Switch Name field.

Note The Success dialog box is displayed. An IP address gets assigned to the switch, and in the Navigation pane, the switch is displayed under the pod.

Figure 22 Switch Registration



Fabric Membership

SERIAL NUMBER	NODE ID	NODE NAME	RACK NAME	MODEL	ROLE	IP	DECOMISSIONED	SUPPORTED MODEL
SAL1819SORY	101	LEAF_1	BIG_DATA	N9K-C9396PX	leaf	10.0.47.255/32	False	True

4. Monitor the Work pane until one or more spine switches appear.
5. To configure the ID, double-click the spine switch row and perform the following actions:
   a. In the ID field, add the appropriate ID (spine1 is ID 201 and spine 2 is ID 202).

      The ID must be a number that is greater than 100.

b. In the Switch Name field, add the name of the switch, and click **Update**.

The Success dialog box is displayed. An IP address gets assigned to the switch, and in the Navigation pane, the switch is displayed under the pod. Wait until all remaining switches appear in the Node Configurations table.

6. For each switch listed in the Fabric Membership table, perform the following steps:

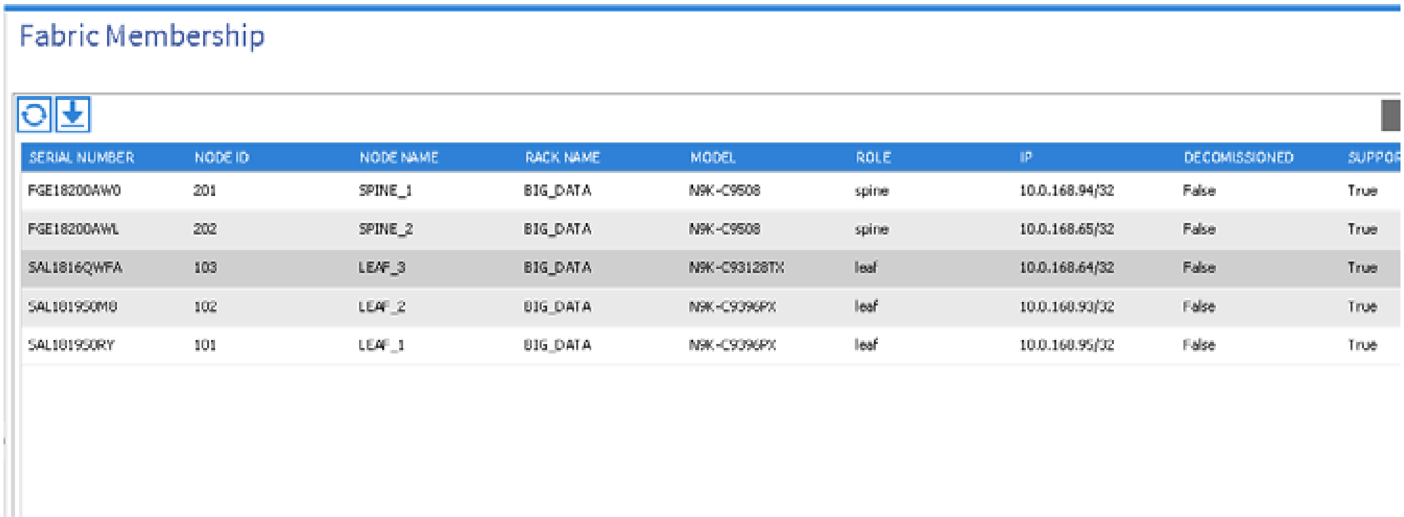
a. Double-click the switch, enter an ID and a Name, and click **Update**.

b. Repeat for the next switch in the list.

Validating the Switches

1. On the menu bar, choose **FABRIC** > **INVENTORY**, and in the Navigation pane, under Pod 1, expand Fabric Membership.
2. The switches in the fabric are displayed with their node IDs. In the Work pane, all the registered switches are displayed with the IP addresses that are assigned to them.

Figure 23 Switch Validation



Fabric Membership

SERIAL NUMBER	NODE ID	NODE NAME	RACK NAME	MODEL	ROLE	IP	DECOMISSIONED	SUPPOR
FGE18200AW0	201	SPINE_1	BIG_DATA	N9K-C9508	spine	10.0.168.94/32	False	True
FGE18200AWL	202	SPINE_2	BIG_DATA	N9K-C9508	spine	10.0.168.65/32	False	True
SAL1816QWFA	103	LEAF_3	BIG_DATA	N9K-C93128TX	leaf	10.0.168.64/32	False	True
SAL181950M0	102	LEAF_2	BIG_DATA	N9K-C9396PX	leaf	10.0.168.93/32	False	True
SAL181950RY	101	LEAF_1	BIG_DATA	N9K-C9396PX	leaf	10.0.168.95/32	False	True

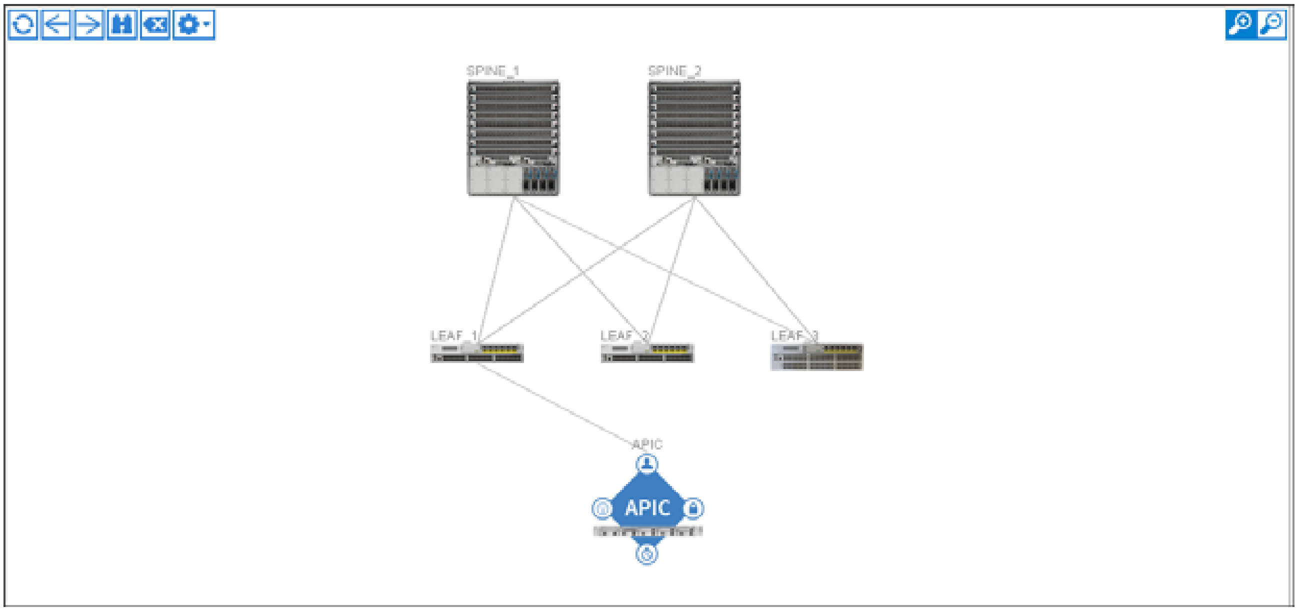
Validating the Fabric Topology

1. On the menu bar, choose **FABRIC** > **INVENTORY**.
2. In the Navigation pane, choose the pod that you want to view.
3. In the Work pane, click the **TOPOLOGY** tab.

   The displayed diagram shows all attached switches, APIC instances, and links.
4. (Optional) To view the port-level connectivity of a leaf switch or spine switch, double-click its icon in the topology diagram.

   To return to the topology diagram, in the upper left corner of the Work pane click the **Previous View** icon.
5. (Optional) To refresh the topology diagram, in the upper left corner of the Work pane, click the **Refresh** icon.

Figure 24 Fabric Topology



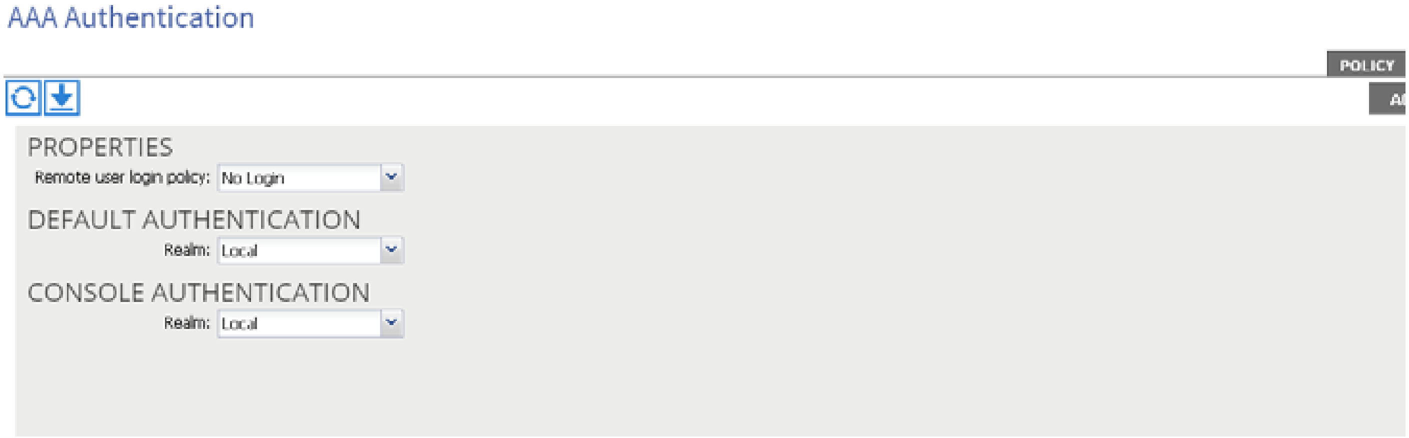
Creating User Accounts

The admin is the only user when the system starts. The APIC supports a granular, role-based access control system where user accounts can be created with various roles including non-admin users with fewer privileges.

1. On the menu bar, choose **ADMIN** > **AAA**.
2. In the Navigation pane, click **AAA** Authentication.

   In the Work pane, the AAA Authentication dialog box is displayed.
3. Verify that in the default Authentication field, the Realm field displays as Local.

Figure 25 AAA Authentication



AAA Authentication

PROPERTIES

Remote user login policy: No Login

DEFAULT AUTHENTICATION

Realm: Local

CONSOLE AUTHENTICATION

Realm: Local

4. In the Navigation pane, expand **Security Management** > **Local Users**.

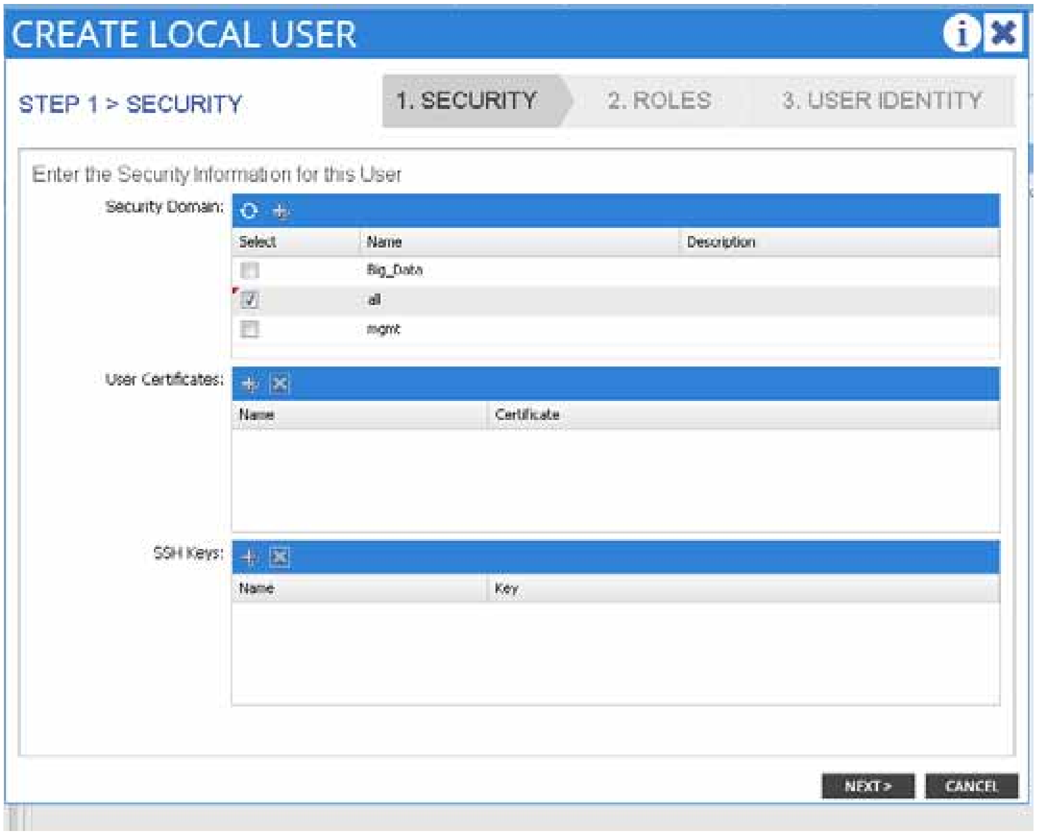
   The admin user is present by default.

5. In the Navigation pane, right-click Create Local User.

   The Create Local User dialog box opens.

6. Under the Security dialog box, choose the desired security domain for the user, and click **Next**.

Figure 26 Creating Local User



Enter the Security Information for this User

Security Domain:

Select	Name	Description
☐	Big_Data	
☑	all	
☐	mgmt	

User Certificates:

Name	Certificate

SSH Keys:

Name	Key

The Roles dialog box opens.

7. In the Roles dialog box, click the radio buttons to choose the roles for your user, and click **Next**.

   You can provide read-only or read/write privileges.

8. In the User Identity dialog box, perform the following actions:

   a. In the Login ID field, add an ID.

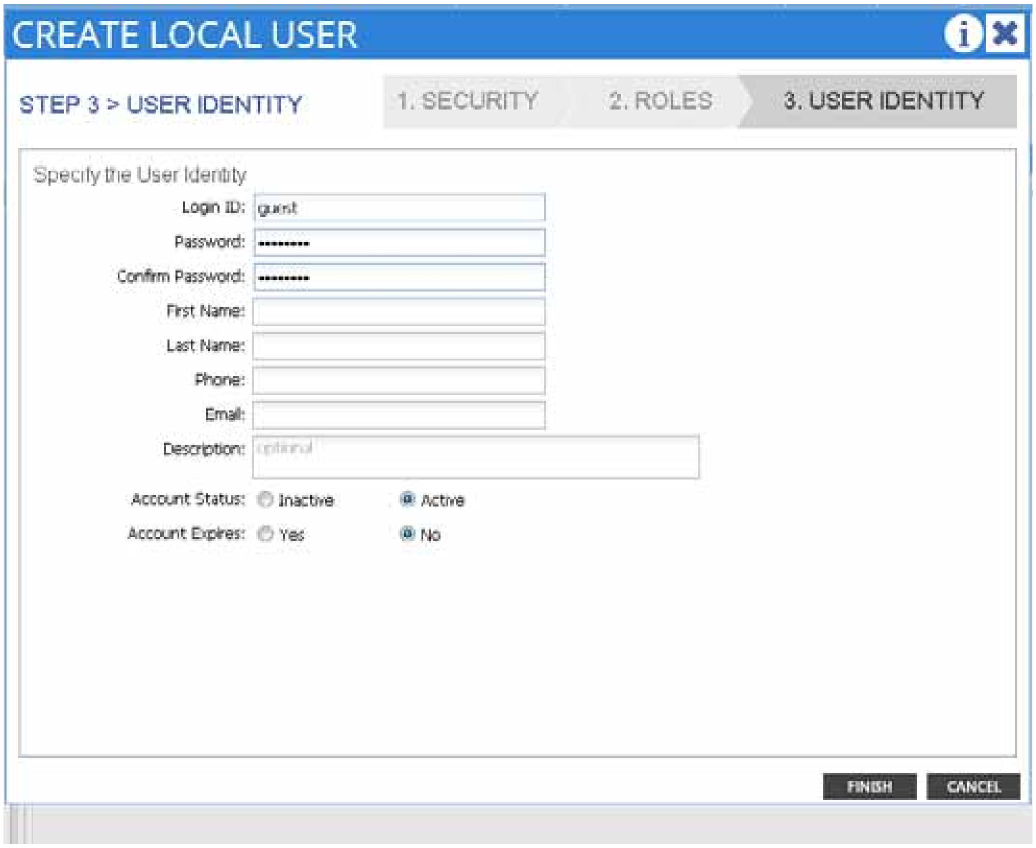
   b. In the Password field, type the password.

   c. In the Confirm Password field, confirm the password.

   d. Click **Finish**.

   e. Type other parameters if desired.

Figure 27 User Identity



Specify the User Identity

Login ID: guest
Password: ---------
Confirm Password: ---------
First Name:
Last Name:
Phone:
Email:
Description: optional
Account Status: ○ Inactive ● Active
Account Expires: ○ Yes ● No

9. In the Navigation pane, click the name of the user that you created. In the Work pane, expand the + sign next to your user in the Security Domains area.

   The access privileges for your user are displayed.

Adding Management Access

Attach Entity Profiles (AEP)

The ACI fabric provides multiple attachment points that connect through leaf ports to various external entities such as baremetal servers, hypervisors, Layer 2 switches (for example, the Cisco UCS fabric interconnect), and Layer 3 routers (for example Cisco Nexus 7000 Series switches). These attachment points can be physical ports, port channels, or a virtual port channel (vPC) on the leaf switches.

An attachable entity profile (AEP) represents a group of external entities with similar infrastructure policy requirements. The infrastructure policies consist of physical interface policies, for example, Cisco Discovery Protocol (CDP), Link Layer Discovery Protocol (LLDP), maximum transmission unit (MTU), and Link Aggregation Control Protocol (LACP).

An AEP is required to deploy any VLAN pools on the leaf switches. It is possible to reuse the encapsulation pools (for example, VLAN) across different leaf switches. An AEP implicitly provides the scope of the VLAN pool (associated to the VMM domain) to the physical infrastructure.

Note

- An AEP provisions the VLAN pool (and associated VLANs) on the leaf. The VLANs are not actually enabled on the port. No traffic flows unless an EPG is deployed on the port.

- Without VLAN pool deployment using an AEP, a VLAN is not enabled on the leaf port even if an EPG is provisioned.
- A particular VLAN is provisioned or enabled on the leaf port based on EPG events either statically binding on a leaf port or based on VM events from external controllers such as VMware vCenter.
- A leaf switch does not support overlapping VLAN pools. Different overlapping VLAN pools must not be associated with the same AEP.

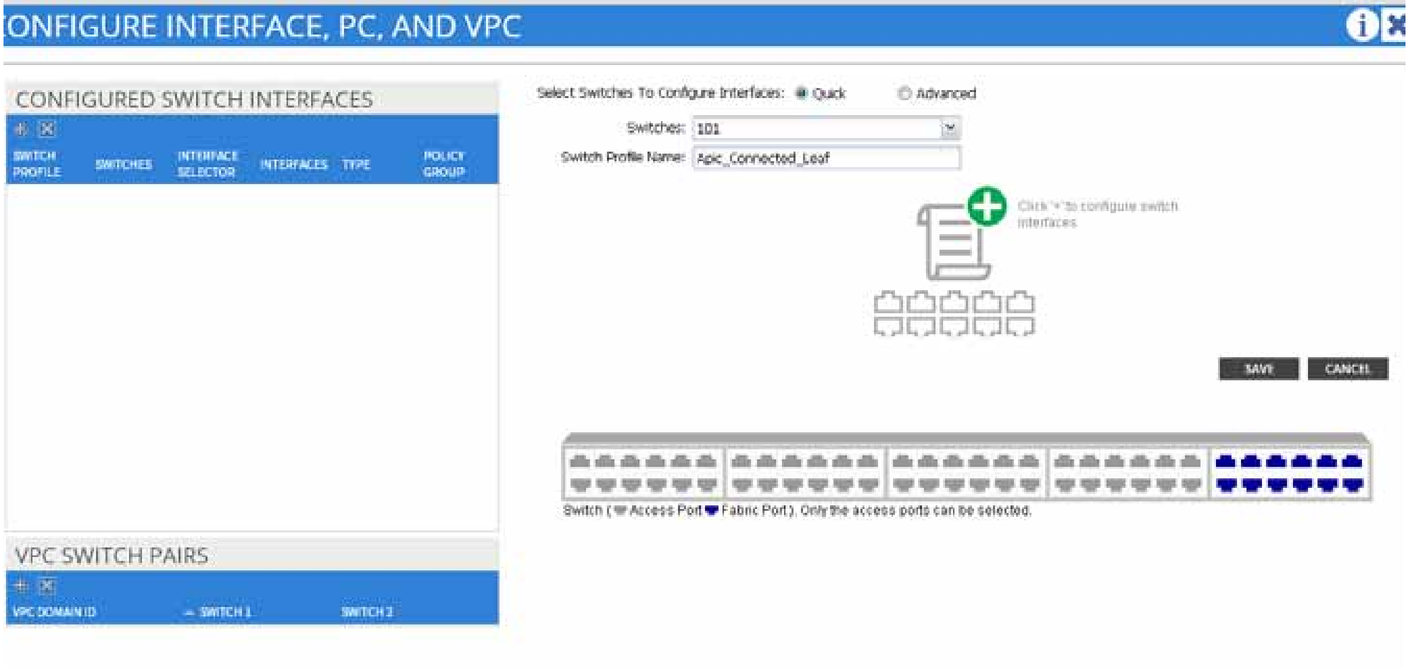
Configuring In-Band Management Access Using the GUI

The In-Band management access is required to establish the communication between the APIC and the ACI fabric.

1. On the menu bar, choose **FABRIC** > **Access Policies**. In the Work pane, click **Configure an Interface, PC and VPC**.
2. In the Configure Interface, PC, and VPC dialog box, click the large + icon next to the switch diagram to create a new profile and configure VLANs for the APIC.

   In the Switches field, from drop-down list, check the check boxes for the switches to which the APICs are connected. (leaf1 and leaf2).

Figure 28 Configuring Interface, PC, and VPC



ONFIGURE INTERFACE, PC, AND VPC

CONFIGURED SWITCH INTERFACES

SWITCH PROFILE	SWITCHES	INTERFACE SELECTOR	INTERFACES	TYPE	POLICY GROUP

Select Switches To Configure Interfaces: ● Quick ○ Advanced

Switches: 101

Switch Profile Name: Apic_Connected_Leaf

Click "+" to configure switch interfaces

SAVE CANCEL

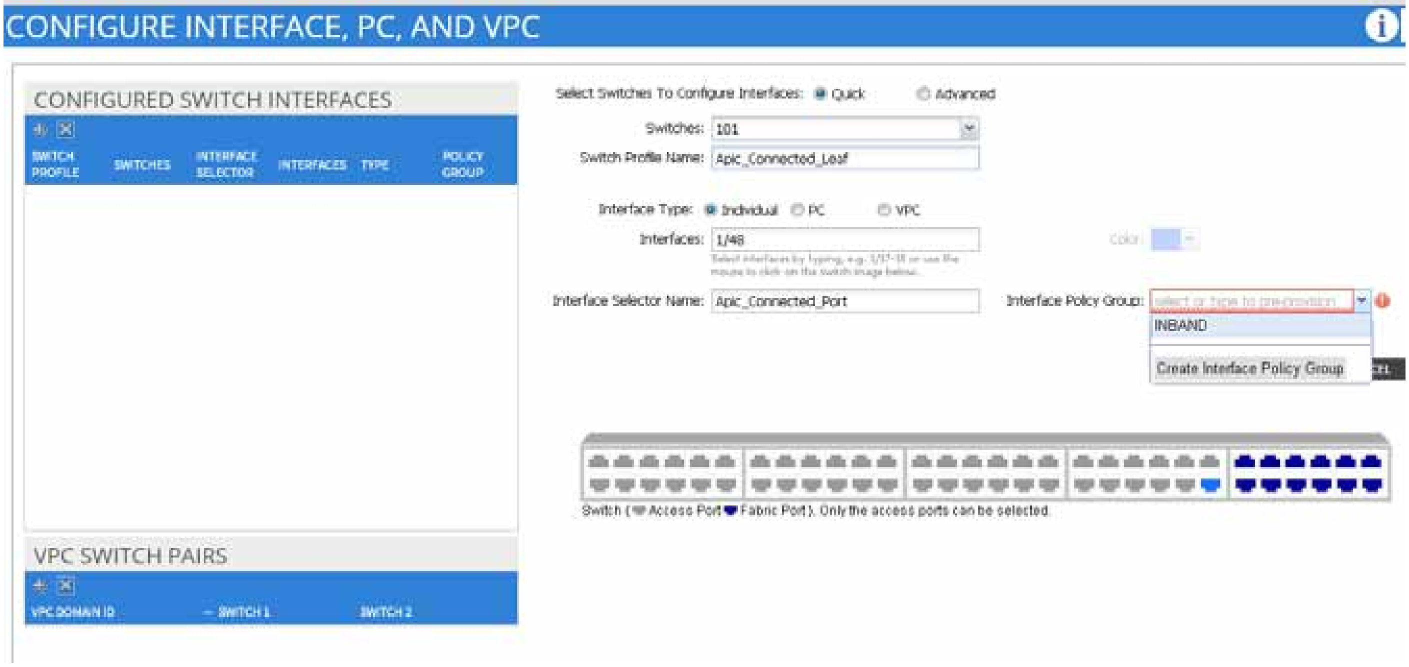
Switch (Access Port Fabric Port). Only the access ports can be selected.

VPC SWITCH PAIRS

VPC DOMAIN ID	SWITCH 1	SWITCH 2

3. In the Switch Profile Name field, enter a name for the profile (Apic_Connected_Leaf).
4. Click the + icon to configure the ports.
5. Verify that in the Interface Type area, the **Individual** radio button is selected.

Figure 29 Configuring APIC Interface



CONFIGURE INTERFACE, PC, AND VPC

CONFIGURED SWITCH INTERFACES

SWITCH PROFILE	SWITCHES	INTERFACE SELECTOR	INTERFACES	TYPE	POLICY GROUP

VPC SWITCH PAIRS

VPC DOMAIN ID	SWITCH 1	SWITCH 2

Select Switches To Configure Interfaces: ● Quick ○ Advanced

Switches: 101

Switch Profile Name: Apic_Connected_Leaf

Interface Type: ● Individual ○ PC ○ VPC

Interfaces: 1/48

Select interfaces by typing, e.g. 1/17-18 or use the mouse to click on the switch image below.

Color:

Interface Selector Name: Apic_Connected_Port

Interface Policy Group: select or type to pre-provision

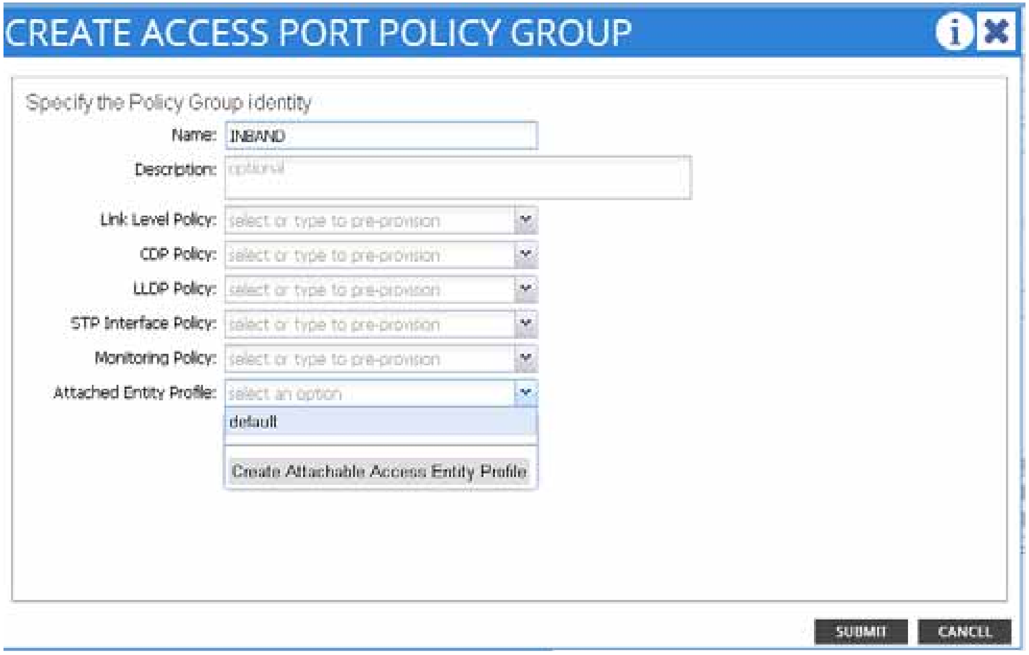
Switch (Access Port Fabric Port). Only the access ports can be selected.

6. In the Interfaces field, enter the ports to which APICs are connected (1/48).
7. In the Interface Selector Name field, enter the name of the port profile (Apic_Connected_Port).
8. In the Interface Policy Group field, from drop-down list, choose **Create Interface Policy Group**.
9. In the Create Access Port Policy Group dialog box, perform the following actions:
   a. In the Name field, enter the name of the policy group (INBAND).

      You can leave the default values in the rest of the fields as they are.

   b. In the Attached Entity Profile field, choose create **Attachable Access Entity Profile**.

Figure 30 Creating Access Port Policy Group



CREATE ACCESS PORT POLICY GROUP

Specify the Policy Group identity

Name: INBAND

Description: optional

Link Level Policy: select or type to pre-provision

CDP Policy: select or type to pre-provision

LLDP Policy: select or type to pre-provision

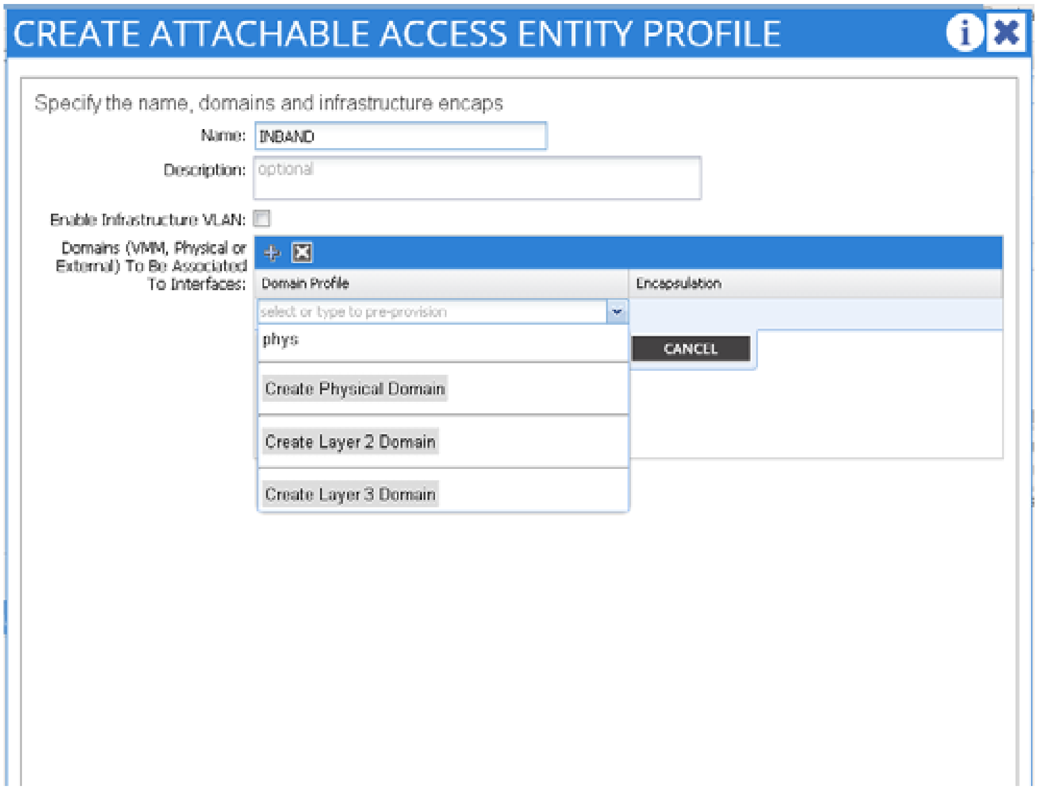
STP Interface Policy: select or type to pre-provision

Monitoring Policy: select or type to pre-provision

Attached Entity Profile: select an option

10. In the Create Attachable Access Entity Profile dialog box, perform the following actions:
    a. In the Name field, enter a name (INBAND).
    b. Expand Domains to be Associated to Interfaces field. In the Domain Profile field, from the drop-down list, choose Create Physical Domain.

Figure 31 Creating Attachable Access Entity Profile



CREATE ATTACHABLE ACCESS ENTITY PROFILE

Specify the name, domains and infrastructure encaps

Name: INBAND

Description: optional

Enable Infrastructure VLAN: □

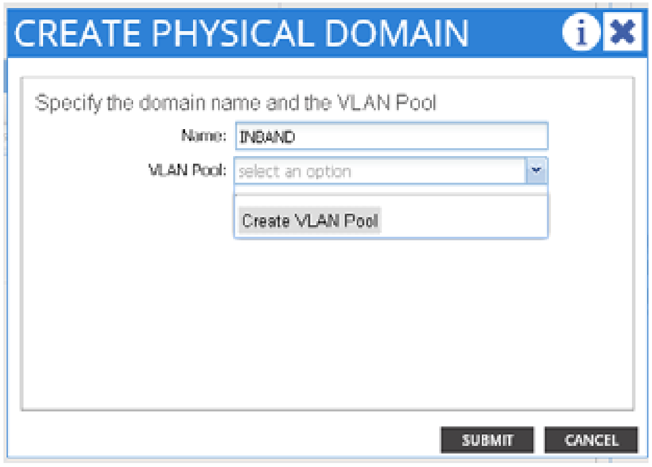
Domains (VMM, Physical or External) To Be Associated To Interfaces:

Domain Profile	Encapsulation
select or type to pre-provision	

c. In the Create Physical Domain dialog box, in the Name field, enter the name (INBAND).

d. In the VLAN Pool field, from the drop-down list, choose **Create VLAN Pool**.

Figure 32 Creating Physical Domain



CREATE PHYSICAL DOMAIN

Specify the domain name and the VLAN Pool

Name: INBAND

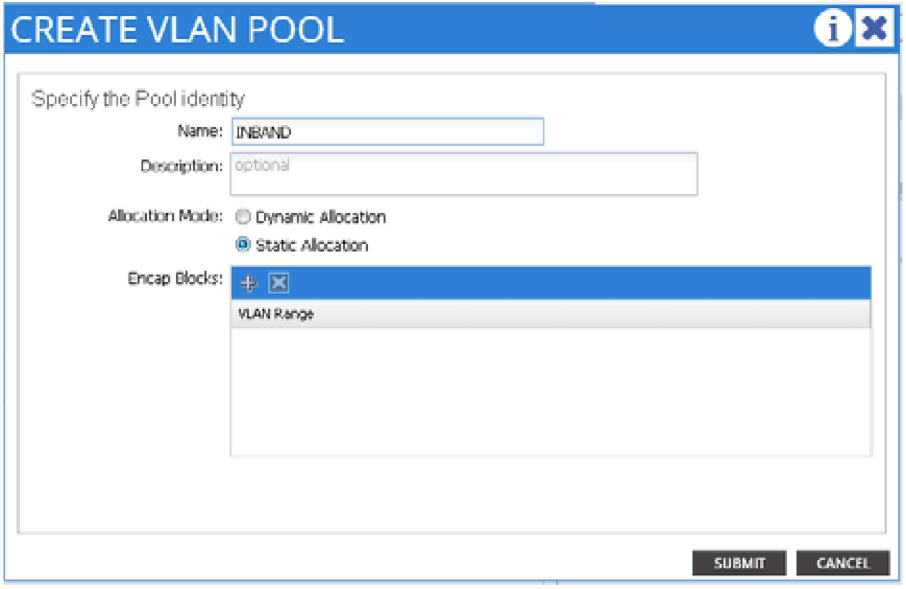
VLAN Pool: select an option

Create VLAN Pool

e. In the Create VLAN Pool dialog box, in the Name field, enter the pool name (INBAND).

f. In the Allocation Mode area, click the **Static Allocation** radio button.

Figure 33 Creating Vlan Pool



CREATE VLAN POOL

Specify the Pool identity

Name: INBAND

Description: optional

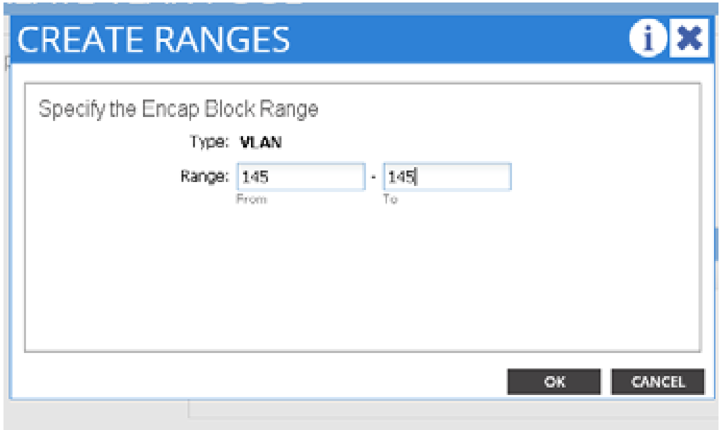
Allocation Mode: ○ Dynamic Allocation
● Static Allocation

Encap Blocks:

VLAN Range

g. Expand Encap Blocks. In the Create Ranges dialog box, in the Range fields, add a VLAN range (145-145).

Figure 34 Creating VLAN Range



CREATE RANGES

Specify the Encap Block Range

Type: VLAN

Range: 145 - 145

From To

h. In the Create VLAN Pool dialog box, click **Submit**.

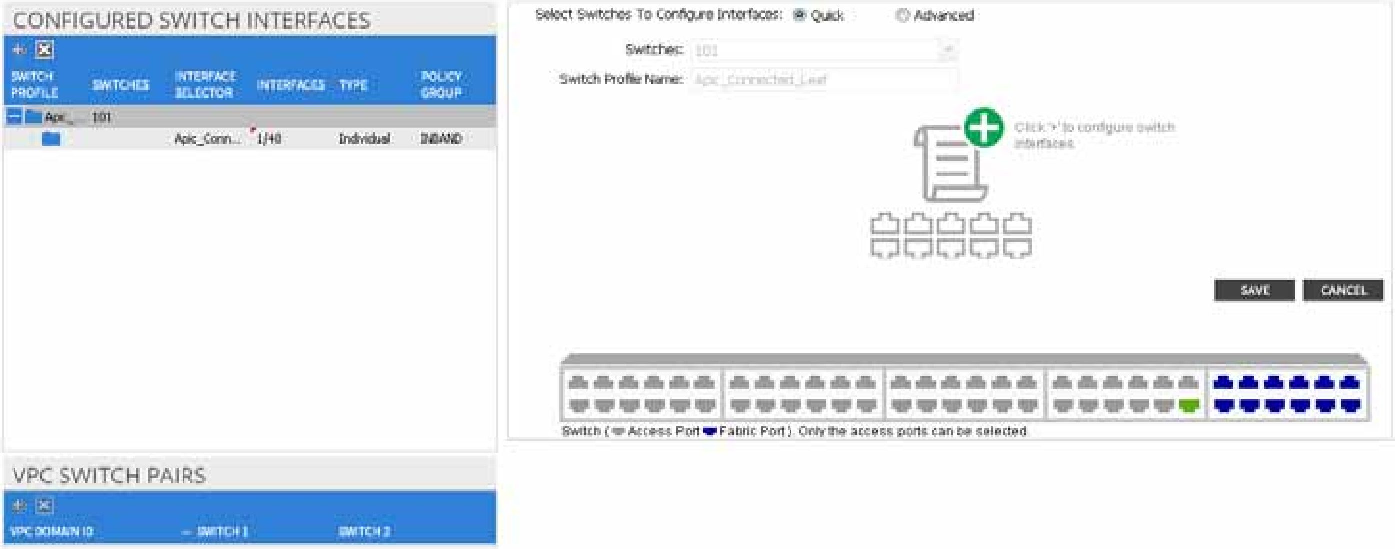
i. In the Create Physical Domain dialog box, click **Submit**.

j. In the Create Attachable Access Entity Profile dialog box, click **Update** and then **Submit**.

k. In the Create Access Port Policy Group dialog box, click **Submit**.

l. In the Configure Interface, PC, and VPC dialog box, click **Save**.

Figure 35 Saving the Configuration



CONFIGURED SWITCH INTERFACES

SWITCH PROFILE	SWITCHES	INTERFACE SELECTOR	INTERFACES	TYPE	POLICY GROUP
Apic_...	101				
		Apic_Conn...	1/48	Individual	INBAND

VPC SWITCH PAIRS

VPC DOMAIN ID	SWITCH 1	SWITCH 2

Select Switches To Configure Interfaces: ● Quick ○ Advanced

Switches: 101

Switch Profile Name: Apic_Connected_Leaf

Click '+' to configure switch interfaces

Switch (Access Port Fabric Port). Only the access ports can be selected

The VLAN and the ports to which the APIC is connected are now configured.

Configuring VPC Ports for Fabric Interconnect

In order to configure vPC we need to create CDP Policy, LLDP Policy and LACP Policy that can be applied to the vPC ports.

- The APIC does not manage fabric interconnects and the rack servers, so these services must be configured from UCSM

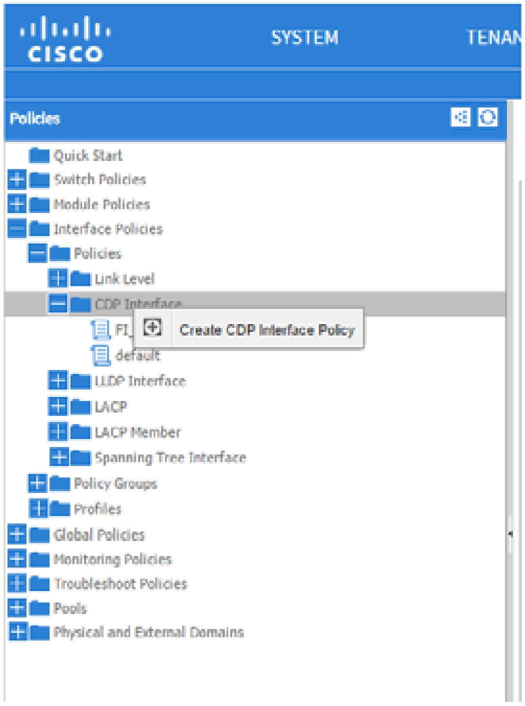
- Create VLAN pools that are associated on the fabric interconnect uplink to the leaf switch on the fabric interconnect.
- Cisco UCS C-series server when used along with ACI, Link Layer Discovery Protocol (LLDP) is not supported and must be disabled.
- Cisco Discovery Prototol (CDP) is disabled by default in the Cisco UCS Manager Fabric interconnects. In the Cisco UCS Manager, you must enable CDP by creating a policy under Network Control Policies > CDP.

The above steps are explained in detail further below

Creating CDP Policy group

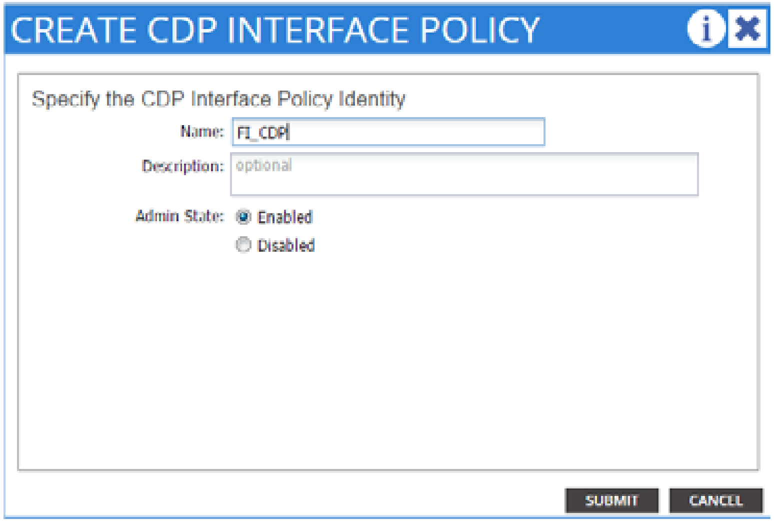
1. On the menu bar, choose **FABRIC** > **ACCESS POLICIES**.
2. In the Navigation pane, expand the Interface Policies and expand the Policies again.
3. Right-click the CDP Interface and select **Create CDP Interface Policy**.

Figure 36 Create CDP Interface Policy



4. In the Create CDP Interface Policy dialogue box, enter “FI_CDP” as the policy name, set Admin State “Enabled” and click **submit**.
5. This will create the CDP policy group.

Figure 37 CDP Enabled



CREATE CDP INTERFACE POLICY

Specify the CDP Interface Policy Identity

Name: FI_CDP

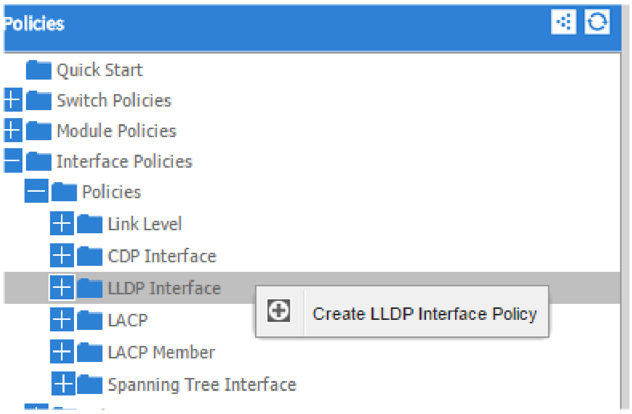
Description: optional

Admin State: ● Enabled ○ Disabled

Creating LLDP Policy group

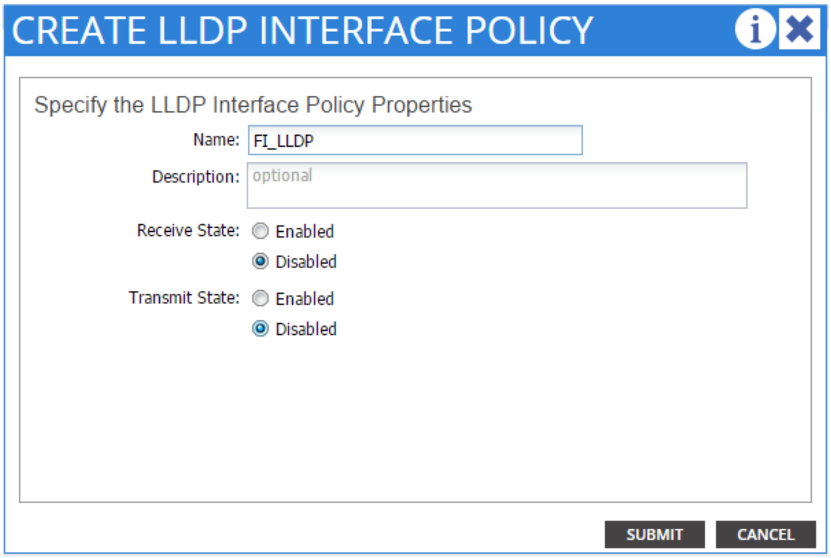
1. On the menu bar, choose **FABRIC** > **ACCESS POLICIES**.
2. In the Navigation pane, expand the Interface Policies and expand the Policies again.
3. Right-click the LLDP Interface and select **Create LLDP Interface Policy**.

Figure 38 Create LLDP Interface Policy



4. In the Create LLDP Interface Policy dialogue box, enter “FI_LLDP” as the policy name, set both the Receive and Transmit State “Disabled” and click **submit**.
5. This will create the LLDP policy group.

Figure 39 LLDP Disabled



CREATE LLDP INTERFACE POLICY

Specify the LLDP Interface Policy Properties

Name: FI_LLDP

Description: optional

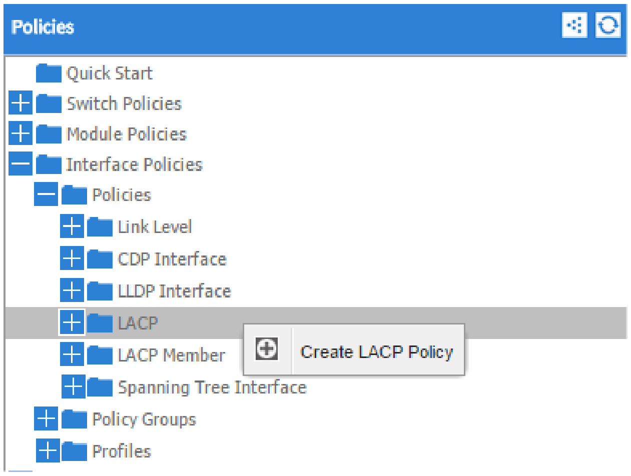
Receive State: ○ Enabled ● Disabled

Transmit State: ○ Enabled ● Disabled

Creating LACP Policy

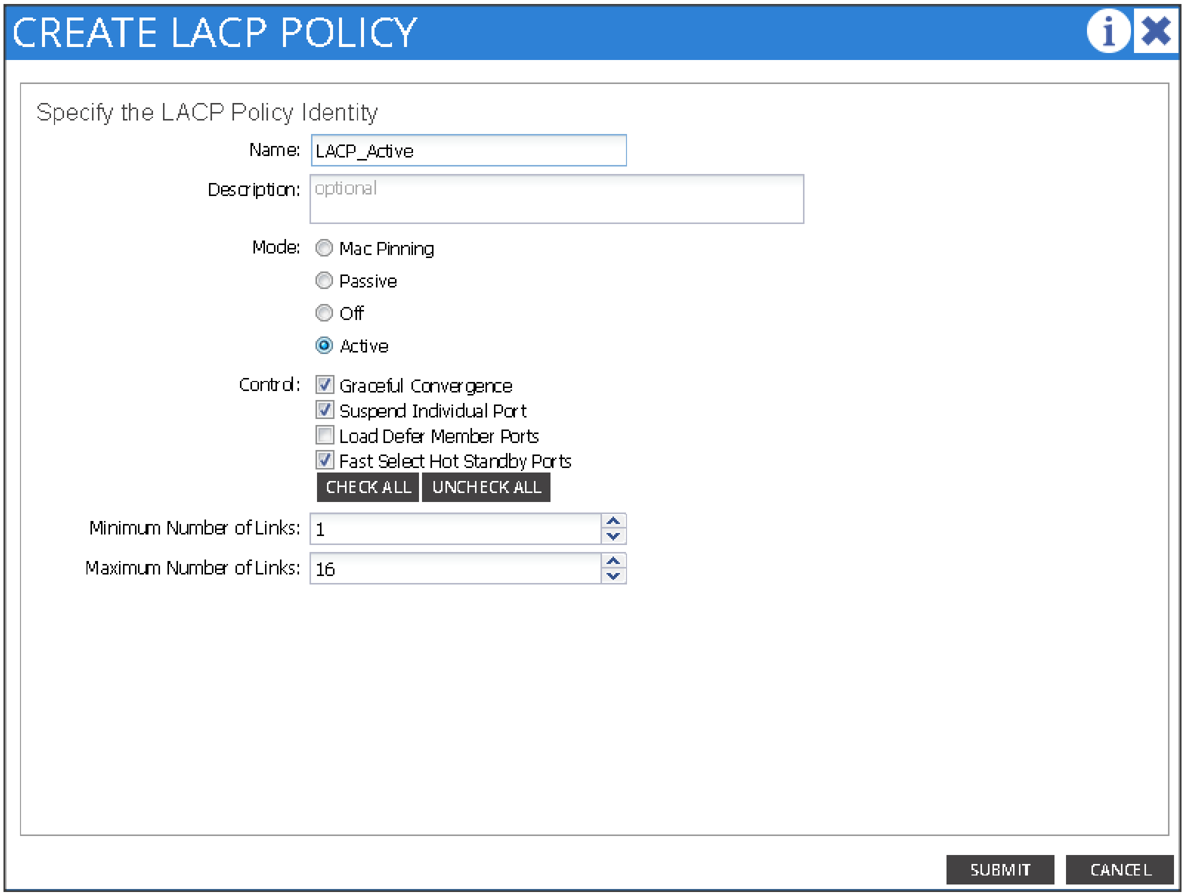
1. On the menu bar, choose **FABRIC** > **ACCESS POLICIES**.
2. In the Navigation pane, expand the Interface Policies and expand the Policies again.
3. Right-click the LACP and select **Create LACP Policy**.

Figure 40 Create LACP Policy



4. In Create LACP Policy window, enter the name “LACP_Active”. In the mode select the “Active” radio button and click **submit**.

Figure 41 Creating LACP Policy



CREATE LACP POLICY

Specify the LACP Policy Identity

Name: LACP_Active

Description: optional

Mode:
○ Mac Pinning
○ Passive
○ Off
● Active

Control:
☑ Graceful Convergence
☑ Suspend Individual Port
□ Load Defer Member Ports
☑ Fast Select Hot Standby Ports

Minimum Number of Links: 1

Maximum Number of Links: 16

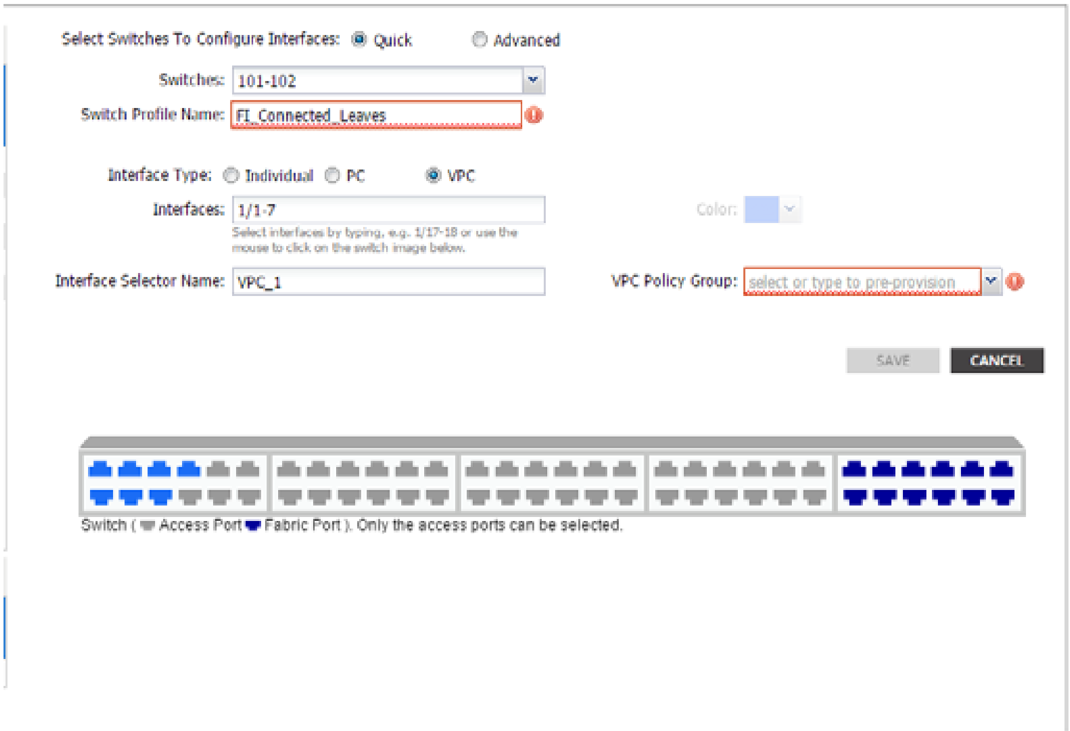
Creating vPC

1. Expand the Configured Switch Interfaces area to configure the VPCs for the server ports, and perform the following actions:

   a. In the Switches drop-down list, check the check boxes for the switches that you want to connect to the Fabric Inteconnect. (LEAF_1 & LEAF_2).

   b. In the Switch Profile Name field, enter a name for the profile (FI_Connected_Leaves).

Figure 42 *Configuring vPC Ports*



Select Switches To Configure Interfaces: ● Quick ○ Advanced

Switches: 101-102

Switch Profile Name: FI_Connected_Leaves

Interface Type: ○ Individual ○ PC ● VPC

Interfaces: 1/1-7

Select interfaces by typing, e.g. 1/17-18 or use the mouse to click on the switch image below.

Color:

Interface Selector Name: VPC_1

VPC Policy Group: select or type to pre-provision

Switch (Access Port Fabric Port). Only the access ports can be selected.

c. Click the + icon to configure the ports.

d. In the Interface Type area, verify the **VPC** radio button is selected.

e. In the Interfaces field, enter the ports to which the servers are connected.

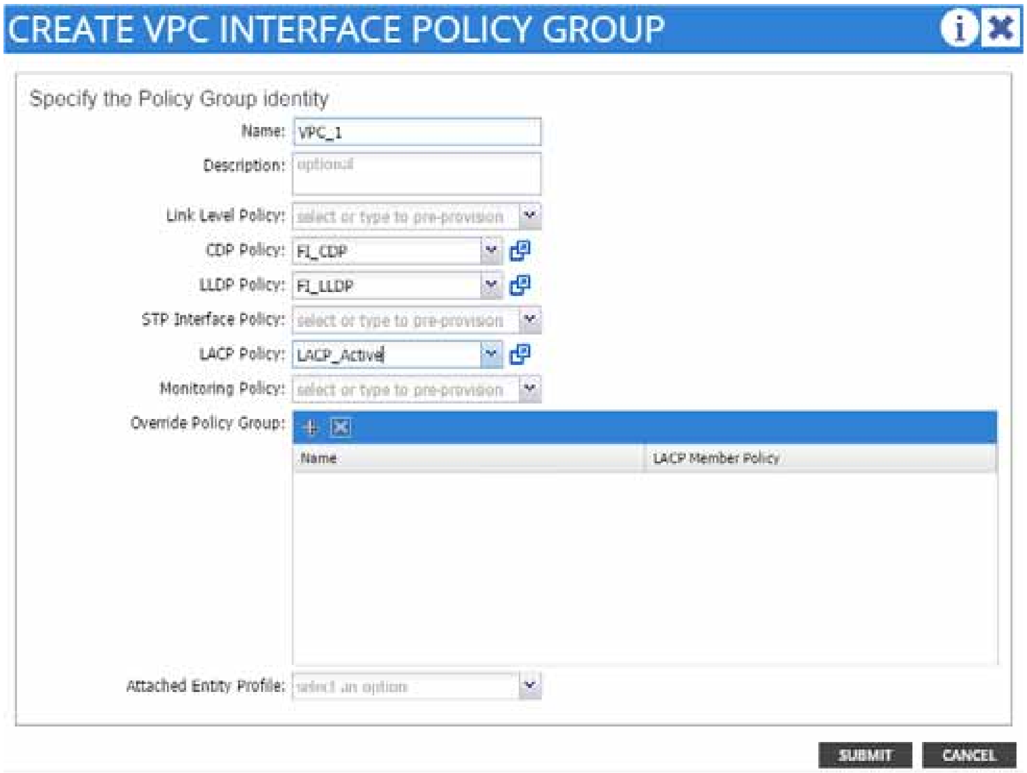
f. In the Interface Selector Name field, enter the name of the port profile (VPC_1).

g. In the VPC Policy Group field, from the drop-down list, choose **Create VPC Interface Policy Group**.

h. In Create VPC Interface Policy Group window, enter the name “VPC1”.

Note Create separate VPC interface policy group for each VPC link.

Figure 43 Creating VPC Interface Policy Group



CREATE VPC INTERFACE POLICY GROUP

Specify the Policy Group identity

Name: VPC_1

Description: optional

Link Level Policy: select or type to pre-provision

CDP Policy: FI_CDP

LLDP Policy: FI_LLDP

STP Interface Policy: select or type to pre-provision

LACP Policy: LACP_Active

Monitoring Policy: select or type to pre-provision

Override Policy Group:

Name	LACP Member Policy

Attached Entity Profile: select an option

i. In the CDP Policy field, from the drop-down list, choose “FI_CDP”.

j. In the LLDP Policy field, from the drop-down list, choose “FI_LLDP”.

k. In the LACP policy field, from the drop-down list choose “LACP_Active” and click **Submit**.

l. In the Create VPC Interface Policy Group window click **Submit**.

m. In the Configure Interface, PC, and VPC dialog box, click **Save** and click **Save** again.

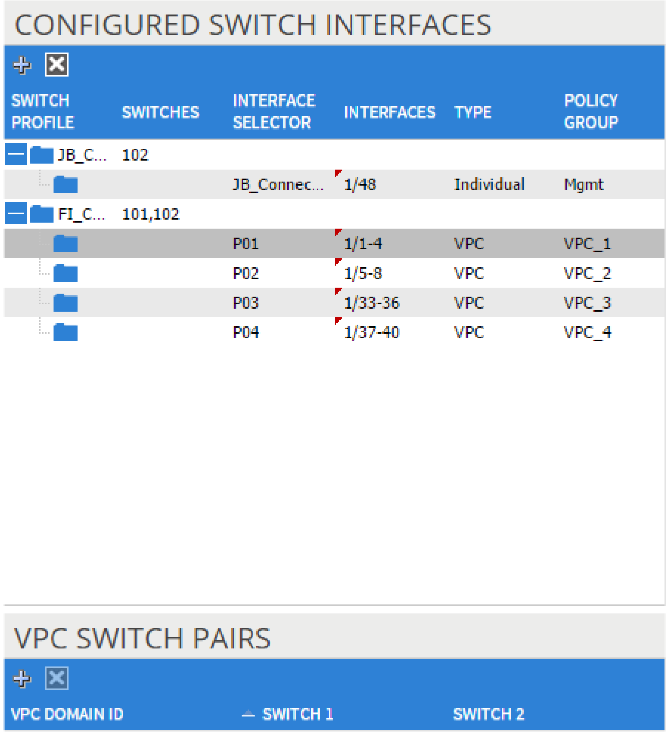
n. In the Configure Interface, PC, and VPC dialog box, click **Submit**.

o. Repeat step “C” to “M” to create VPC port for all the Fabric Interconnects connected to the ACI fabric. Once all the FI vPC port is configured, the configured switch interface window should look like fig below.

Configuring vPC Leaf Pairing

1. In the Configure Interface, PC, and VPC dialog box, click on the “+” on VPC DOMAIN ID.

Figure 44 Creating vPC Domain



CONFIGURED SWITCH INTERFACES

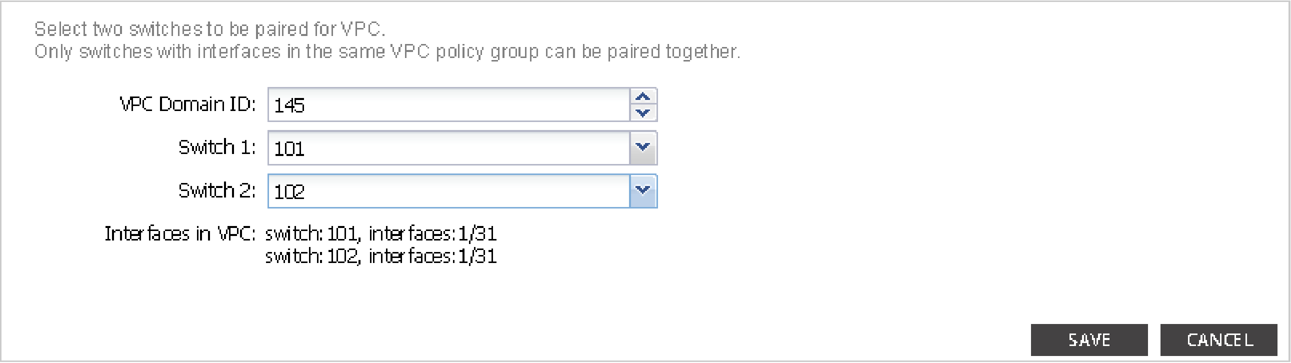
SWITCH PROFILE	SWITCHES	INTERFACE SELECTOR	INTERFACES	TYPE	POLICY GROUP
JB_C...	102				
		JB_Connec...	1/48	Individual	Mgmt
FI_C...	101,102				
		P01	1/1-4	VPC	VPC_1
		P02	1/5-8	VPC	VPC_2
		P03	1/33-36	VPC	VPC_3
		P04	1/37-40	VPC	VPC_4

VPC SWITCH PAIRS

VPC DOMAIN ID	SWITCH 1	SWITCH 2

2. In the VPC Domain ID field, enter “145”.
3. In the “Switch A” drop down box, select node “101”.
4. In the “Switch B” drop down box, select node “102” and click **Save** and **Submit**.

Figure 45 Creating vPC Peer



Select two switches to be paired for VPC.
Only switches with interfaces in the same VPC policy group can be paired together.

VPC Domain ID: 145

Switch 1: 101

Switch 2: 102

Interfaces in VPC: switch: 101, interfaces: 1/31
switch: 102, interfaces: 1/31

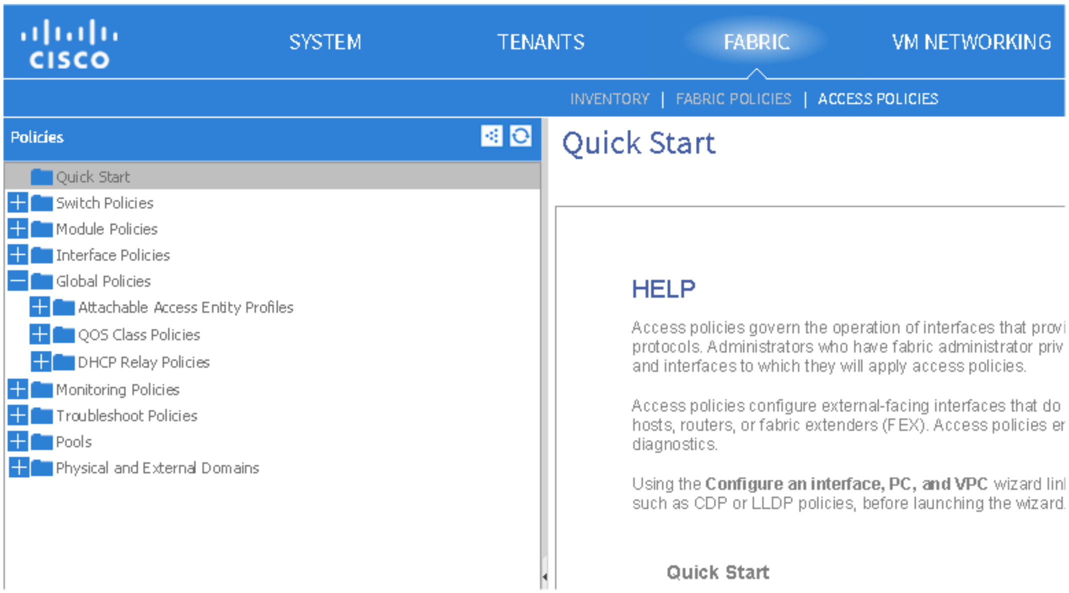
Note The vPC created here will not come up until the port-channel in Fabric Interconnect uplink ports is created.

Creating Attachable Entity Profile

1. On the menu bar, choose **FABRIC** > **Access Policies**. In the Work pane, expand Global Policies.

2. Select Attachable Access Entity Profile and right-click on it and select **Create Attachable Access Entity Profile**.

Figure 46 Fabric Window



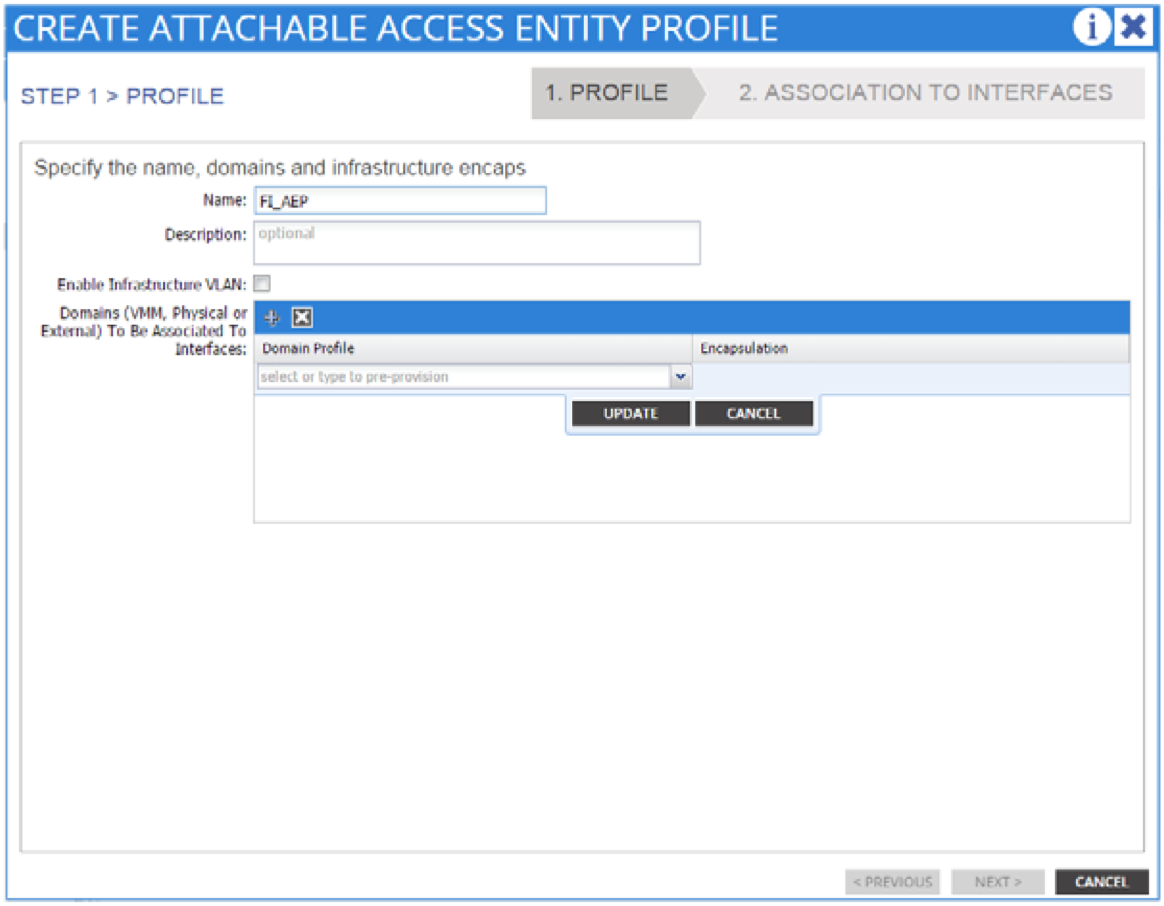
Access policies govern the operation of interfaces that provi
protocols. Administrators who have fabric administrator priv
and interfaces to which they will apply access policies.

Access policies configure external-facing interfaces that do
hosts, routers, or fabric extenders (FEX). Access policies er
diagnostics.

Using the **Configure an interface, PC, and VPC** wizard linl
such as CDP or LLDP policies, before launching the wizard.

3. Create Attachable Access Entity Profile window opens, in the name field enter FI_AEP and click + Domains (VMM, Physical Or External) To Be Associated To Interfaces.

Figure 47 Creating Attachable Access Entity Profile for vPC


CREATE ATTACHABLE ACCESS ENTITY PROFILE
STEP 1 > PROFILE
1. PROFILE
2. ASSOCIATION TO INTERFACES
UPDATE
CANCEL
< PREVIOUS
NEXT >
CANCEL

Specify the name, domains and infrastructure encaps

Name: FI_AEP

Description: optional

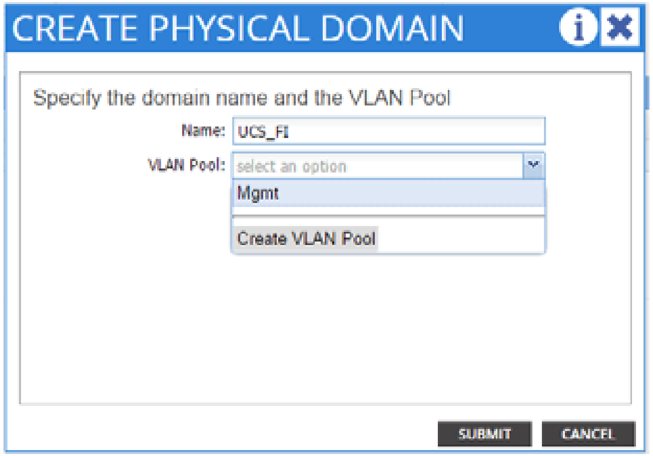
Enable Infrastructure VLAN: □

Domains (VMM, Physical or External) To Be Associated To Interfaces:

Domain Profile	Encapsulation
select or type to pre-provision	

4. In the Domain Profile field, from the drop-down list, choose **Create Physical Domain**.
5. In the Create Physical Domain dialog box, in the Name field, enter the name (UCS_FI).

Figure 48 Creating Physical Domain



Specify the domain name and the VLAN Pool

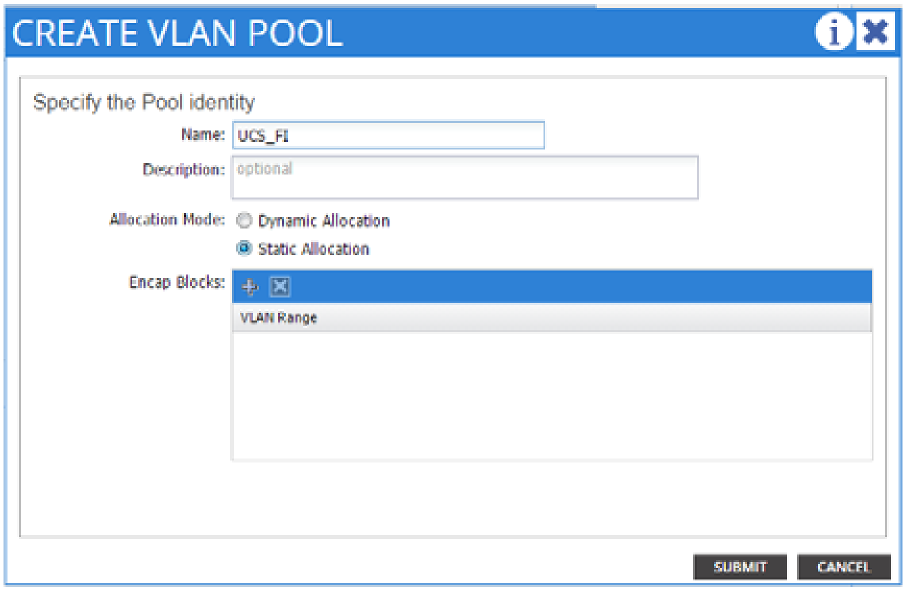
Name: UCS_FI

VLAN Pool: select an option

6. In the VLAN Pool field, from the drop-down list, choose **Create VLAN Pool**.
7. In the Create VLAN Pool dialog box, in the Name field, enter the pool name (UCS_FI).

8. In the Allocation Mode area, click the **Static Allocation** radio button.

Figure 49 Creating VLAN Pool



CREATE VLAN POOL

Specify the Pool identity

Name: UCS_FI

Description: optional

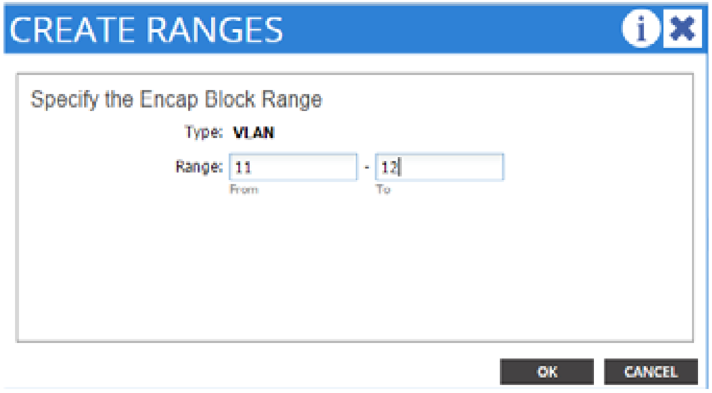
Allocation Mode: ○ Dynamic Allocation ● Static Allocation

Encap Blocks:

VLAN Range

9. Expand Encap Blocks. In the Create Ranges dialog box, in the Range fields, add a VLAN range (11-12) and click **OK**.

Figure 50 Assigning VLAN Range



CREATE RANGES

Specify the Encap Block Range

Type: VLAN

Range: 11 - 12

From To

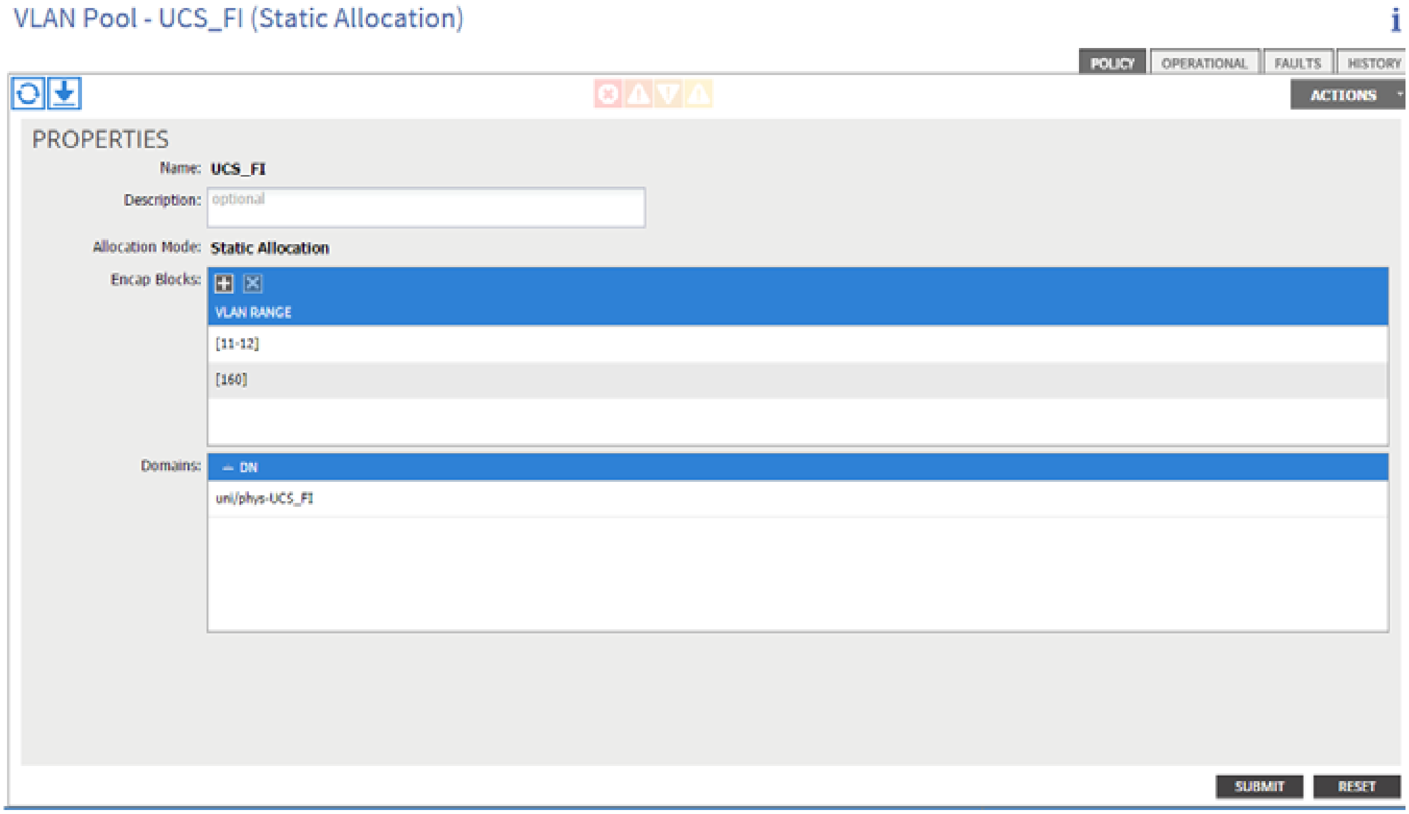
10. Repeat step 9 again to create VLAN 160.

VLAN Assignments are as follows:

- Vlan 160 for Management
- Vlan 11 for HDFS
- Vlan 12 for DATA

More detail is provided in the FI configuration section.

Figure 51 VLAN Pool



VLAN Pool - UCS_FI (Static Allocation)

PROPERTIES

Name: UCS_FI

Description: optional

Allocation Mode: Static Allocation

Encap Blocks:

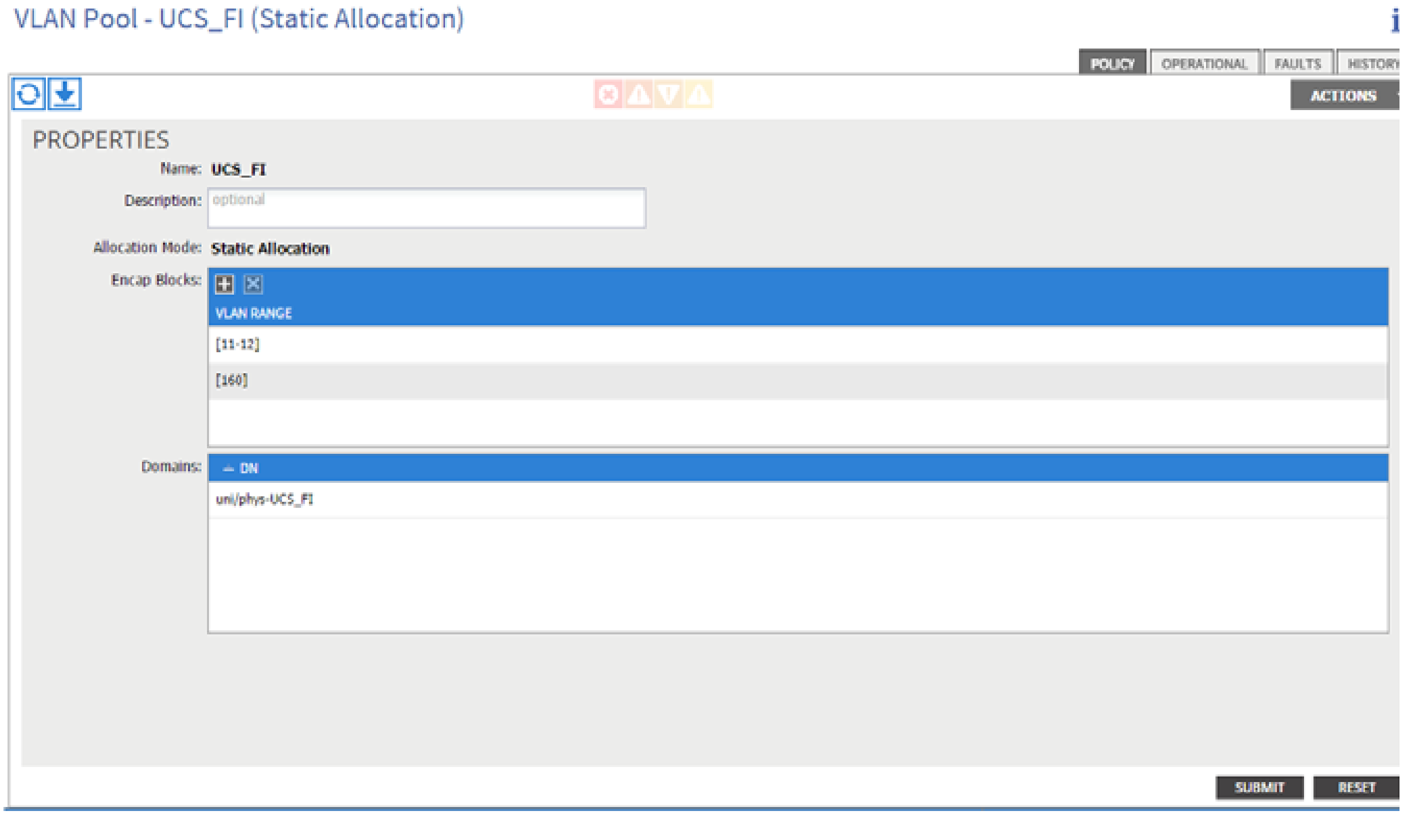
VLAN RANGE
[11-12]
[160]

Domains:

DN
uni/phys-UCS_FI

11. In the Create VLAN Pool dialog box, click **Submit**.
12. In the Create Physical Domain dialog box, click **Submit**.
13. In the Create Attachable Access Entity Profile dialog box, click **Update**.
14. Create Attachable Access Entity Profile window opens, in the name field enter FI_AEP and click "+" Domains (VMM, Physical Or External) To Be Associated To Interfaces.
15. In the Domain Profile field, from the drop-down list, choose **Create Layer 2 Domain**.
16. In the Create Layer 2 Domain dialog box, in the Name field, enter the name (FI).
17. From the VLAN Pool drop-down list choose "UCS_FI" and click **Submit**.

Figure 52 Creating Layer 2 Domain



VLAN Pool - UCS_FI (Static Allocation)

Name: UCS_FI

Description: optional

Allocation Mode: Static Allocation

Encap Blocks:

VLAN RANGE
[11-12]
[160]

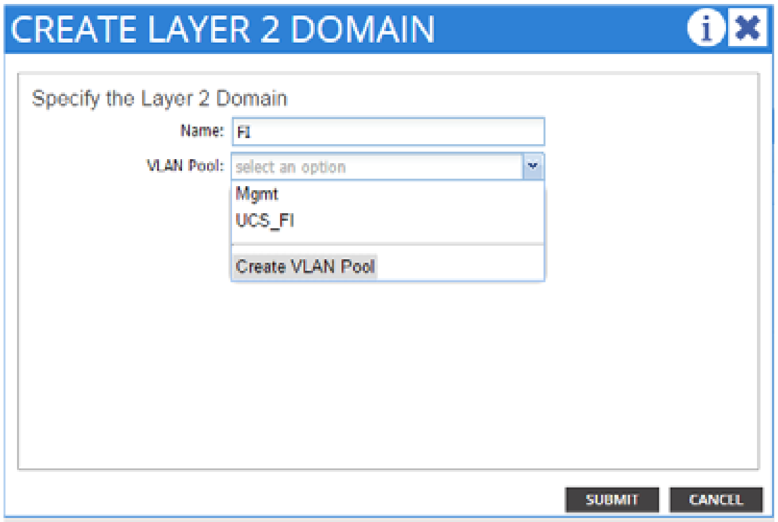
Domains:

DN
uni/phys-UCS_FI

18. In Create Attachable Access Entity Profile window click **Next**.

19. In each of the “Interface Policies” that was created for the vPC, select the radio button **All** and click **Finish**.

Figure 53 Associating the Interface to AEP



CREATE LAYER 2 DOMAIN

Specify the Layer 2 Domain

Name: FI

VLAN Pool: select an option

Creating Tenants, Private Network, and Bridge Domains

Tenants Overview

- A tenant contains policies that enable qualified users domain-based access control. Qualified users can access privileges such as tenant administration and networking administration.
- A user requires read/write privileges for accessing and configuring policies in a domain. A tenant user can have specific privileges into one or more domains.
- In a multi-tenancy environment, a tenant provides group user access privileges so that resources are isolated from one another (such as for endpoint groups and networking). These privileges also enable different users to manage different tenants.

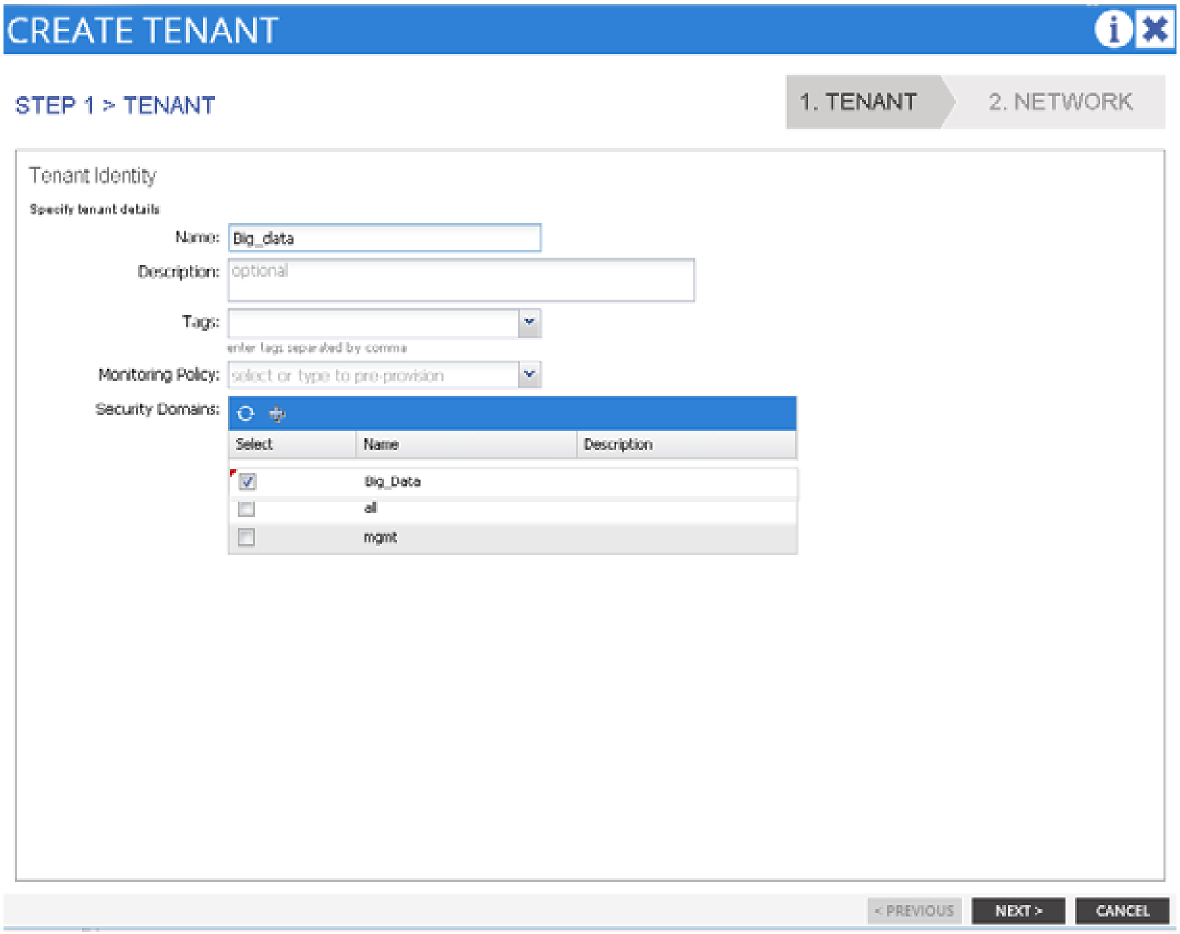
Creating a Tenant, Private Network, and Bridge Domain Using the GUI

Create and specify a network and a bridge domain for the tenant. The defined bridge domain element subnets reference a corresponding Layer 3 context.

1. On the menu bar, choose **TENANTS**, and perform the following actions:
   a. Click **Add Tenant**.
   b. The Create Tenant dialog box opens.
   c. In the Name field, add the tenant name (Big_Data), and click **Next**.
2. Create a security domain so that it allows only users in that security domain to have access.

   Click the + sign next to Security Domains to open the Create Security Domain dialog box, and perform the following actions:
   a. In the Name field, specify the security domain name. (Big_Data)
   b. Click **Submit**. In the Create Tenant dialog box, check the check box for the security domain that you created, and click **Next**.

Figure 54 Creating Tenant



CREATE TENANT

STEP 1 > TENANT

1. TENANT 2. NETWORK

Tenant Identity

Specify tenant details

Name: Big_data

Description: optional

Tags:

enter tags separated by comma

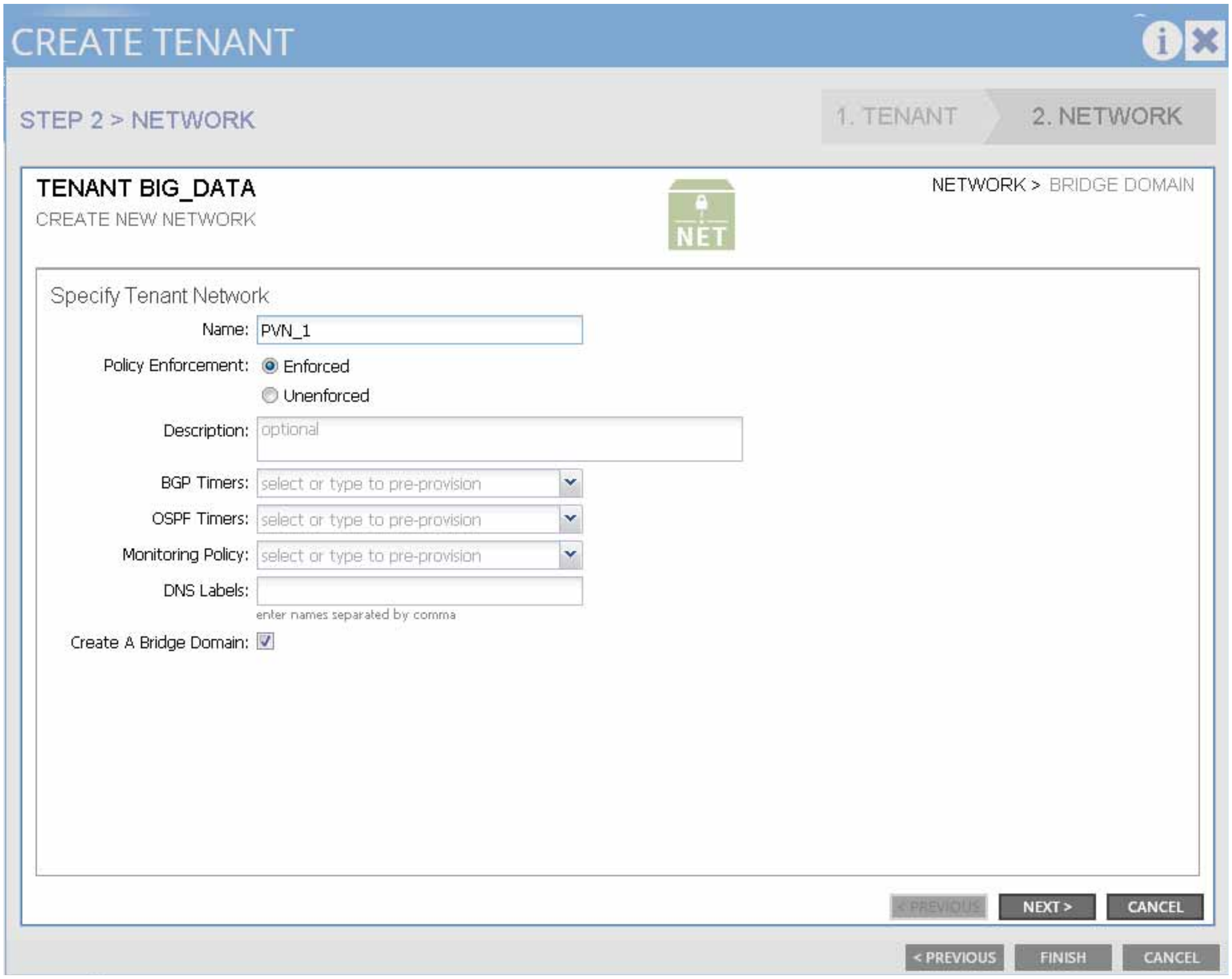
Monitoring Policy: select or type to pre-provision

Security Domains:

Select	Name	Description
☑	Big_Data	
□	all	
□	mgmt	

3. In the Network window, perform the following actions:
   a. Click the + sign to add the network.
   b. In the Create New Network area, specify the private tenant network name (PVN_1) and click **Next**.

Figure 55 Creating Tenant Network



Specify Tenant Network

Name: PVN_1

Policy Enforcement: ● Enforced ○ Unenforced

Description: optional

BGP Timers: select or type to pre-provision

OSPF Timers: select or type to pre-provision

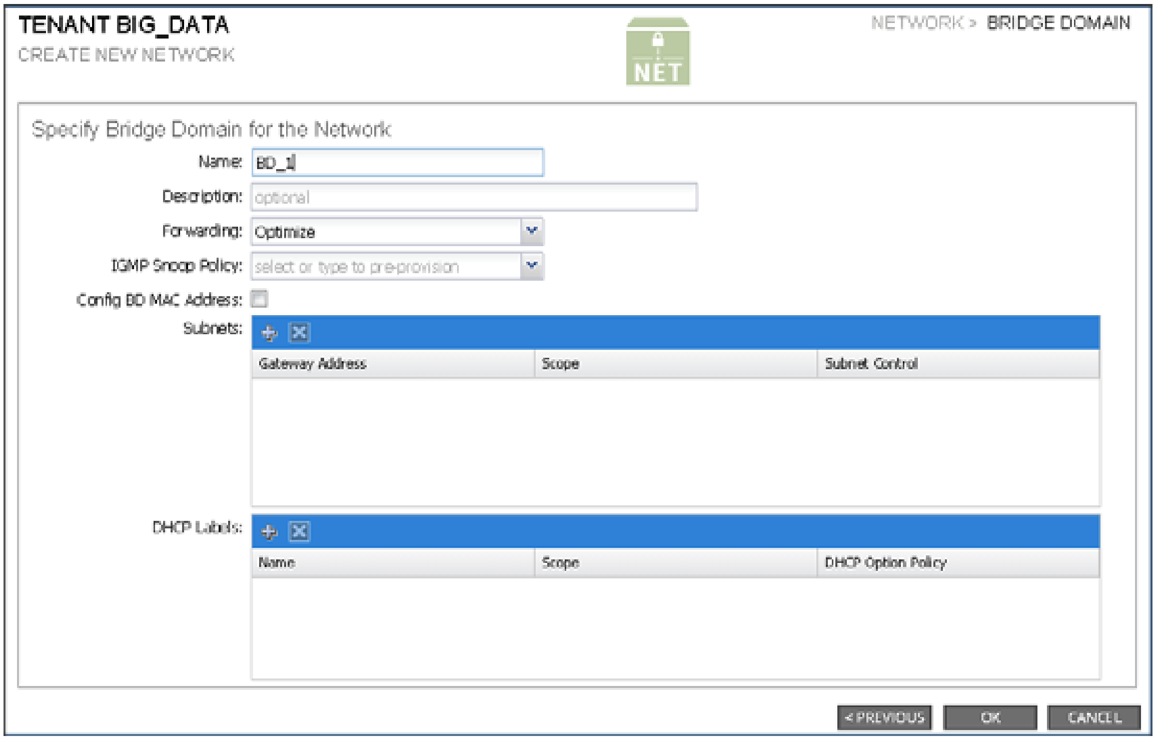
Monitoring Policy: select or type to pre-provision

DNS Labels:
enter names separated by comma

Create A Bridge Domain: ☑

4. Specify the bridge domain in the Name field (BD_1), click **OK**. Click **Next**, and perform the following actions:

Figure 56 Creating Bridge Domain



TENANT BIG_DATA

CREATE NEW NETWORK

NETWORK > BRIDGE DOMAIN

Specify Bridge Domain for the Network

Name: BD_1

Description: optional

Forwarding: Optimize

IGMP Snoop Policy: select or type to pre-provision

Config BD MAC Address: □

Subnets:

Gateway Address	Scope	Subnet Control

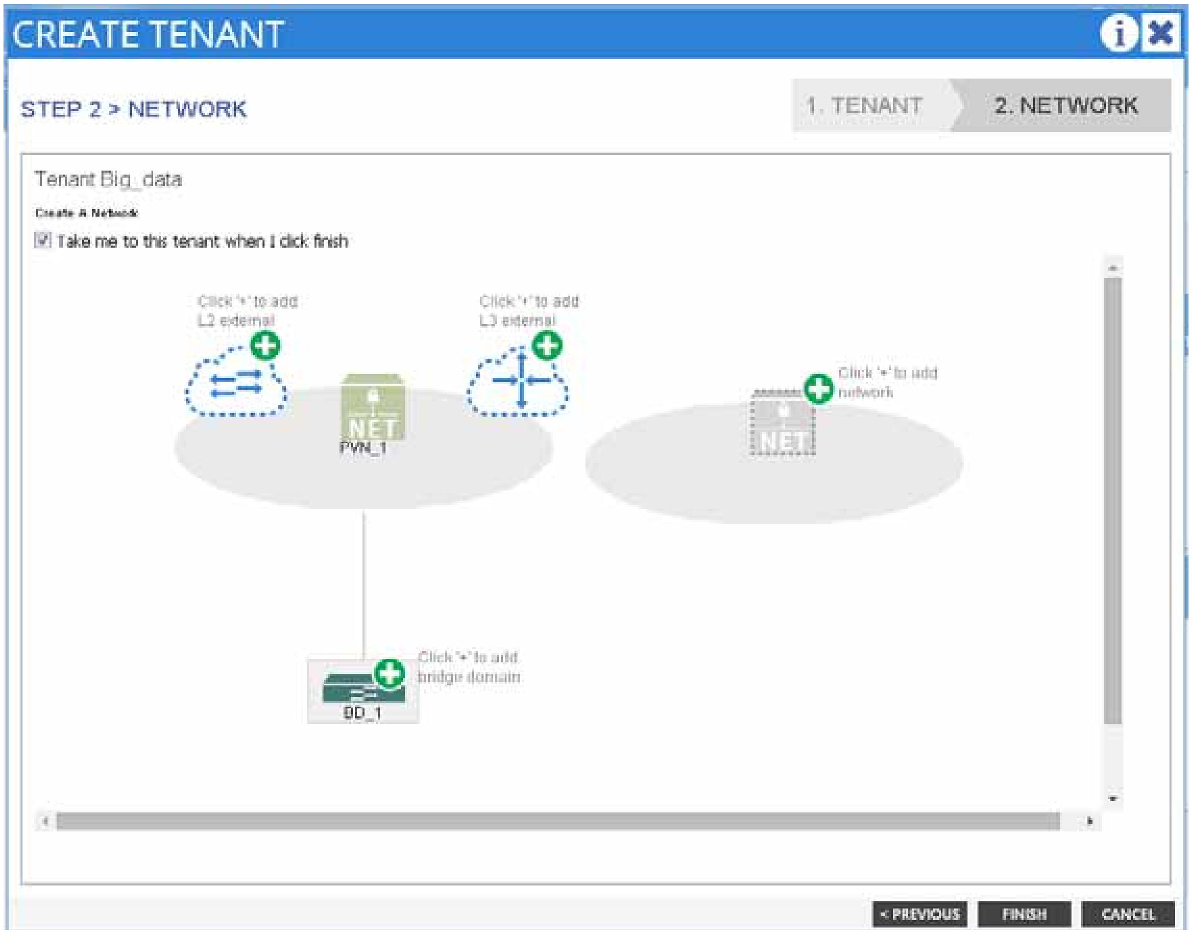
DHCP Labels:

Name	Scope	DHCP Option Policy

a. Confirm that the private network (PVN_1) is created and is associated with the bridge domain (BD_1).

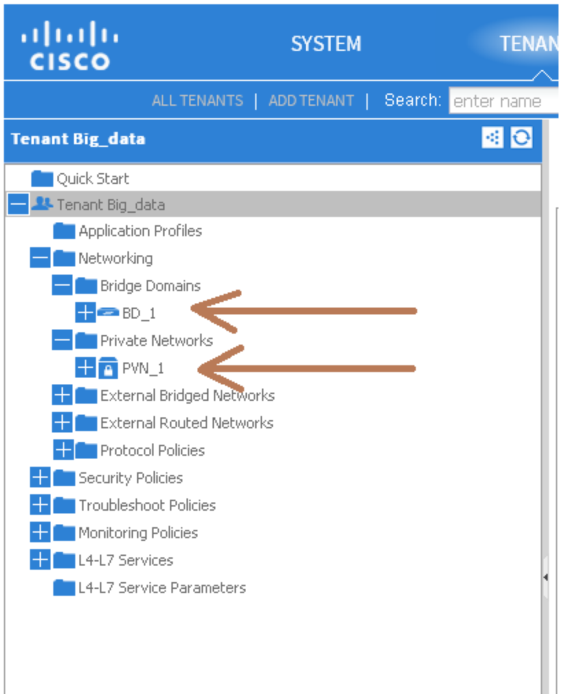
b. In the Application Profile window, click **Finish**.

Figure 57 Confirming the Association



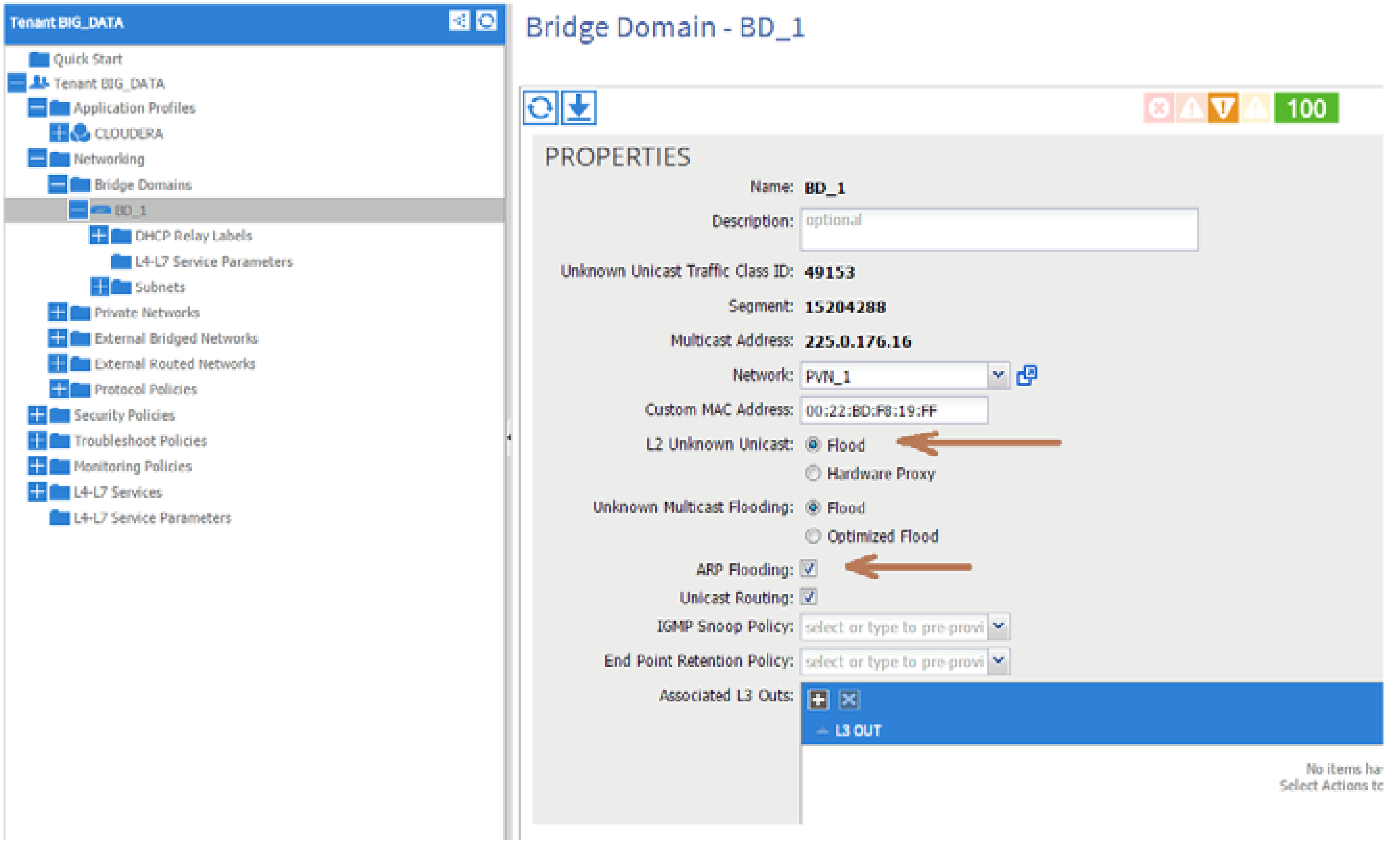
5. To validate that the tenant has a private network and bridge domain, in the submenu bar under the Tenants tab, click the new tenant name that was created earlier. In the Navigation pane, expand the tenant name. Under Bridge Domains, the new bridge domain is displayed. Under Private Networks, the new network is displayed.

Figure 58 Validating the Bridge Domain and Private Network



6. Select the bridge domain created earlier (BD_1) and check the L2 Unknown Unicast to Flood, and check the ARP Flooding checkbox and click **Submit**.

Figure 59 ARP Flooding



Bridge Domain - BD_1

PROPERTIES

Name: BD_1

Description: optional

Unknown Unicast Traffic Class ID: 49153

Segment: 15204288

Multicast Address: 225.0.176.16

Network: PVN_1

Custom MAC Address: 00:22:BD:F8:19:FF

L2 Unknown Unicast: ● Flood ○ Hardware Proxy

Unknown Multicast Flooding: ● Flood ○ Optimized Flood

ARP Flooding: ☑

Unicast Routing: ☑

IGMP Snoop Policy: select or type to pre-provi

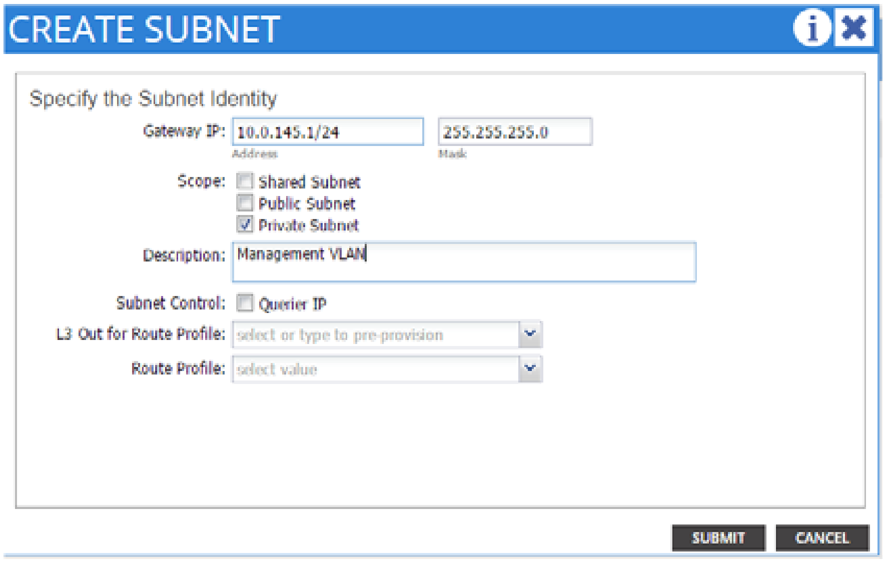
End Point Retention Policy: select or type to pre-provi

Associated L3 Outs:

7. Expand the Bridge Domain and BD_1, right-click on the Subnets and select **Create Subnet**.
8. In the Create Subnet dialogue box, enter the gateway IP 10.0.145.1/24 and click **Submit**.

   This IP address (10.0.145.1/24) is assigned to the bridge domain that typically is used as the switch virtual interface (SVI) in a traditional switch configuration.

Figure 60 Create Subnet



CREATE SUBNET

Specify the Subnet Identity

Gateway IP: 10.0.145.1/24 (Address) 255.255.255.0 (Mask)

Scope: □ Shared Subnet □ Public Subnet ☑ Private Subnet

Description: Management VLAN

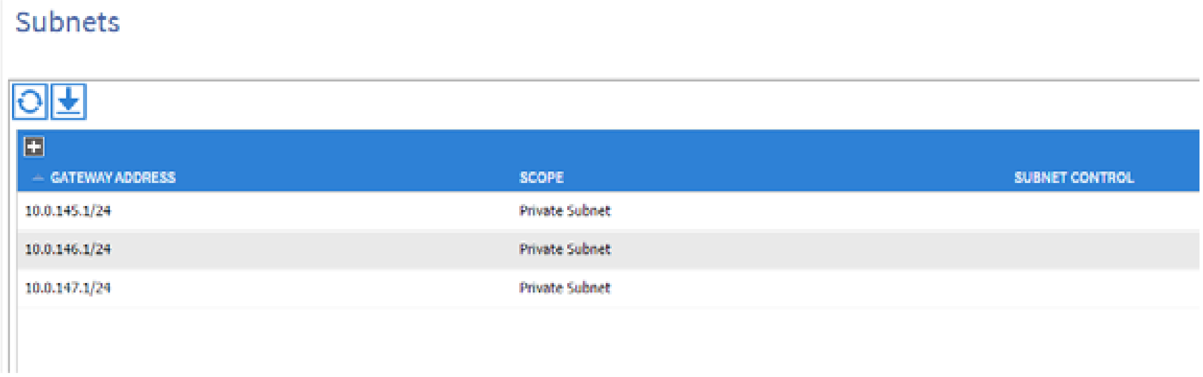
Subnet Control: □ Querier IP

L3 Out for Route Profile: select or type to pre-provision

Route Profile: select value

9. Repeat step 7 again to create two more subnets for other two VLANS.

Figure 61 Created Subnets



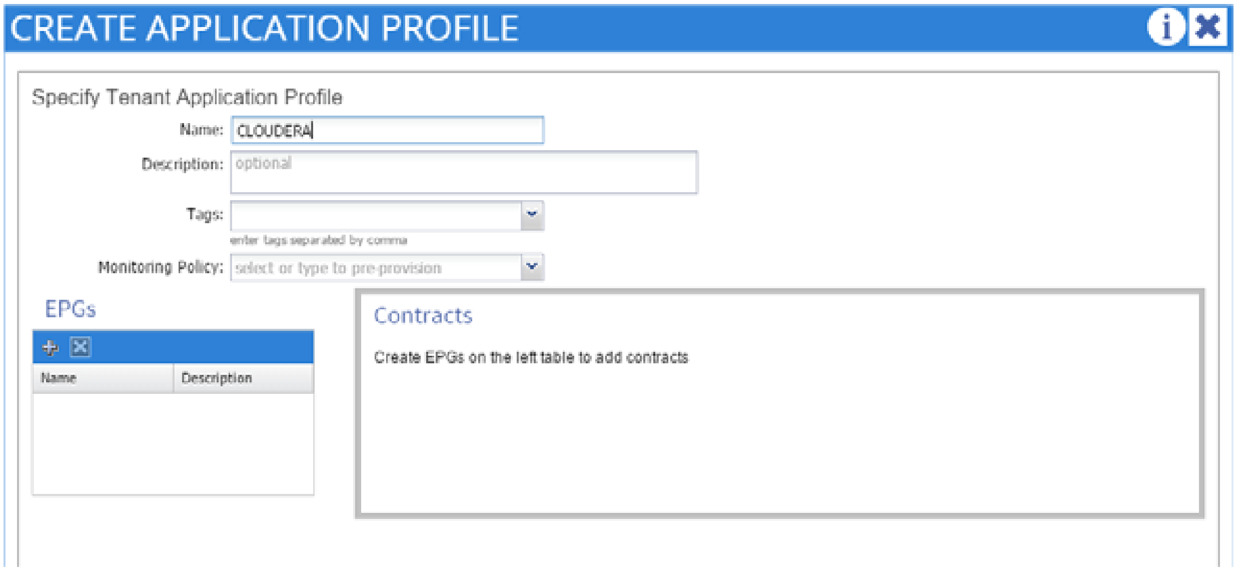
Subnets

GATEWAY ADDRESS	SCOPE	SUBNET CONTROL
10.0.145.1/24	Private Subnet	
10.0.146.1/24	Private Subnet	
10.0.147.1/24	Private Subnet	

Creating an Application Profile Using the GUI

1. On the menu bar, choose **TENANTS**. In the Navigation pane, expand the tenant, right-click Application Profiles, and click **Create Application Profile**.
2. In the Create Application Profile dialog box, in the Name field, add the application profile name (CLOUDERA).

Figure 62 Creating Application Profile



CREATE APPLICATION PROFILE

Specify Tenant Application Profile

Name: CLOUDERA

Description: optional

Tags:

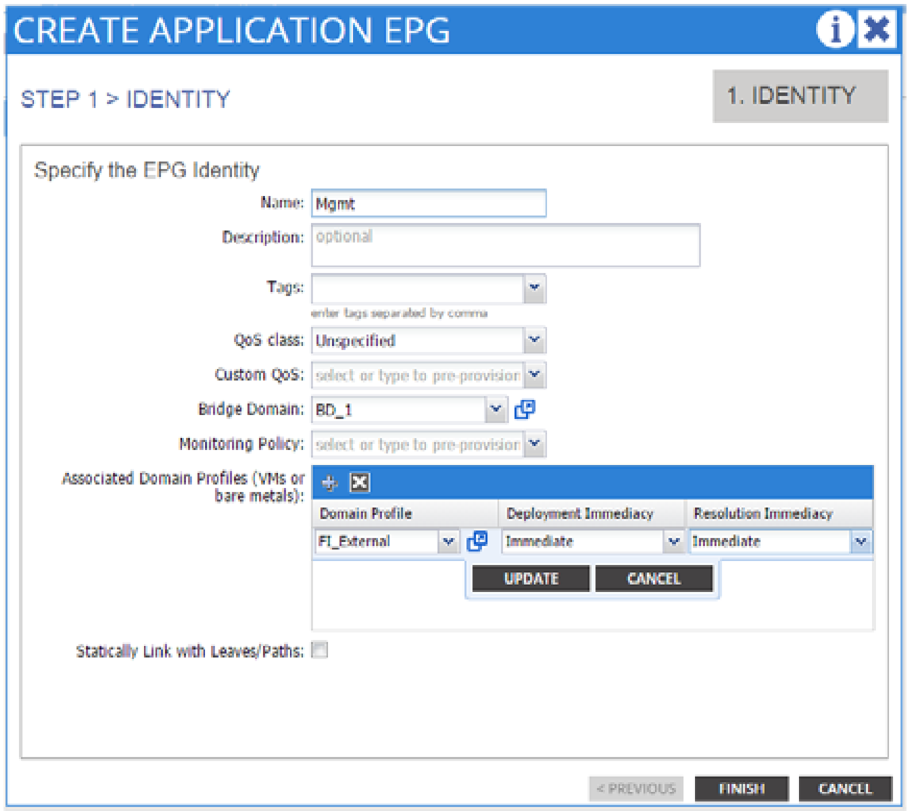
enter tags separated by comma

Monitoring Policy: select or type to pre-provision

Creating EPGs Using the GUI

1. Expand **Tenant BIG_DATA** > **Application Profiles** > **CLOUDERA**, right-click on the Application EPGs and select **Create Application EPG**. In the Create Application EPG dialog box, perform the following actions:
   a. In the **Name** field, add the EPG name (Mgmt).
   b. In the **Bridge Domain** field, choose the bridge domain from the drop-down list (BD_1).
   c. Expand **Associated Domain Profiles** and from the drop-down list, choose the Domain Profile name (Mgmt).
   d. From the Deployment Immediacy and Resolution Immediacy drop-down list select Immediate.
   e. Click **Update**, and click **Finish**.

Figure 63 Creating EPG



Specify the EPG Identity

Name: Mgmt

Description: optional

Tags:

enter tags separated by comma

QoS class: Unspecified

Custom QoS: select or type to pre-provision

Bridge Domain: BD_1

Monitoring Policy: select or type to pre-provision

Associated Domain Profiles (VMs or bare metals):

Domain Profile	Deployment Immediacy	Resolution Immediacy
FI_External	Immediate	Immediate

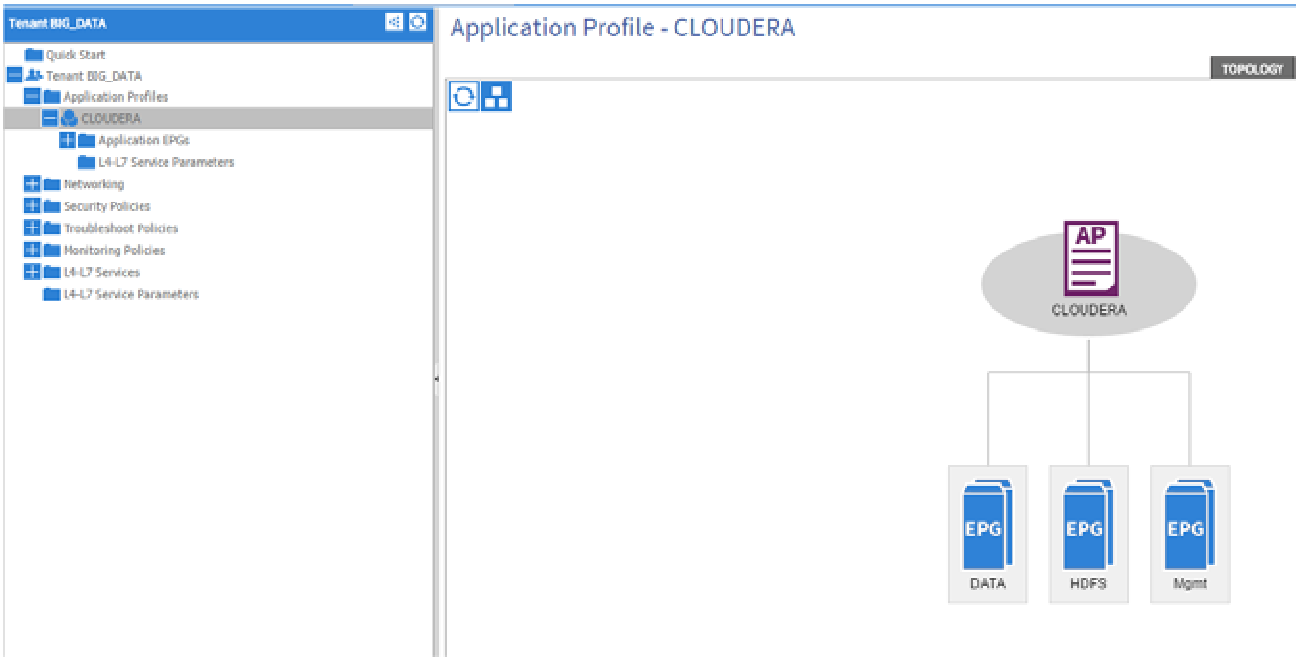
Statically Link with Leaves/Paths: □

2. Repeat step 1 to create two more EPGs named DATA and HDFS.

Note On Cloudera Security: When deploying Cloudera with Security only one VLAN on one vNIC is supported at the UCS Manager and UCS Server level. Under this scenario, there is no need to create EPGs DATA and HDFS at the ACI level. If already created, there is no problem. This could be left as is as from the downstream, only data from mgmt VLAN will be forwarded upstream.

3. Once all three EPGs are created, these EPGs are associated with the Application Profile CLOUDERA.

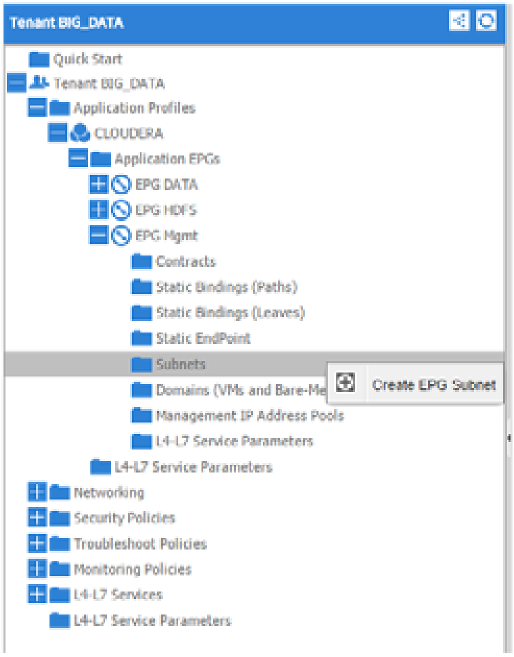
Figure 64 EPG Associated with Application Profile CLOUDERA



Configuring EPGs

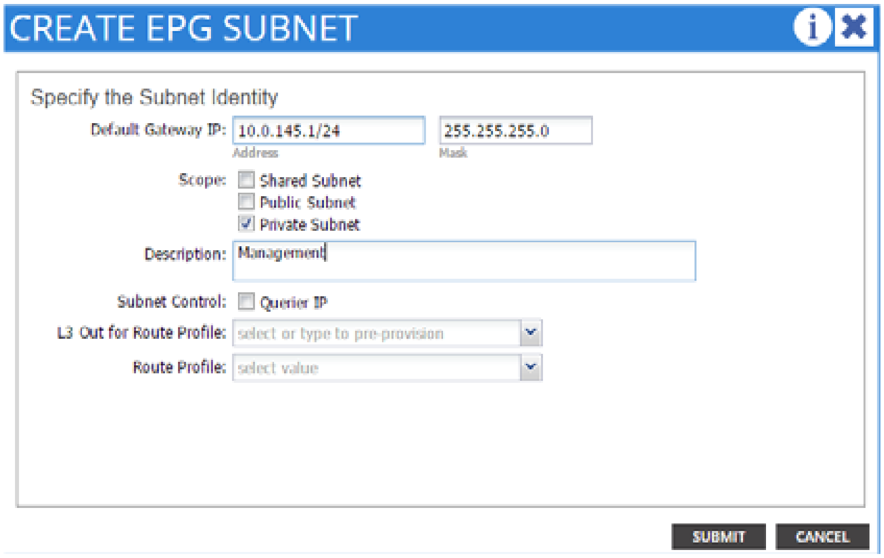
1. Expand **Tenant BIG_DATA** > **Application Profiles** > **CLOUDERA** > **Application EPGs** > **EPG Mgmt**.
2. Right-click the Subnets and select **Create EPG Subnet**.

Figure 65 Creating EPG Subnet



3. In the Create EPG Subnet dialogue box, enter the Default Gateway IP as 10.0.145.1/24 and click **Submit**.

Figure 66 Defining Subnet Address


CREATE EPG SUBNET

Specify the Subnet Identity

Default Gateway IP: 10.0.145.1/24 (Address) 255.255.255.0 (Mask)

Scope: □ Shared Subnet
□ Public Subnet
☑ Private Subnet

Description: Management

Subnet Control: □ Querier IP

L3 Out for Route Profile: select or type to pre-provision

Route Profile: select value

4. Similarly configure subnet for other EPGs with appropriate subnet address. For more detail, navigate to the IP Address Assignment section.

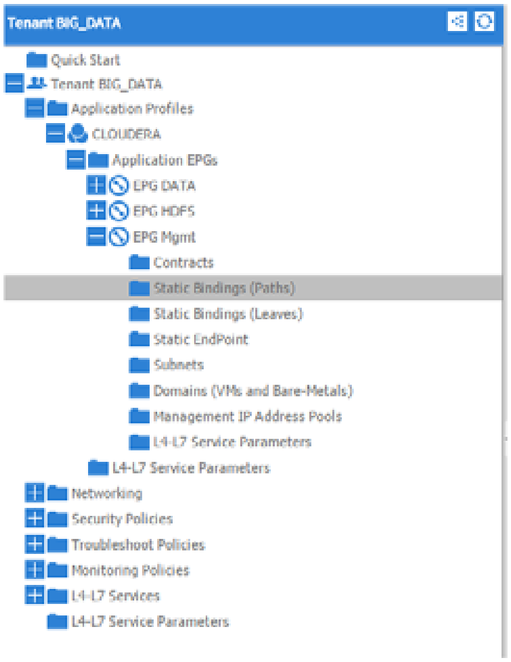
Creating the Static Binding for the Leaves and Paths

The static binding for the leaves are required to associate the physical interfaces with the EPGs.

No traffic flows unless an EPG is deployed on the port. Without VLAN pool deployment using an AEP, a VLAN is not enabled on the leaf port even if an EPG is provisioned. A particular VLAN is provisioned or enabled on the leaf port based on EPG events by statically binding on a leaf port.

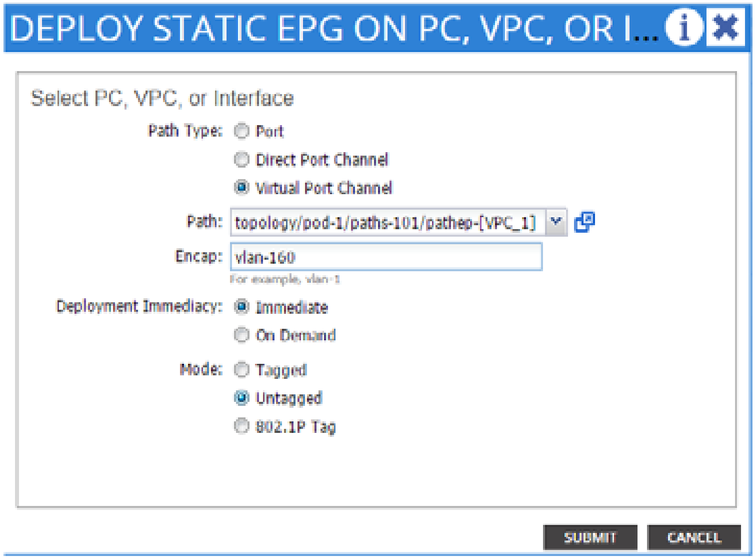
1. On the menu bar, choose TENANTS and the tenant name on which you want to operate. In the Navigation pane, expand the **Tenants** > **Application Profiles** > **CLOUDERA** > **Application EPGs** > **EPG Mgmt** and select **Static Bindings** (Paths).

Figure 67 Exploring EPG Mgmt



2. Right-click the Static Bindings (paths) and select **Deploy Static EPG on PC, VPC, or Interface**.
3. In the Path Type: select the **Virtual Port Channel** radio button.
4. From the Path: drop down list select the appropriate nodes and port where the FI’s are connected. On Encap field use vlan-160, on Depolyment Immediacy select the **Immediate** radio button and on Mode select the Untagged and click **Submit**.

Figure 68 Deploying Static EPG on vPC



DEPLOY STATIC EPG ON PC, VPC, OR I...

Select PC, VPC, or Interface

Path Type: ○ Port
○ Direct Port Channel
● Virtual Port Channel

Path: topology/pod-1/paths-101/pathep-[VPC_1]

Encap: vlan-160
For example, vlan-1

Deployment Immediacy: ● Immediate
○ On Demand

Mode: ○ Tagged
● Untagged
○ 802.1P Tag

5. Repeat step 2, 3 & 4 for all the vPC ports created.

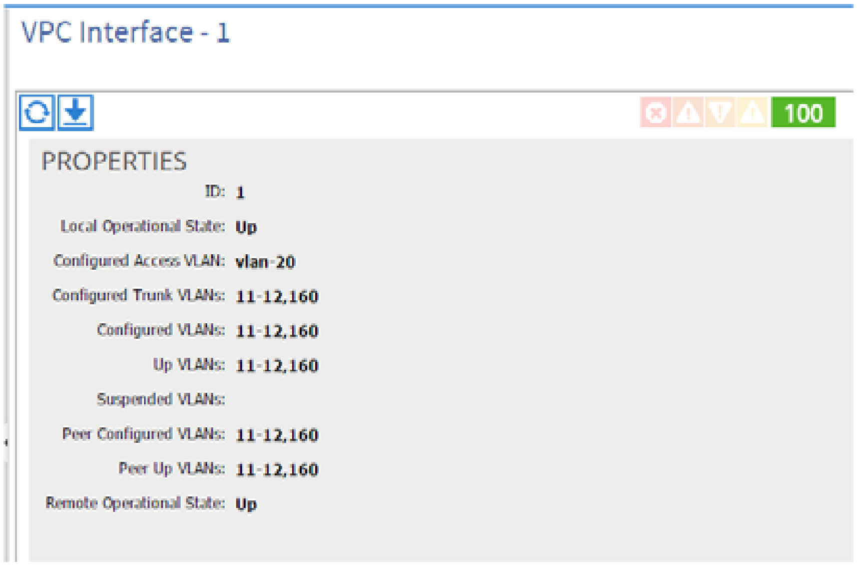
6. Similarly, statically bind the ports in other EPGs created using the appropriate VLAN numbers (12 for HDFS and 11 for DATA).

7. Once the Static binding for all the EPG is configured properly, verify that the VPC ports created earlier are trunking the appropriate VLANS. This can be verified by the following steps:

   a. On the menu bar, choose **FABRIC** > **Access Policies**.

   a. Expand **Pod 1** > **LEAF_1** (Node-101) > **Interfaces** > **VPC Interfaces** > **1** (This number might be different in different setups). Select any of the Interfaces to view the properties.

Figure 69 VPC Properties



VPC Interface - 1

PROPERTIES

ID: 1

Local Operational State: Up

Configured Access VLAN: vlan-20

Configured Trunk VLANs: 11-12,160

Configured VLANs: 11-12,160

Up VLANs: 11-12,160

Suspended VLANs:

Peer Configured VLANs: 11-12,160

Peer Up VLANs: 11-12,160

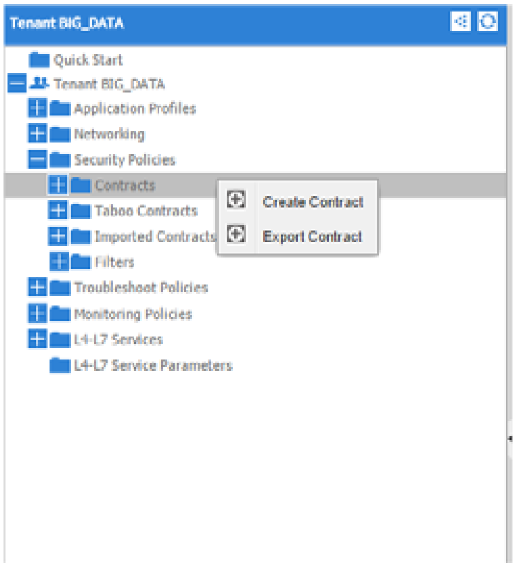
Remote Operational State: Up

Creating Contracts

Contracts are policies that enable inter-End Point Group (inter-EPG) communication. These policies are the rules that specify communication between application tiers. If no contract is attached to the EPG, inter-EPG communication is disabled by default. No contract is required for intra-EPG communication because intra-EPG communication is always allowed.

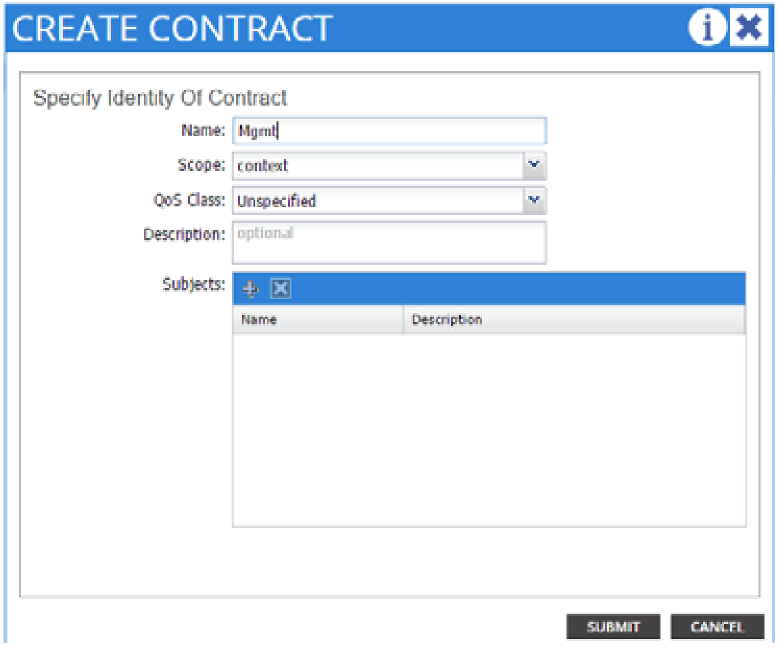
1. On the menu bar, choose **TENANTS** and the tenant name on which you want to operate. In the Navigation pane, expand the **Tenant** > **Security Policies**.
   a. Right-click **Contracts** > **Create Contract**.

Figure 70 Create Contract



b. In the Create Contract dialog box, In the Name field, enter the contract name (Mgmt) and click **Submit**.

Figure 71 Enter Contract Details



CREATE CONTRACT

Specify Identity Of Contract

Name: Mgmt

Scope: context

QoS Class: Unspecified

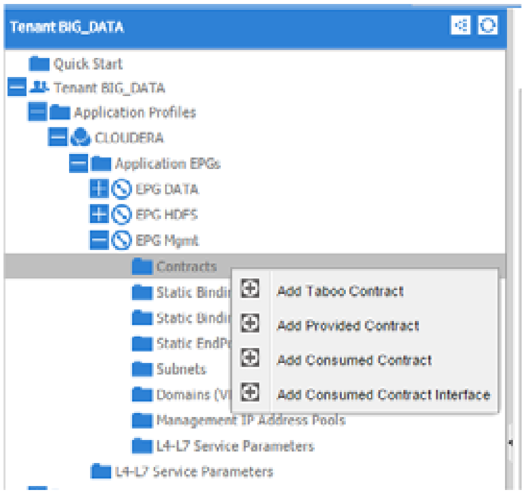
Description: optional

Subjects:

Name	Description

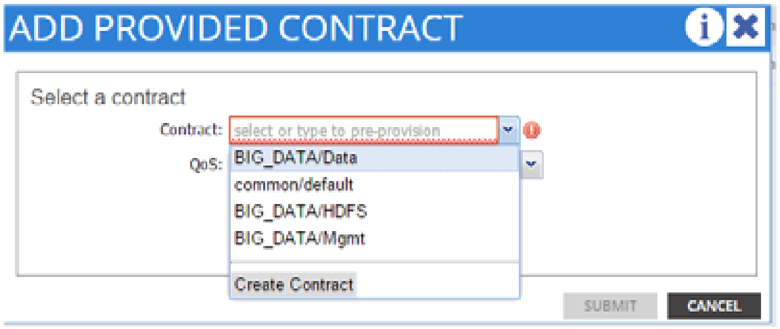
2. Create two more contracts for Data and for HDFS following the same steps in this procedure.
3. On the menu bar, choose TENANTS and the tenant name on which you want to operate. In the Navigation pane, expand the **Tenant** > **Application Profiles** > **CLOUDERA** > **Application EPGs** > **EPG Mgmt**.
4. Right-click the contract and select **Add Provided Contract**.

Figure 72 Add Provided Contract



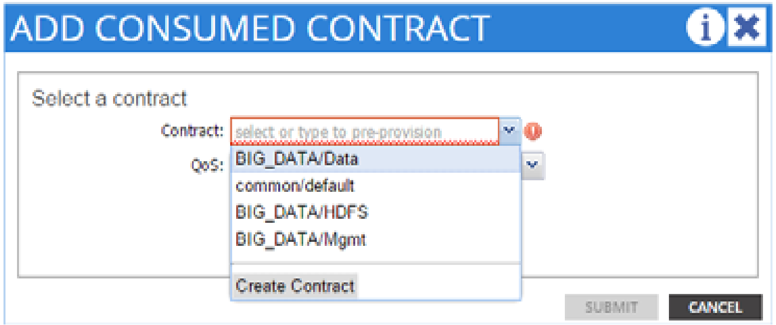
5. In the add provided contract dialogue box, from the contract drop-down list choose BIG_DATA/Mgmt and click **Submit**.

Figure 73 Select Contract for Provided Contract



6. Right-click the contract and select **Add Consumed Contract**.
7. In the add consumed contract dialogue box, from the contract drop-down list choose BIG_DATA/DATA and click Submit.
8. Right-click the contract and select **Add Consumed Contract**.
9. In the add consumed contract dialogue box, from the contract drop-down list choose BIG_DATA/HDFS and click **Submit**.

Figure 74 Select Contract for Consumed Contract



ADD CONSUMED CONTRACT

Select a contract

Contract: select or type to pre-provision

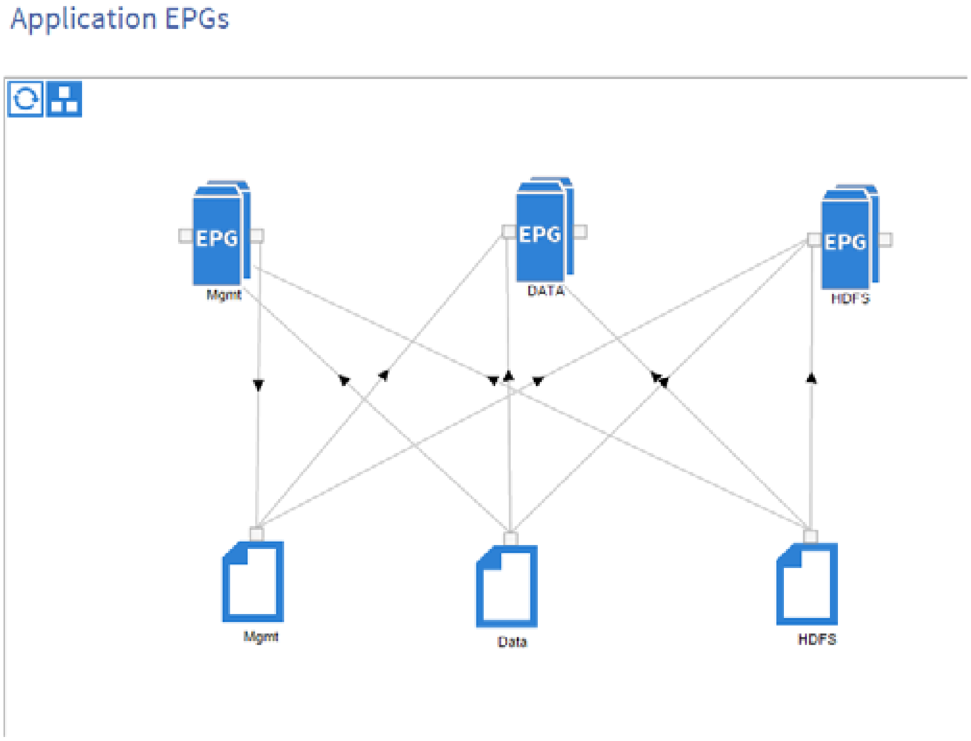
QoS:

10. For EPG DATA, add provided contract BIG_DATA/Data and consumed contract BIG_DATA/Mgmt and BIG_DATA/HDFS.

11. For EPG HDFS, add provided contract BIG_DATA/HDFS and consumed contract BIG_DATA/Mgmt and BIG_DATA/Data.

12. Once all the contract is configured, in the Navigation pane, expand the tenant **BIG_DATA** > **Application Profiles** > **CLOUDERA** and select **Application EPGs**, the window should appear as follows.

Figure 75 Application EPGs After all the Contracts are Configured



Application EPGs

This will complete the Network configuration with three EPGs for each VLANs, a Private Network and a Bridge Domain.

Fabric Configuration

This section provides details for configuring a fully redundant, highly available Cisco UCS 6296 fabric configuration.

1. Initial setup of the Fabric Interconnect A and B.
2. Connect to UCS Manager using virtual IP address of using the web browser.
3. Launch UCS Manager.
4. Enable server, uplink and appliance ports.
5. Start discovery process.
6. Create pools and polices for Service profile template.
7. Create Service Profile template and 64 Service profiles.
8. Associate Service Profiles to servers.

Performing Initial Setup of Cisco UCS 6296 Fabric Interconnects

This section describes the steps to perform initial setup of the Cisco UCS 6296 Fabric Interconnects A and B.

Configure Fabric Interconnect A

1. Connect to the console port on the first Cisco UCS 6296 Fabric Interconnect.
2. At the prompt to enter the configuration method, enter console to continue.
3. If asked to either perform a new setup or restore from backup, enter setup to continue.
4. Enter **y** to continue to set up a new Fabric Interconnect.
5. Enter **y** to enforce strong passwords.
6. Enter the password for the admin user.
7. Enter the same password again to confirm the password for the admin user.
8. When asked if this fabric interconnect is part of a cluster, answer y to continue.
9. Enter A for the switch fabric.
10. Enter the cluster name for the system name.
11. Enter the Mgmt0 IPv4 address.
12. Enter the Mgmt0 IPv4 netmask.
13. Enter the IPv4 address of the default gateway.
14. Enter the cluster IPv4 address.
15. To configure DNS, answer y.
16. Enter the DNS IPv4 address.
17. Answer **y** to set up the default domain name.
18. Enter the default domain name.
19. Review the settings that were printed to the console, and if they are correct, answer **yes** to save the configuration.
20. Wait for the login prompt to make sure the configuration has been saved.

Configure Fabric Interconnect B

1. Connect to the console port on the second Cisco UCS 6296 Fabric Interconnect.
2. When prompted to enter the configuration method, enter console to continue.
3. The installer detects the presence of the partner Fabric Interconnect and adds this fabric interconnect to the cluster. Enter y to continue the installation.
4. Enter the admin password that was configured for the first Fabric Interconnect.
5. Enter the Mgmt0 IPv4 address.
6. Answer **yes** to save the configuration.
7. Wait for the login prompt to confirm that the configuration has been saved.

For more information on configuring Cisco UCS 6200 Series Fabric Interconnect, see:

http://www.cisco.com/en/US/docs/unified_computing/ucs/sw/gui/config/guide/2.0/b_UCSM_GUI_Configuration_Guide_2_0_chapter_0100.html

Logging Into Cisco UCS Manager

Follow these steps to login to Cisco UCS Manager.

1. Open a web browser and navigate to the Cisco UCS 6296 Fabric Interconnect cluster address.
2. Click the **Launch** link to download the Cisco UCS Manager software.
3. If prompted to accept security certificates, accept as necessary.
4. When prompted, enter **admin** for the user-name and enter the administrative password.
5. Click **Login** to log in to the Cisco UCS Manager.

Upgrading Cisco UCS Manager Software to Version 2.2(3d)

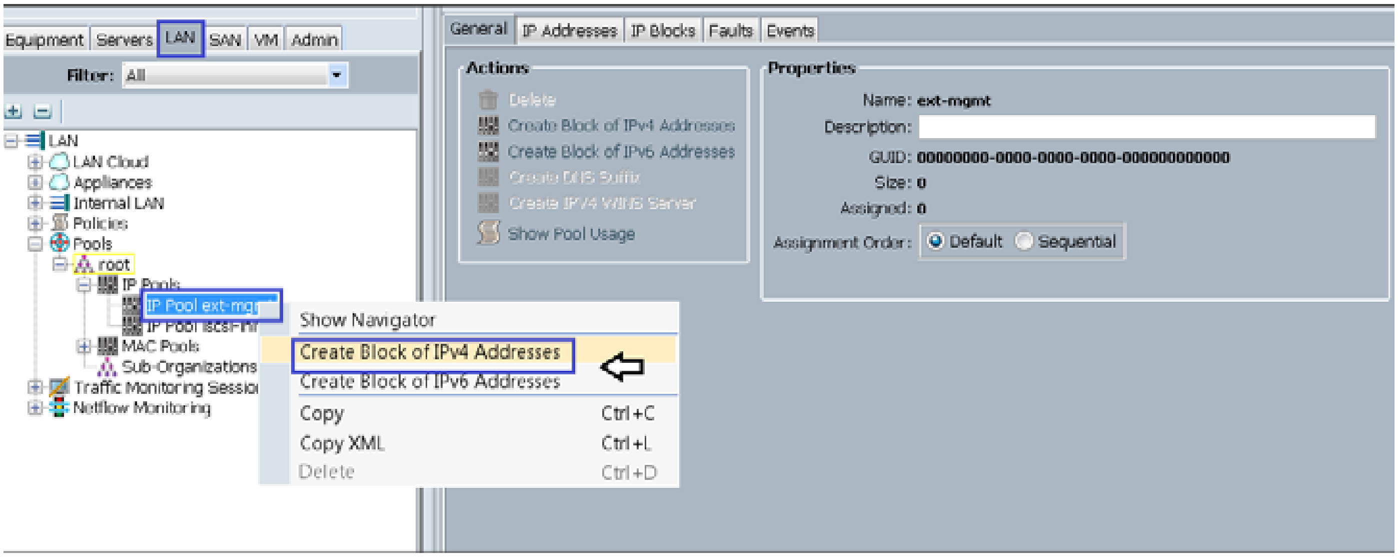
This document assumes the use of UCS 2.2(3d). Refer to Upgrading between Cisco UCS 2.0 Releases to upgrade the Cisco UCS Manager software and UCS 6296 Fabric Interconnect software to version 2.2(3d). Also, make sure the UCS C-Series version 2.2(3d) software bundles is installed on the Fabric Interconnects.

Adding Block of IP Addresses for KVM Access

These steps provide details for creating a block of KVM IP addresses for server access in the Cisco UCS environment.

1. Select the **LAN** tab at the top of the left window.
2. Select **Pools > IP Pools > IP Pool ext-mgmt**.
3. Right-click **IP Pool ext-mgmt**
4. Select **Create Block of IPv4 Addresses**.

Figure 76 Adding Block of IPv4 Addresses for KVM Access Part 1



Name: ext-mgmt

Description:

GUID: 00000000-0000-0000-0000-000000000000

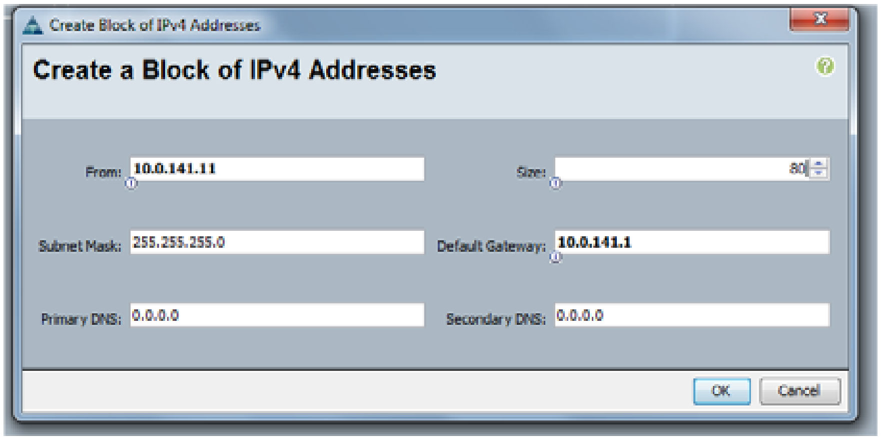
Size: 0

Assigned: 0

Assignment Order: ● Default ○ Sequential

5. Enter the starting IP address of the block and number of IPs needed, as well as the subnet and gateway information.

Figure 77 Adding Block of IPv4 Addresses for KVM Access Part 2



Create Block of IPv4 Addresses
Create a Block of IPv4 Addresses
OK
Cancel

From: 10.0.141.11

Size: 80

Subnet Mask: 255.255.255.0

Default Gateway: 10.0.141.1

Primary DNS: 0.0.0.0

Secondary DNS: 0.0.0.0

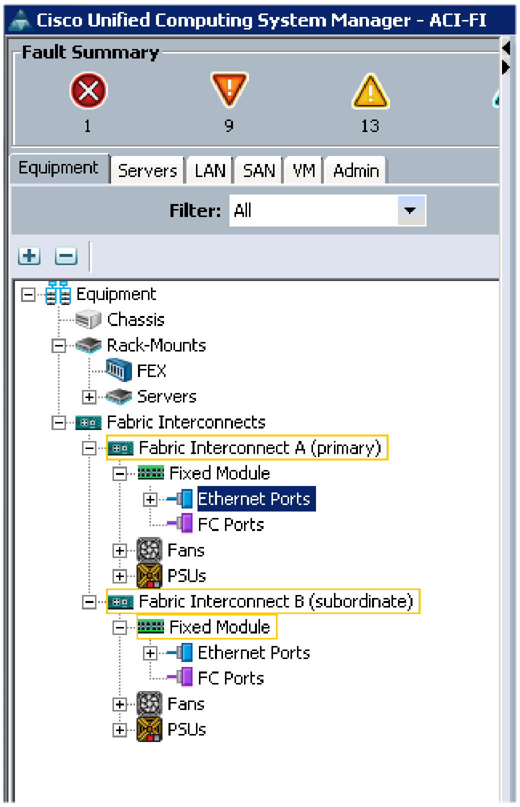
6. Click **OK** to create the IP block.
7. Click **OK** in the message box.

Enabling Uplink Port

These steps provide details for enabling uplinks ports.

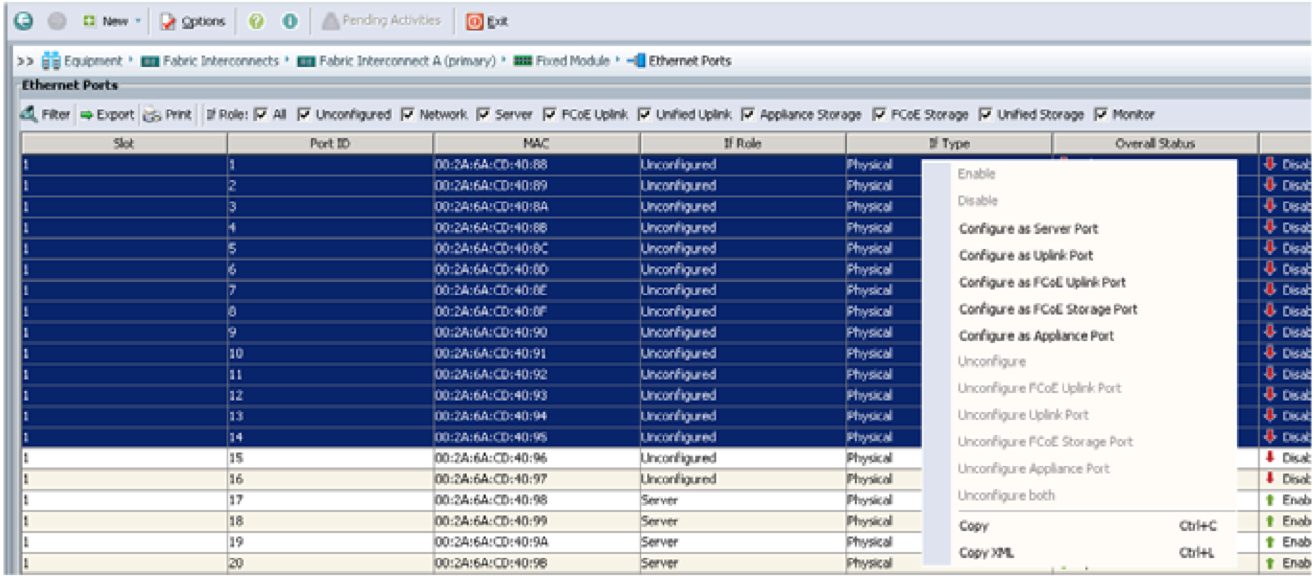
1. Select the **Equipment** tab on the top left of the window.
2. Select **Equipment > Fabric Interconnects > Fabric Interconnect A (primary) > Fixed Module > Ethernet Ports.**

Figure 78 Selecting Ethernet Ports



3. On the Right window select all the ports that are connected to the Nexus 9396 leaf switch (14 per FI), right-click them, and select **Configure as uplink Port**.

Figure 79 Enabling Uplink Ports


New
Options
Pending Activities
Exit
>> Equipment > Fabric Interconnects > Fabric Interconnect A (primary) > Fixed Module > Ethernet Ports
Ethernet Ports
Filter
Export
Print
If Role: ☑ All ☑ Unconfigured ☑ Network ☑ Server ☑ FCoE Uplink ☑ Unified Uplink ☑ Appliance Storage ☑ FCoE Storage ☑ Unified Storage ☑ Monitor
Enable
Disable
Configure as Server Port
Configure as Uplink Port
Configure as FCoE Uplink Port
Configure as FCoE Storage Port
Configure as Appliance Port
Unconfigure
Unconfigure FCoE Uplink Port
Unconfigure Uplink Port
Unconfigure FCoE Storage Port
Unconfigure Appliance Port
Unconfigure both
Copy Ctrl+C
Copy XML Ctrl+L

Slot	Port ID	MAC	If Role	If Type	Overall Status	
1	1	00:2A:6A:CD:40:88	Unconfigured	Physical		Disab
1	2	00:2A:6A:CD:40:89	Unconfigured	Physical		Disab
1	3	00:2A:6A:CD:40:8A	Unconfigured	Physical		Disab
1	4	00:2A:6A:CD:40:8B	Unconfigured	Physical		Disab
1	5	00:2A:6A:CD:40:8C	Unconfigured	Physical		Disab
1	6	00:2A:6A:CD:40:8D	Unconfigured	Physical		Disab
1	7	00:2A:6A:CD:40:8E	Unconfigured	Physical		Disab
1	8	00:2A:6A:CD:40:8F	Unconfigured	Physical		Disab
1	9	00:2A:6A:CD:40:90	Unconfigured	Physical		Disab
1	10	00:2A:6A:CD:40:91	Unconfigured	Physical		Disab
1	11	00:2A:6A:CD:40:92	Unconfigured	Physical		Disab
1	12	00:2A:6A:CD:40:93	Unconfigured	Physical		Disab
1	13	00:2A:6A:CD:40:94	Unconfigured	Physical		Disab
1	14	00:2A:6A:CD:40:95	Unconfigured	Physical		Disab
1	15	00:2A:6A:CD:40:96	Unconfigured	Physical		Disab
1	16	00:2A:6A:CD:40:97	Unconfigured	Physical		Disab
1	17	00:2A:6A:CD:40:98	Server	Physical		Enab
1	18	00:2A:6A:CD:40:99	Server	Physical		Enab
1	19	00:2A:6A:CD:40:9A	Server	Physical		Enab
1	20	00:2A:6A:CD:40:9B	Server	Physical		Enab

4. Select **Equipment** > **Fabric Interconnects** > **Fabric Interconnect B** (subordinate) > **Fixed Module**.

5. Expand the UnConfigured Ethernet Ports section.
6. Select all the ports that are connected to the Nexus 9396 leaf switch (14 per FI), right-click them, and select **Configure as uplink Port**.

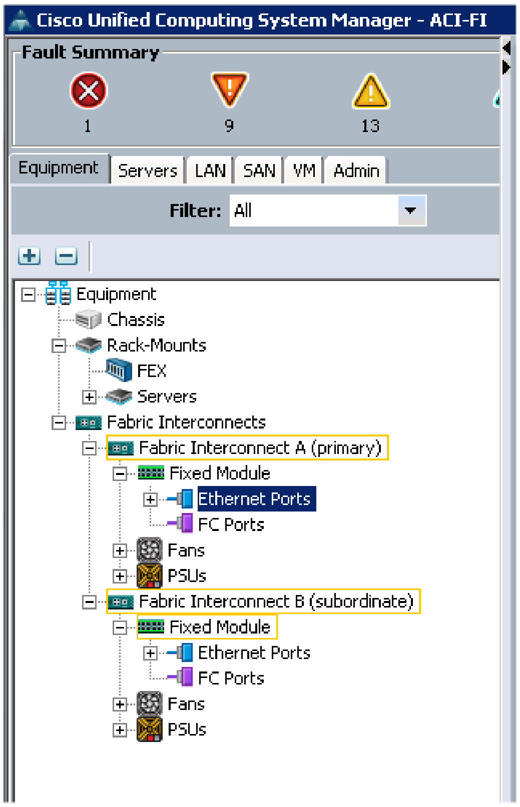
Note The ports that are configured as uplink port should appear as Network under IF role.

Enabling Server Ports

These steps provide details for enabling server ports.

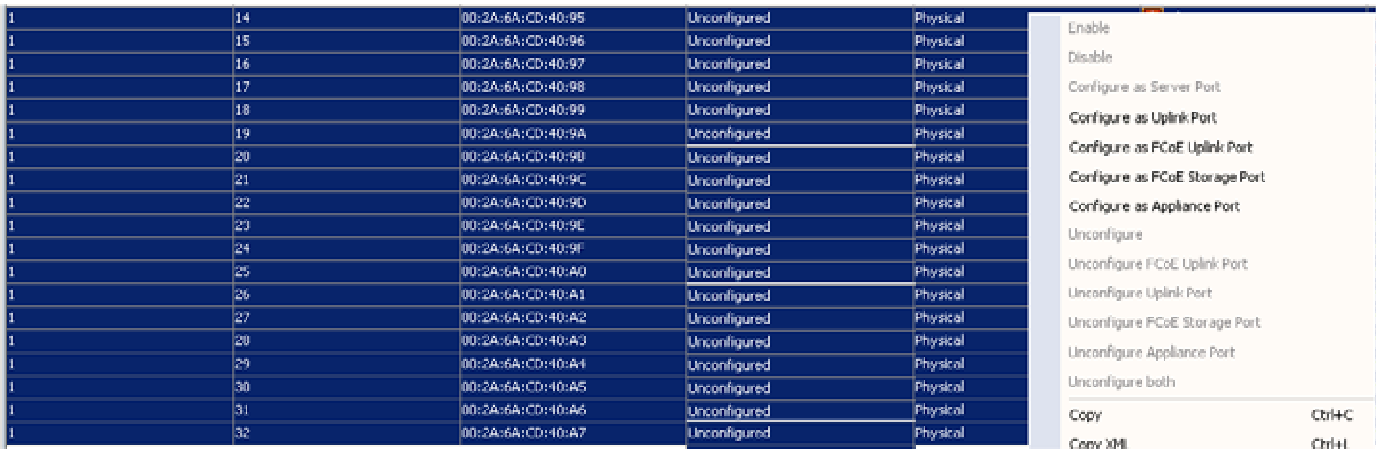
7. Select the **Equipment** tab on the top left of the window.
8. Select **Equipment > Fabric Interconnects > Fabric Interconnect A (primary) > Fixed Module > Ethernet Ports**.

Figure 80 Select Ethernet Ports



9. On the Right window select all the ports that are connected to the UCS C240 server (1 per Server), right-click them, and select **Configure as Server Port**.

Figure 81 Showing Servers Ports



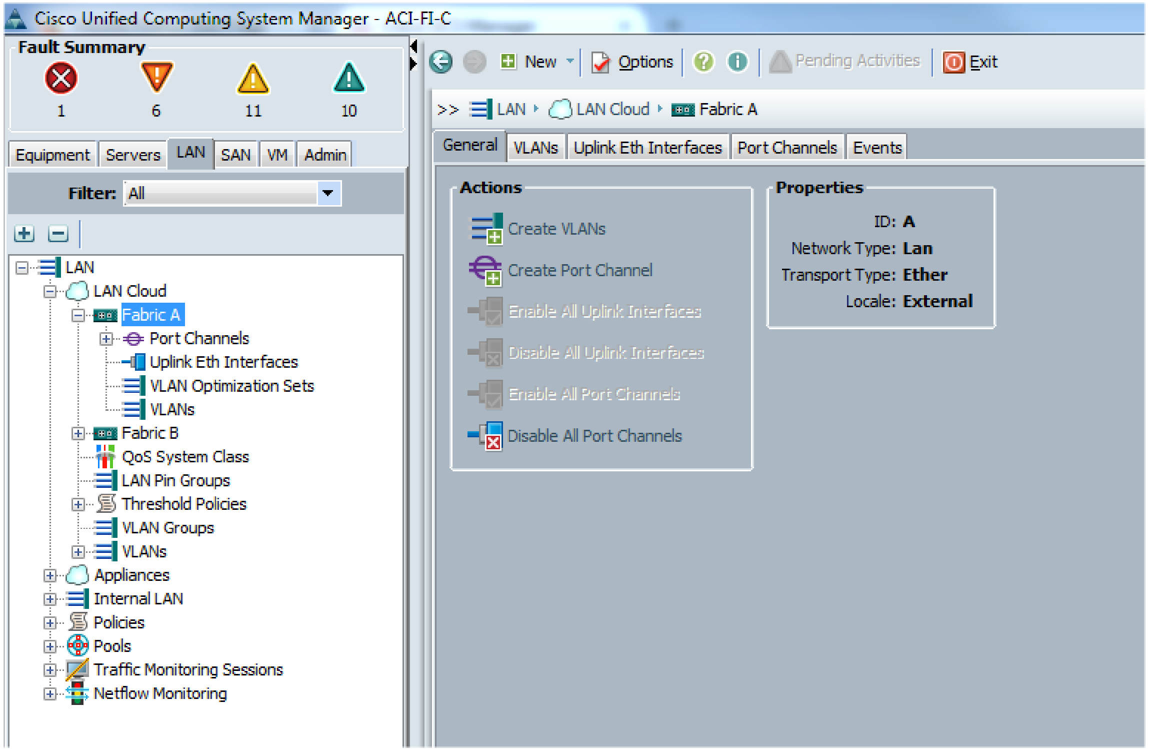
1	14	00:2A:6A:CD:40:95	Unconfigured	Physical
1	15	00:2A:6A:CD:40:96	Unconfigured	Physical
1	16	00:2A:6A:CD:40:97	Unconfigured	Physical
1	17	00:2A:6A:CD:40:98	Unconfigured	Physical
1	18	00:2A:6A:CD:40:99	Unconfigured	Physical
1	19	00:2A:6A:CD:40:9A	Unconfigured	Physical
1	20	00:2A:6A:CD:40:9B	Unconfigured	Physical
1	21	00:2A:6A:CD:40:9C	Unconfigured	Physical
1	22	00:2A:6A:CD:40:9D	Unconfigured	Physical
1	23	00:2A:6A:CD:40:9E	Unconfigured	Physical
1	24	00:2A:6A:CD:40:9F	Unconfigured	Physical
1	25	00:2A:6A:CD:40:A0	Unconfigured	Physical
1	26	00:2A:6A:CD:40:A1	Unconfigured	Physical
1	27	00:2A:6A:CD:40:A2	Unconfigured	Physical
1	28	00:2A:6A:CD:40:A3	Unconfigured	Physical
1	29	00:2A:6A:CD:40:A4	Unconfigured	Physical
1	30	00:2A:6A:CD:40:A5	Unconfigured	Physical
1	31	00:2A:6A:CD:40:A6	Unconfigured	Physical
1	32	00:2A:6A:CD:40:A7	Unconfigured	Physical

Enable
Disable
Configure as Server Port
Configure as Uplink Port
Configure as FCoE Uplink Port
Configure as FCoE Storage Port
Configure as Appliance Port
Unconfigure
Unconfigure FCoE Uplink Port
Unconfigure Uplink Port
Unconfigure FCoE Storage Port
Unconfigure Appliance Port
Unconfigure both
Copy Ctrl+C
Copy XML Ctrl+L

Configuring Port-Channels

1. Click the **LAN** tab on top left window.
2. Expand the **LAN Cloud** > **Fabric A**.
3. On the right window select Create Port Channel.

Figure 82 Creating Port Channel



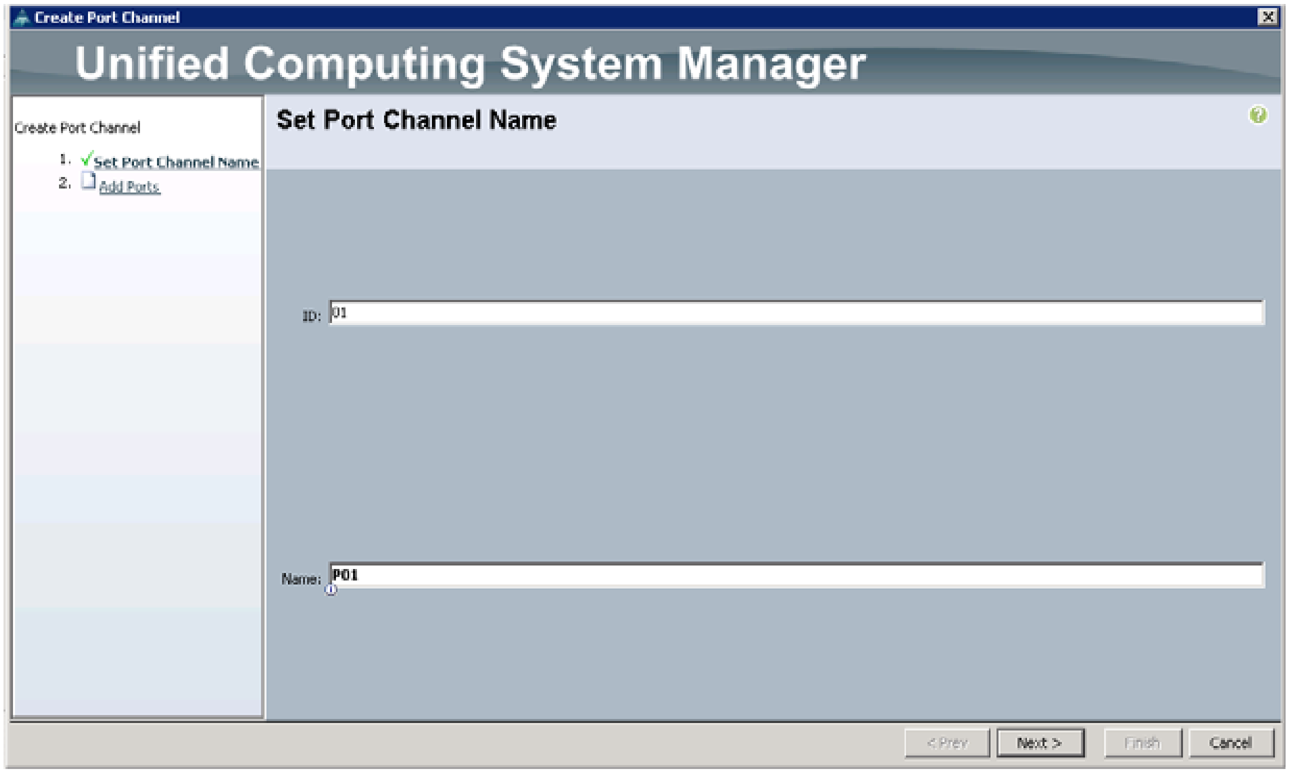
ID: **A**
Network Type: **Lan**
Transport Type: **Ether**
Locale: **External**

4. On Set Port Channel Name window, perform the following actions:

a. In the ID field, specify the ID “01” as the first port channel

b. In Name field, type P01 as Port-channel01 and click **Next**.

Figure 83 Setting Port-Channel ID and Name



Create Port Channel

Unified Computing System Manager

Create Port Channel

1. ✓ Set Port Channel Name
2. Add Ports

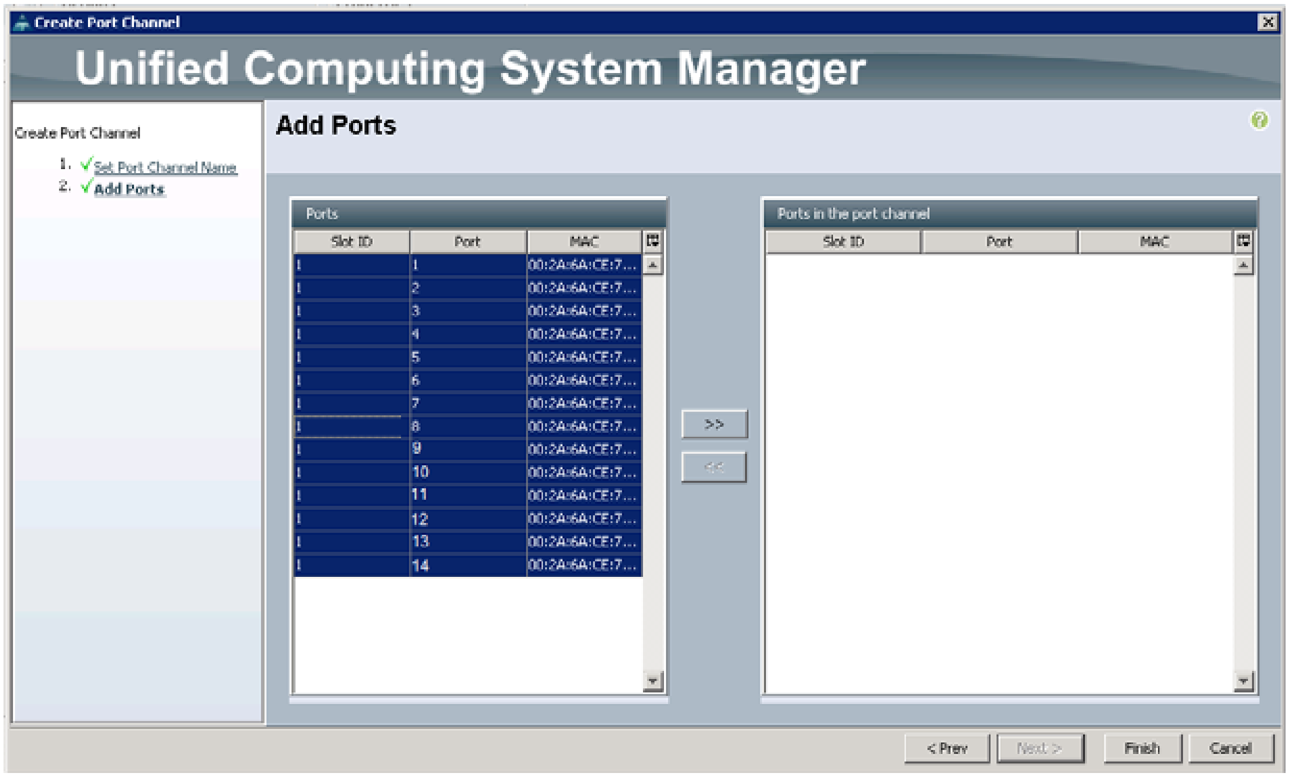
Set Port Channel Name

ID: 01

Name: P01

5. In Add Ports window select all the ports that is connected to the Nexus 9396 Leaf Switch and click >>. This will add all the ports in the port channel created earlier.

Figure 84 Adding Ports to the Port Channel



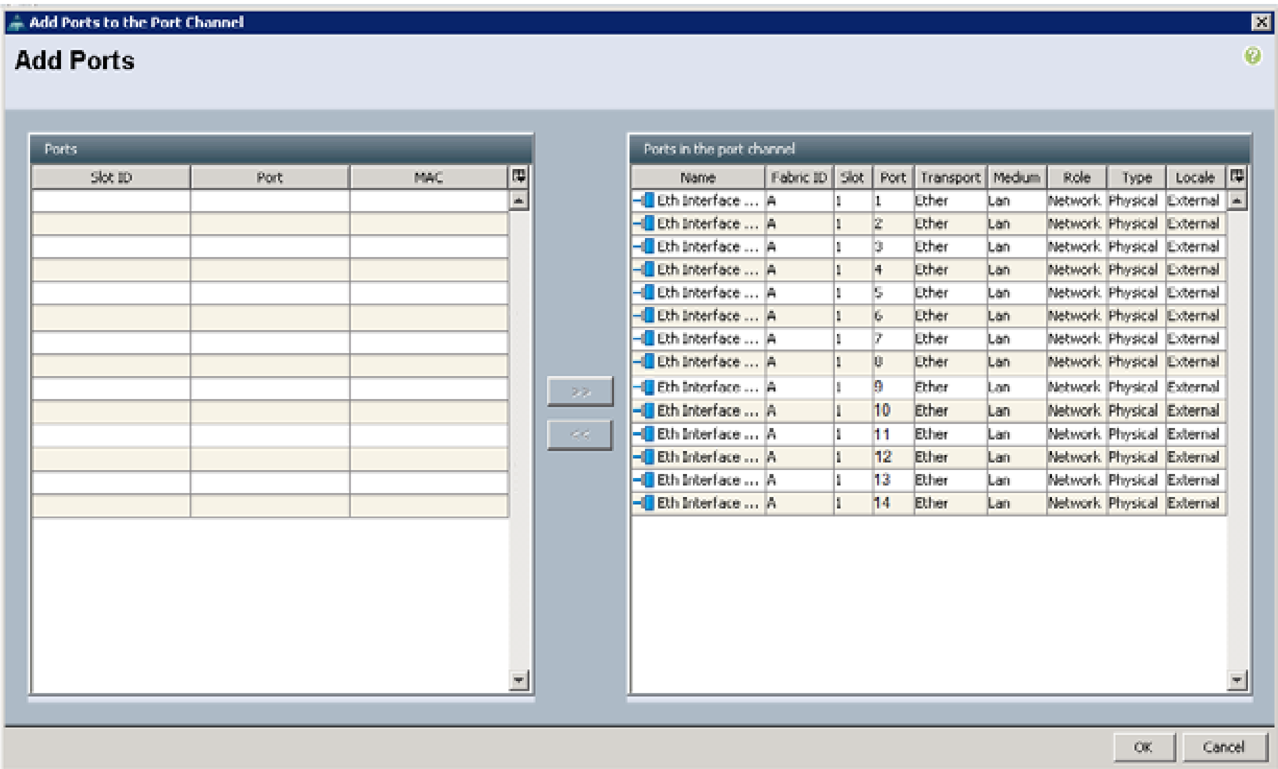
Ports

Slot ID	Port	MAC
1	1	00:2A:6A:CE:7...
1	2	00:2A:6A:CE:7...
1	3	00:2A:6A:CE:7...
1	4	00:2A:6A:CE:7...
1	5	00:2A:6A:CE:7...
1	6	00:2A:6A:CE:7...
1	7	00:2A:6A:CE:7...
1	8	00:2A:6A:CE:7...
1	9	00:2A:6A:CE:7...
1	10	00:2A:6A:CE:7...
1	11	00:2A:6A:CE:7...
1	12	00:2A:6A:CE:7...
1	13	00:2A:6A:CE:7...
1	14	00:2A:6A:CE:7...

Ports in the port channel

Slot ID	Port	MAC

Figure 85 Added Ports to the Port Channel



Add Ports to the Port Channel

Add Ports

Ports

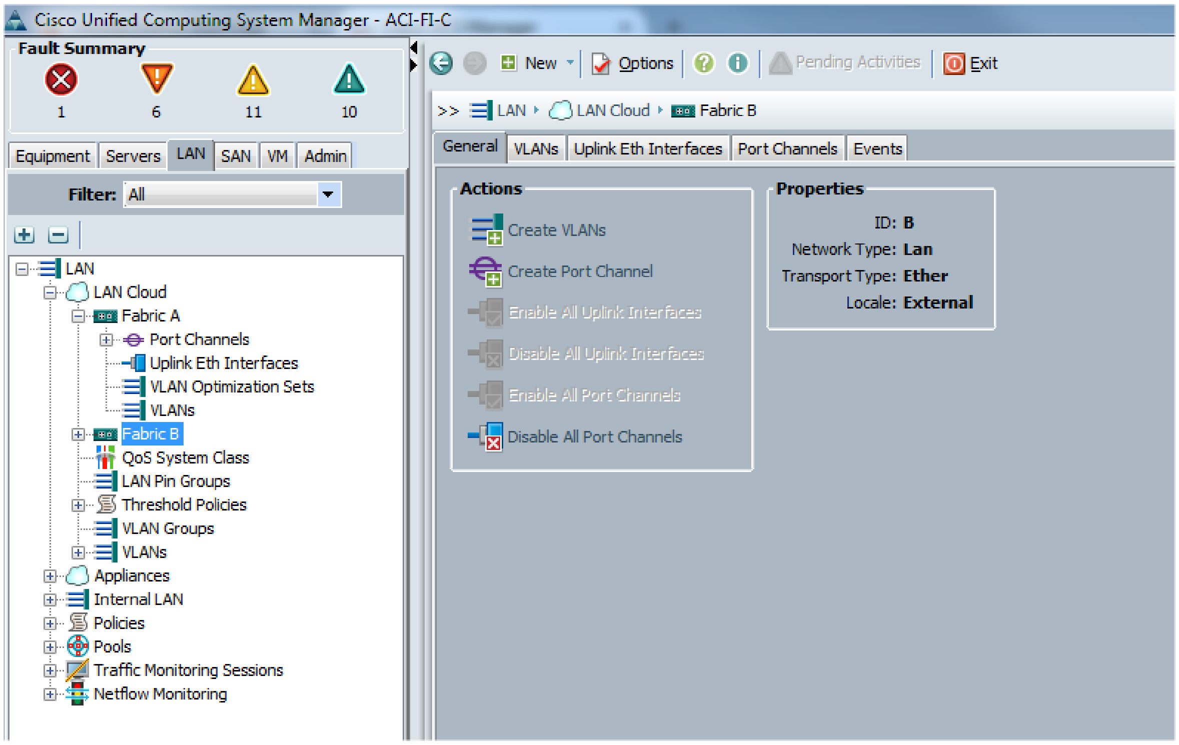
Slot ID	Port	MAC

Ports in the port channel

Name	Fabric ID	Slot	Port	Transport	Medium	Role	Type	Locale
Eth Interface ...	A	1	1	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	2	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	3	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	4	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	5	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	6	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	7	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	8	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	9	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	10	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	11	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	12	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	13	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	14	Ether	Lan	Network	Physical	External

6. Similarly for Fabric Interconnect B, click the **LAN** tab on top left window.
7. Expand the **LAN Cloud** > **Fabric B**.
8. In the right pane of the window select **Create Port Channel**.

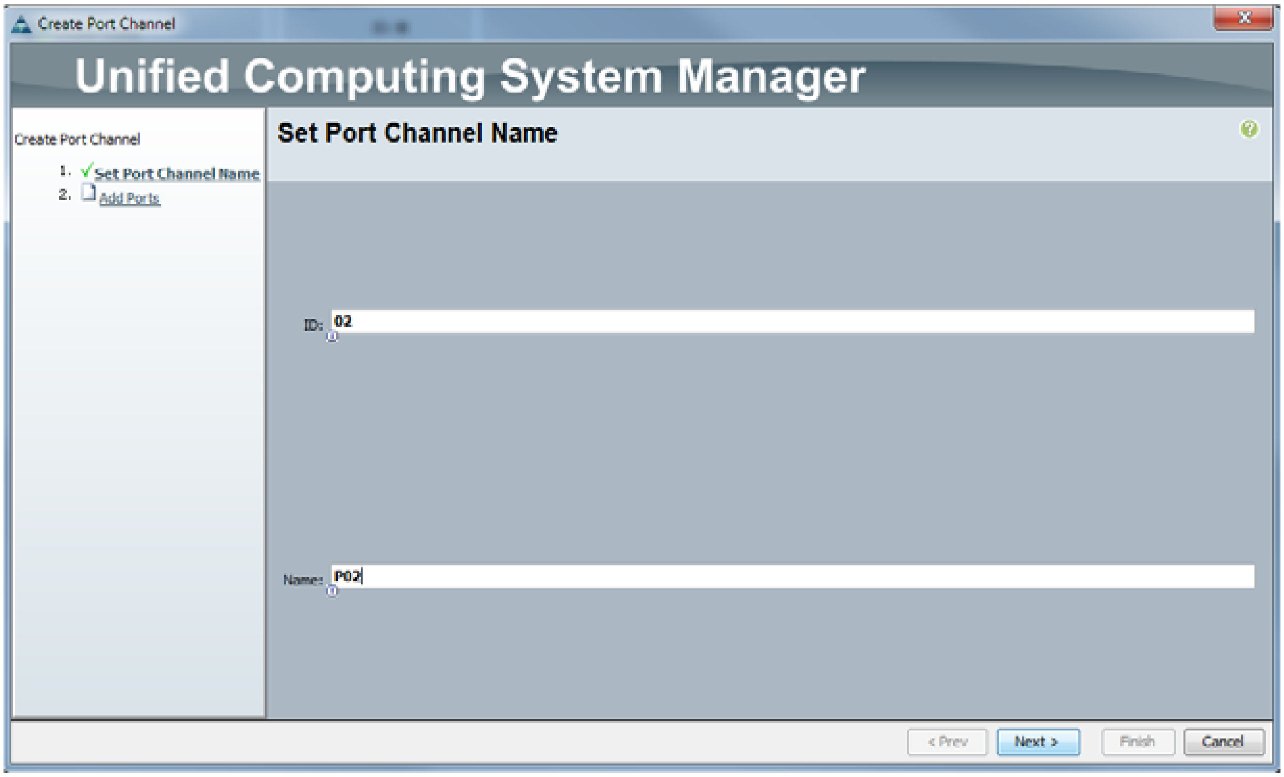
Figure 86 Creating Port Channel



ID: B
Network Type: Lan
Transport Type: Ether
Locale: External

9. On Set Port Channel Name window, perform the following actions:
   a. In the ID field, specify the ID “02” as the second port channel
   b. In Name field, type P02 as Port-channel01 and click **Next**.

Figure 87 Setting Port-Channel ID and Name

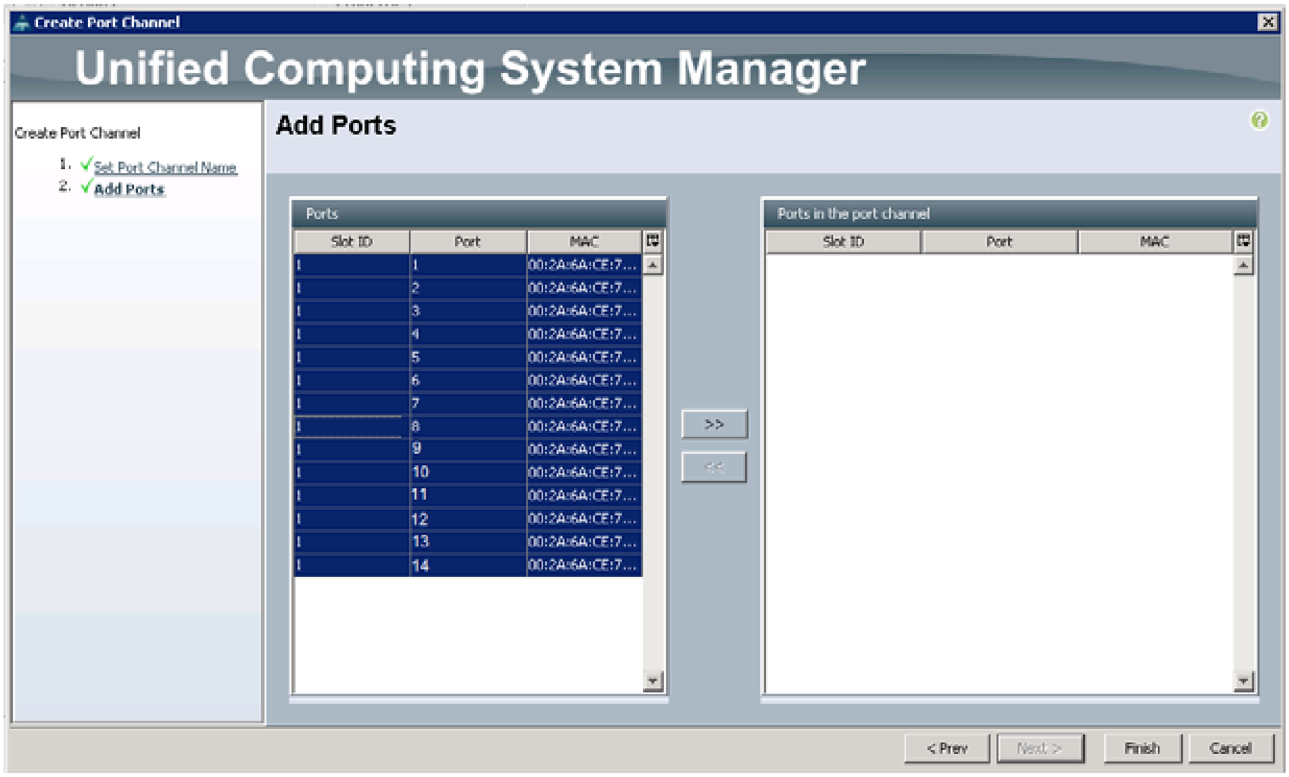


ID: 02

Name: P02

10. In Add Ports window select all the ports that is connected to the Nexus 9396 Leaf Switch and click >>. This will add all the ports in the port channel created earlier.

Figure 88 Adding Ports to the Port Channel



Create Port Channel

1. √ Set Port Channel Name
2. √ Add Ports

Add Ports

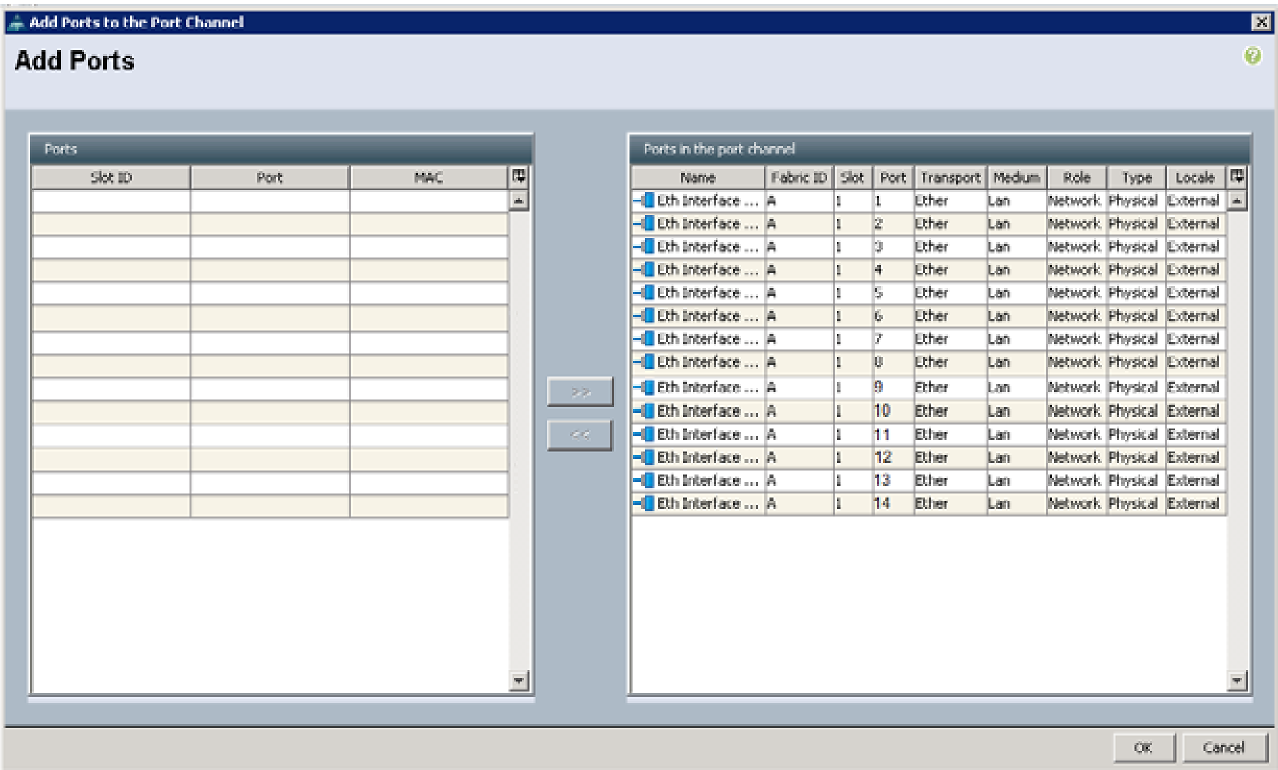
Ports

Slot ID	Port	MAC
1	1	00:2A:6A:CE:7...
1	2	00:2A:6A:CE:7...
1	3	00:2A:6A:CE:7...
1	4	00:2A:6A:CE:7...
1	5	00:2A:6A:CE:7...
1	6	00:2A:6A:CE:7...
1	7	00:2A:6A:CE:7...
1	8	00:2A:6A:CE:7...
1	9	00:2A:6A:CE:7...
1	10	00:2A:6A:CE:7...
1	11	00:2A:6A:CE:7...
1	12	00:2A:6A:CE:7...
1	13	00:2A:6A:CE:7...
1	14	00:2A:6A:CE:7...

Ports in the port channel

Slot ID	Port	MAC

Figure 89 Added Ports to the Port Channel



Add Ports

Ports

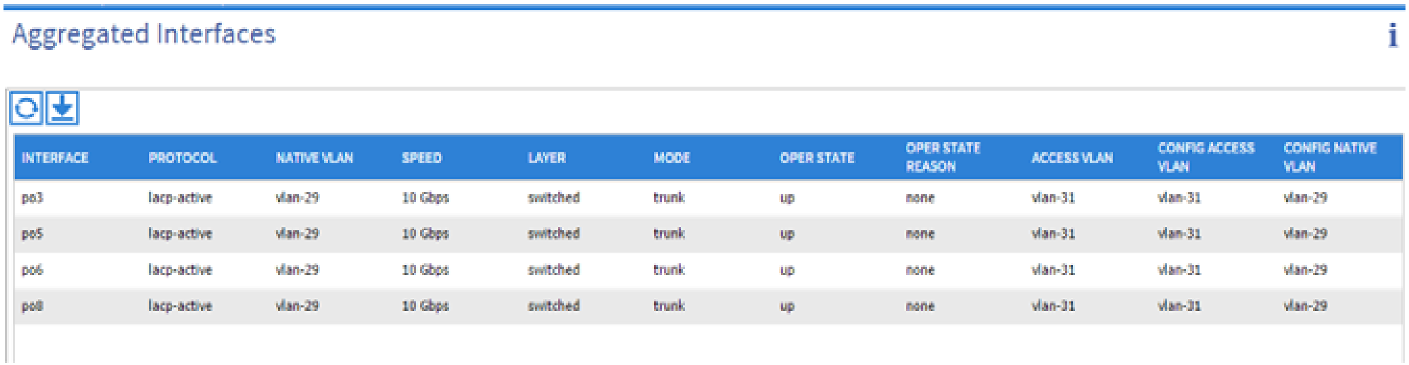
Slot ID	Port	MAC

Ports in the port channel

Name	Fabric ID	Slot	Port	Transport	Medium	Role	Type	Locale
Eth Interface ...	A	1	1	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	2	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	3	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	4	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	5	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	6	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	7	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	8	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	9	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	10	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	11	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	12	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	13	Ether	Lan	Network	Physical	External
Eth Interface ...	A	1	14	Ether	Lan	Network	Physical	External

11. The configured port channels and vPC can be verified by logging in to the APIC.

Figure 90 Verify Configured Port Channels and vPC



Aggregated Interfaces

INTERFACE	PROTOCOL	NATIVE VLAN	SPEED	LAYER	MODE	OPER STATE	OPER STATE REASON	ACCESS VLAN	CONFIG ACCESS VLAN	CONFIG NATIVE VLAN
po3	lacp-active	vlan-29	10 Gbps	switched	trunk	up	none	vlan-31	vlan-31	vlan-29
po5	lacp-active	vlan-29	10 Gbps	switched	trunk	up	none	vlan-31	vlan-31	vlan-29
po6	lacp-active	vlan-29	10 Gbps	switched	trunk	up	none	vlan-31	vlan-31	vlan-29
po8	lacp-active	vlan-29	10 Gbps	switched	trunk	up	none	vlan-31	vlan-31	vlan-29

Creating Pools for Service Profile Templates

Creating an Organization

Organizations are used as a means to arrange and restrict access to various groups within the IT organization, thereby enabling multi-tenancy of the compute resources. This document does not assume the use of Organizations; however the necessary steps are provided for future reference.

Follow these steps to configure an organization within the Cisco UCS Manager GUI:

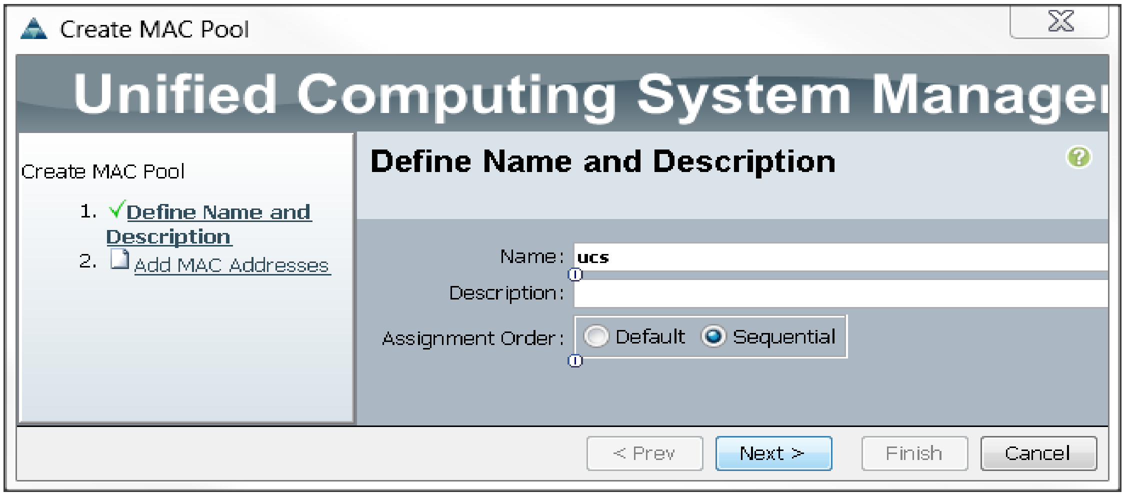
1. Click **New** on the top left corner in the right pane in the UCS Manager GUI.
2. Select Create Organization from the options
3. Enter a name for the organization.
4. (Optional) Enter a description for the organization.
5. Click **OK**.
6. Click **OK** in the success message box.

Creating MAC Address Pools

Follow these steps to create MAC address pools:

1. Select the **LAN** tab on the left of the window.
2. Select **Pools > root**.
3. Right-click **MAC** Pools under the root organization.
4. Select **Create MAC Pool** to create the MAC address pool. Enter ucs for the name of the MAC pool.
5. (Optional) Enter a description of the MAC pool.
6. Select Assignment Order Sequential.
7. Click **Next**.
8. Click **Add**.
9. Specify a starting MAC address.
10. Specify a size of the MAC address pool, which is sufficient to support the available server resources.
11. Click **OK**.

Figure 91 Creating MAC Pool Window

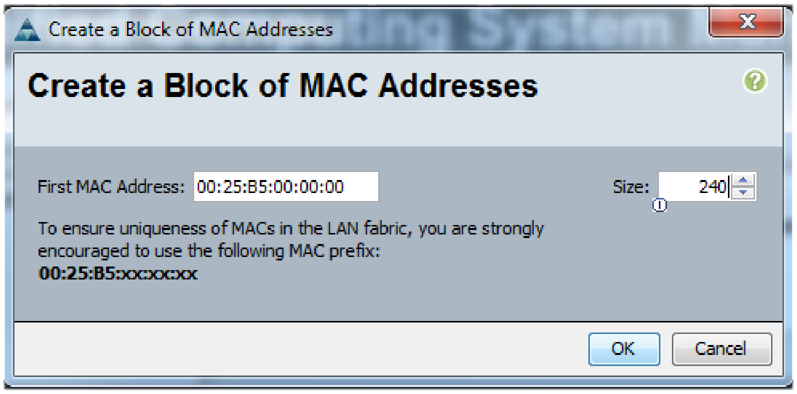

Create MAC Pool
Unified Computing System Manager
Create MAC Pool
1. Define Name and Description
2. Add MAC Addresses
Define Name and Description
< Prev
Next >
Finish
Cancel

Name: ucs

Description:

Assignment Order: ○ Default ● Sequential

Figure 92 Specifying First MAC Address and Size


Create a Block of MAC Addresses
Create a Block of MAC Addresses
OK
Cancel

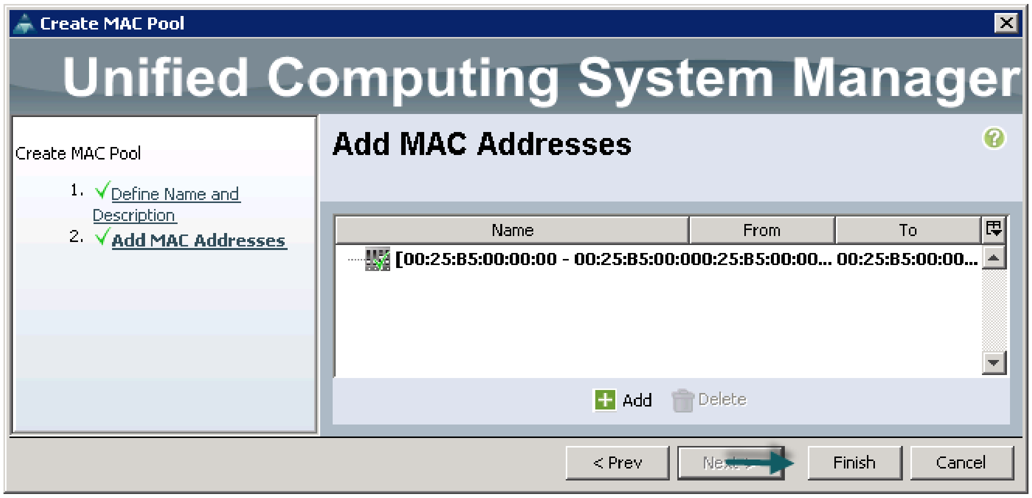
First MAC Address: 00:25:B5:00:00:00

Size: 240

To ensure uniqueness of MACs in the LAN fabric, you are strongly encouraged to use the following MAC prefix:
00:25:B5:xx:xx:xx

12. Click **Finish**.

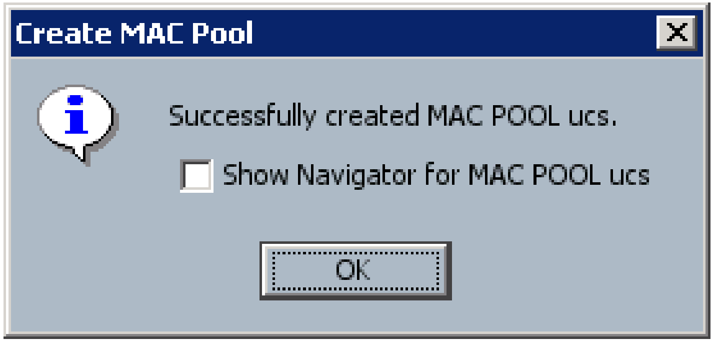
Figure 93 Adding MAC Addresses



Name	From	To
[00:25:B5:00:00:00 - 00:25:B5:00:00	0:25:B5:00:00...	00:25:B5:00:00...

13. When the message box displays, click **OK**.

Figure 94 Confirming Newly Added MAC Pool



Create MAC Pool

Successfully created MAC POOL ucs.

□ Show Navigator for MAC POOL ucs

Configuring VLANs

VLANs are configured as in shown in table 6.

Table 9 VLAN Configurations

VLAN	Fabric	NIC Port	Function	Failover
vlan160_mgmt	A	eth0	Management, User connectivity	Fabric Failover to B
vlan12_HDFS	B	eth1	Hadoop	Fabric Failover to A
vlan11_DATA	A	eth2	Hadoop with multiple NICs support	Fabric Failover to B

All the VLANs created need to be trunked to the upstream distribution switch connecting the fabric interconnects. For this deployment VLAN160 is configured for management access (Installing and configuring OS, clustershell commands, setup NTP, user connectivity, etc) and vlan12_HDFS is configured for Hadoop Data traffic.

With some Hadoop distributions supporting multiple NICs, where Hadoop uses multiple IP subnets for its data traffic, vlan11_DATA can be configured to carry Hadoop Data traffic allowing use of both the Fabrics (10 GigE on each Fabric allowing 20Gbps active-active connectivity).

Further, if there are other distributed applications co-existing in the same Hadoop cluster, then these applications could use vlan11_DATA providing full 10GigE connectivity to this application on a different fabric without affecting Hadoop Data traffic (here Hadoop is not enabled for multi-NIC).

Note

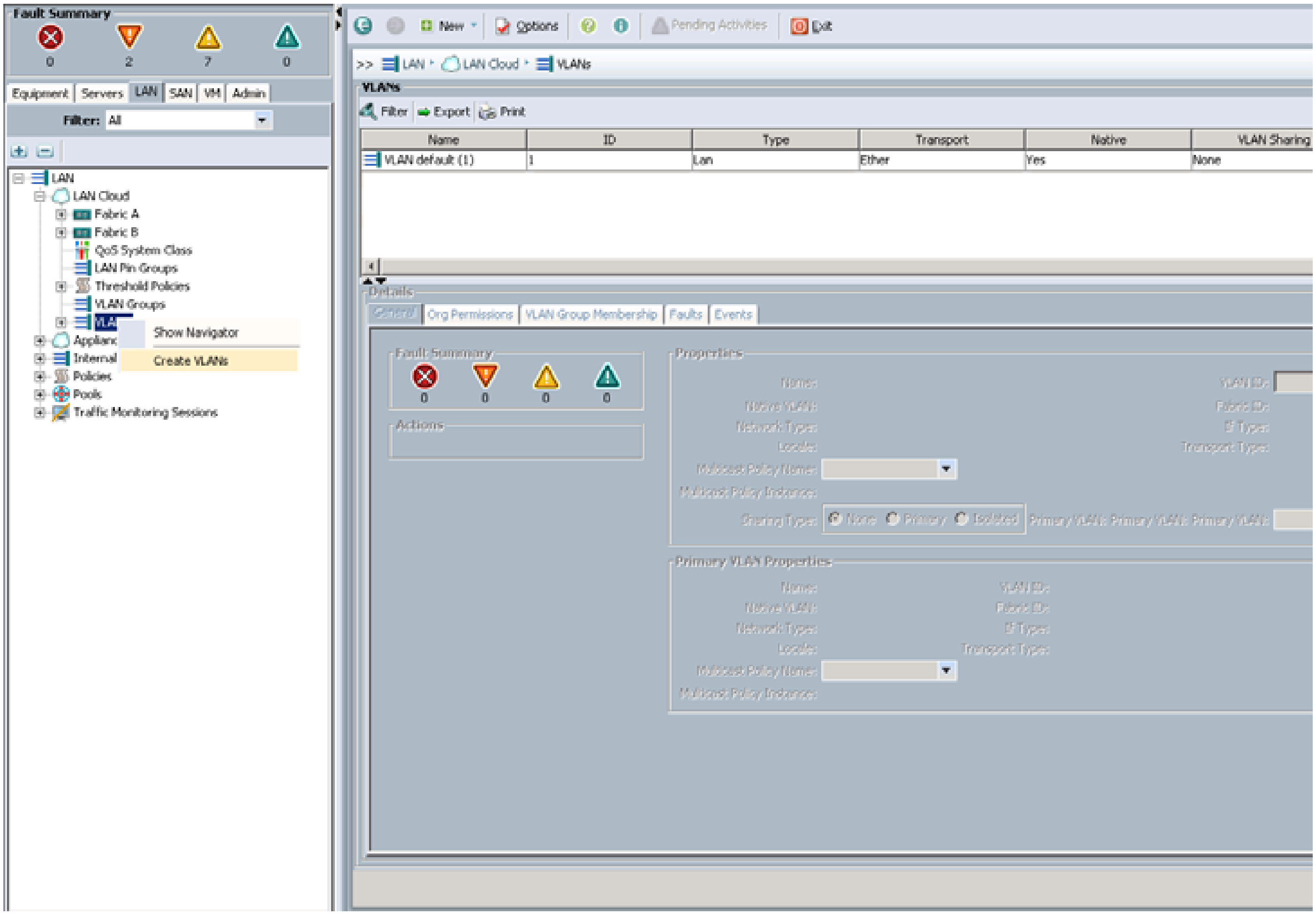
- **On Cloudera Security**: When deploying Cloudera with Security only one VLAN on one vNIC is supported. If the Cloudera install is going to have Security features enabled at a later stage, then use or create only single VLAN/vNIC in UCS Manager (could be name VLAN160_mgmt or VLAN12_HDFS) which will carry both management traffic and HDFS traffic. Ensure the MTU is set to 9000 and QoS policy is set to Platinum.
- If all the three VLANs are already created, and Cloudera Security needs to be enabled, then keep only one vNIC, VLAN160_Mgmt and delete rest of the vNICs from UCS Manager Service Profile Template. Modify the vNIC connected to VLAN160_Mgmt and update the MTU to 9000 and QoS Policy and before re-acknowledging the changes (this will lead to server reboot), on the servers

remove the configuration files for the vNICs **/etc/sysconfig/network-scripts/<ifcfg-deleted-NICs>** and re-acknowledge on the UCS Manager. This will restart the servers with only one vNIC/VLAN enabled.

Follow these steps to configure the VLANs in the Cisco UCS Manager GUI:

1. Select the **LAN** tab in the left pane in the UCS Manager GUI.
2. Select **LAN > VLANs**.
3. Right-click the **VLANs** under the root organization.
4. Select **Create VLANs** to create the VLAN.

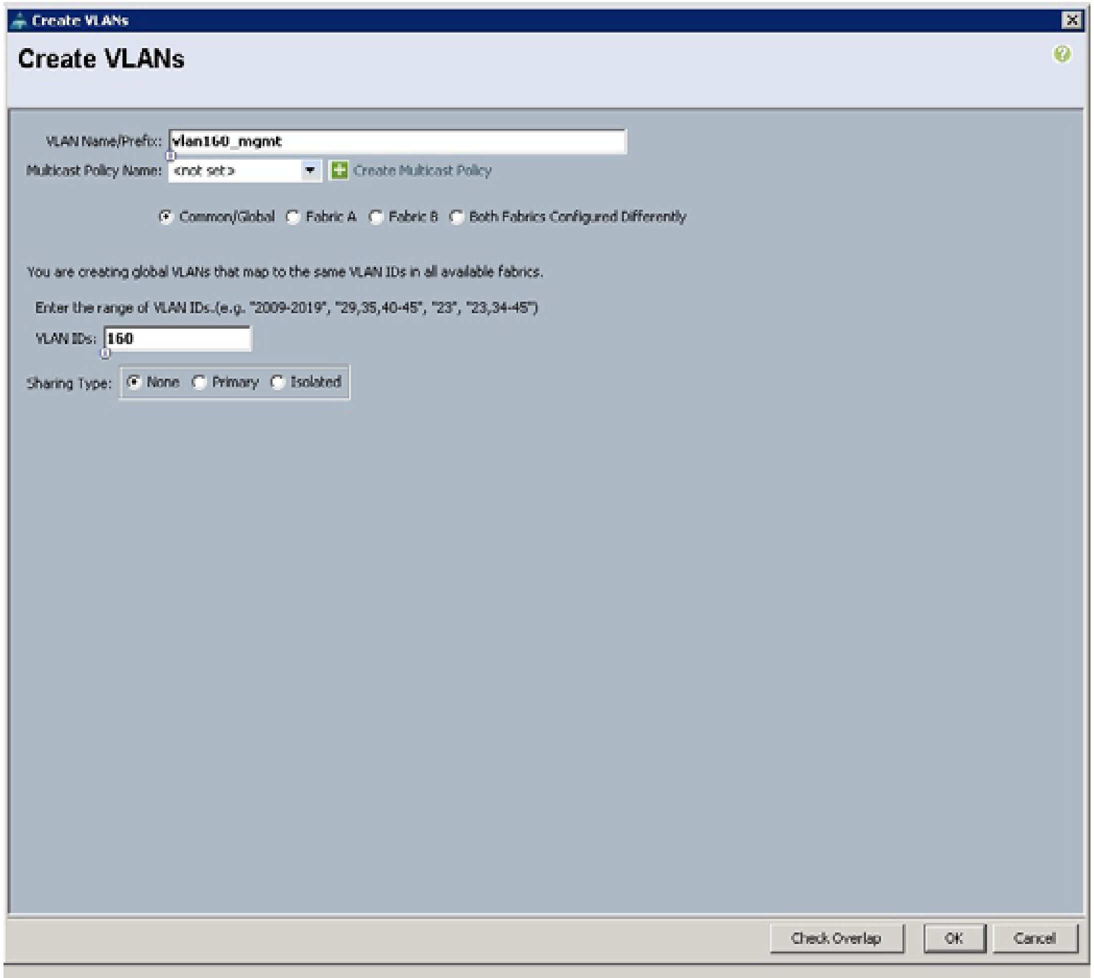
Figure 95 Creating VLAN



Name	ID	Type	Transport	Native	VLAN Sharing
VLAN default (1)	1	Lan	Ether	Yes	None

5. Enter vlan160_mgmt for the VLAN Name.
6. Click the **Common/Global** radio button for the vlan160_mgmt.
7. Enter 160 on VLAN IDs of the Create VLAN IDs.
8. Click **OK** and then, click **Finish**.
9. Click **OK** in the success message box.

Figure 96 Creating VLAN for Management VLAN



VLAN Name/Prefix: vlan160_mgmt

Multicast Policy Name: <not set>

● Common/Global ○ Fabric A ○ Fabric B ○ Both Fabrics Configured Differently

You are creating global VLANs that map to the same VLAN IDs in all available fabrics.

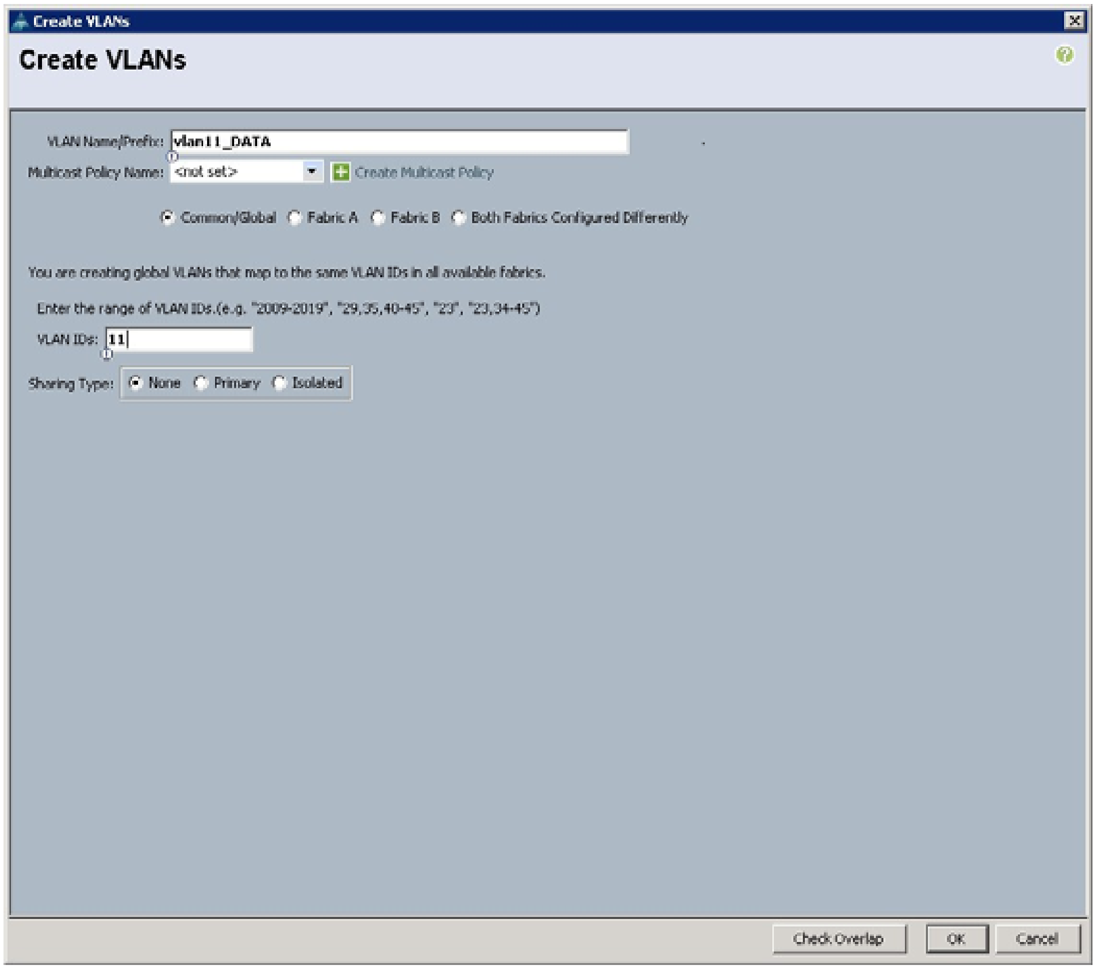
Enter the range of VLAN IDs.(e.g. "2009-2019", "29,35,40-45", "23", "23,34-45")

VLAN IDs: 160

Sharing Type: ● None ○ Primary ○ Isolated

10. Select the **LAN** tab in the left pane again
11. Select **LAN > VLANs**.
12. Right-click the **VLANs** under the root organization.
13. Select Create **VLANs** to create the VLAN.
14. Enter vlan11_DATA for the VLAN Name.
15. Click the **Common/Global** radio button for the vlan11_DATA.
16. Enter 11 on VLAN IDs of the Create VLAN IDs.
17. Click **OK** and then, click **Finish**.
18. Click **OK** in the success message box.

Figure 97 Creating VLAN for Data



VLAN Name/Prefix: vlan11_DATA

Multicast Policy Name: <not set>

● Common/Global ○ Fabric A ○ Fabric B ○ Both Fabrics Configured Differently

You are creating global VLANs that map to the same VLAN IDs in all available fabrics.

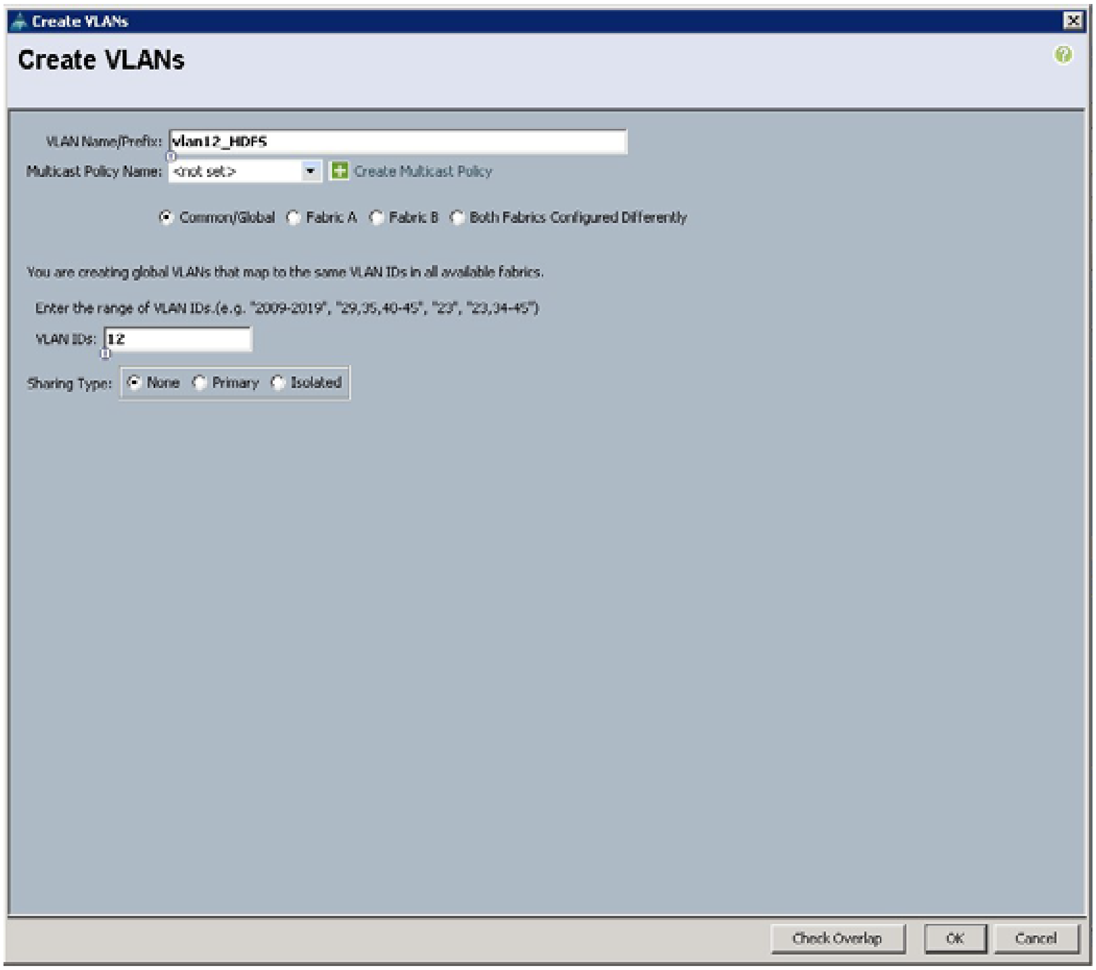
Enter the range of VLAN IDs.(e.g. "2009-2019", "29,35,40-45", "23", "23,34-45")

VLAN IDs: 11

Sharing Type: ● None ○ Primary ○ Isolated

19. Click the **LAN** tab in the left pane again
20. Select **LAN** > **VLANs**.
21. Right-click the VLANs under the root organization.
22. Select Create VLANs to create the VLAN.
23. Enter vlan12_HDFS for the VLAN Name.
24. Select Common/Global for the vlan12_HDFS.
25. Enter 12 on VLAN IDs of the Create VLAN IDs.
26. Click **OK** and then, click **Finish**.

Figure 98 Creating VLAN for Hadoop Data



VLAN Name/Prefix: vlan12_HDFS

Multicast Policy Name: <not set>

● Common/Global ○ Fabric A ○ Fabric B ○ Both Fabrics Configured Differently

You are creating global VLANs that map to the same VLAN IDs in all available fabrics.

Enter the range of VLAN IDs.(e.g. "2009-2019", "29,35,40-45", "23", "23,34-45")

VLAN IDs: 12

Sharing Type: ● None ○ Primary ○ Isolated

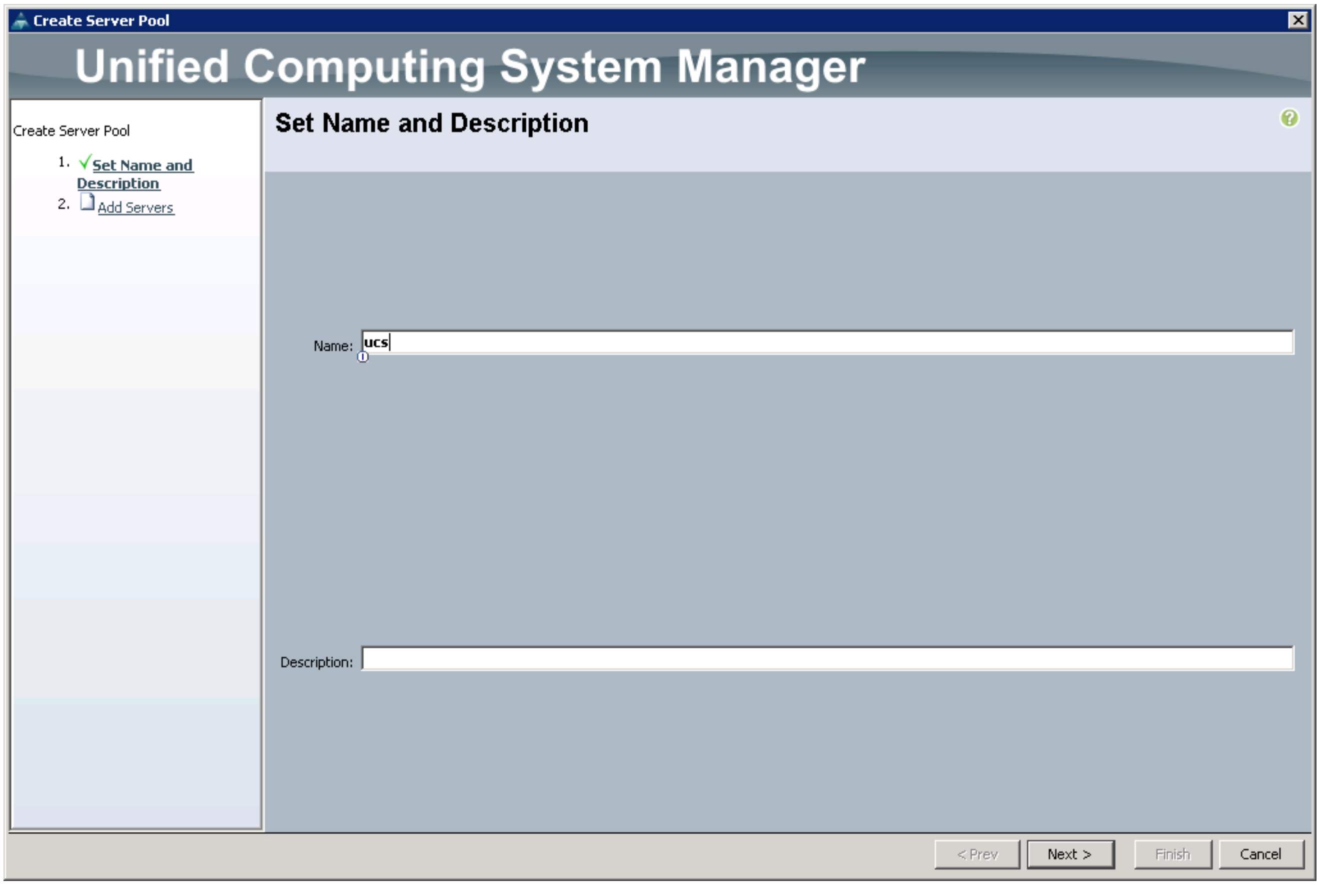
Creating Server Pools

A server pool contains a set of servers. These servers typically share the same characteristics. Those characteristics can be their location in the chassis, or an attribute such as server type, amount of memory, local storage, type of CPU, or local drive configuration. You can manually assign a server to a server pool, or use server pool policies and server pool policy qualifications to automate the assignment

Follow these steps to configure the server pool within the Cisco UCS Manager GUI:

1. Select the **Servers** tab in the left pane in the UCS Manager GUI.
2. Select **Pools > root**.
3. Right-click the **Server Pools**.
4. Select **Create Server Pool**.
5. Enter your required name (ucs) for the Server Pool in the name text box.
6. (Optional) enter a description for the organization
7. Click **Next** to add the servers.

Figure 99 Setting Name and Description of Server Pool



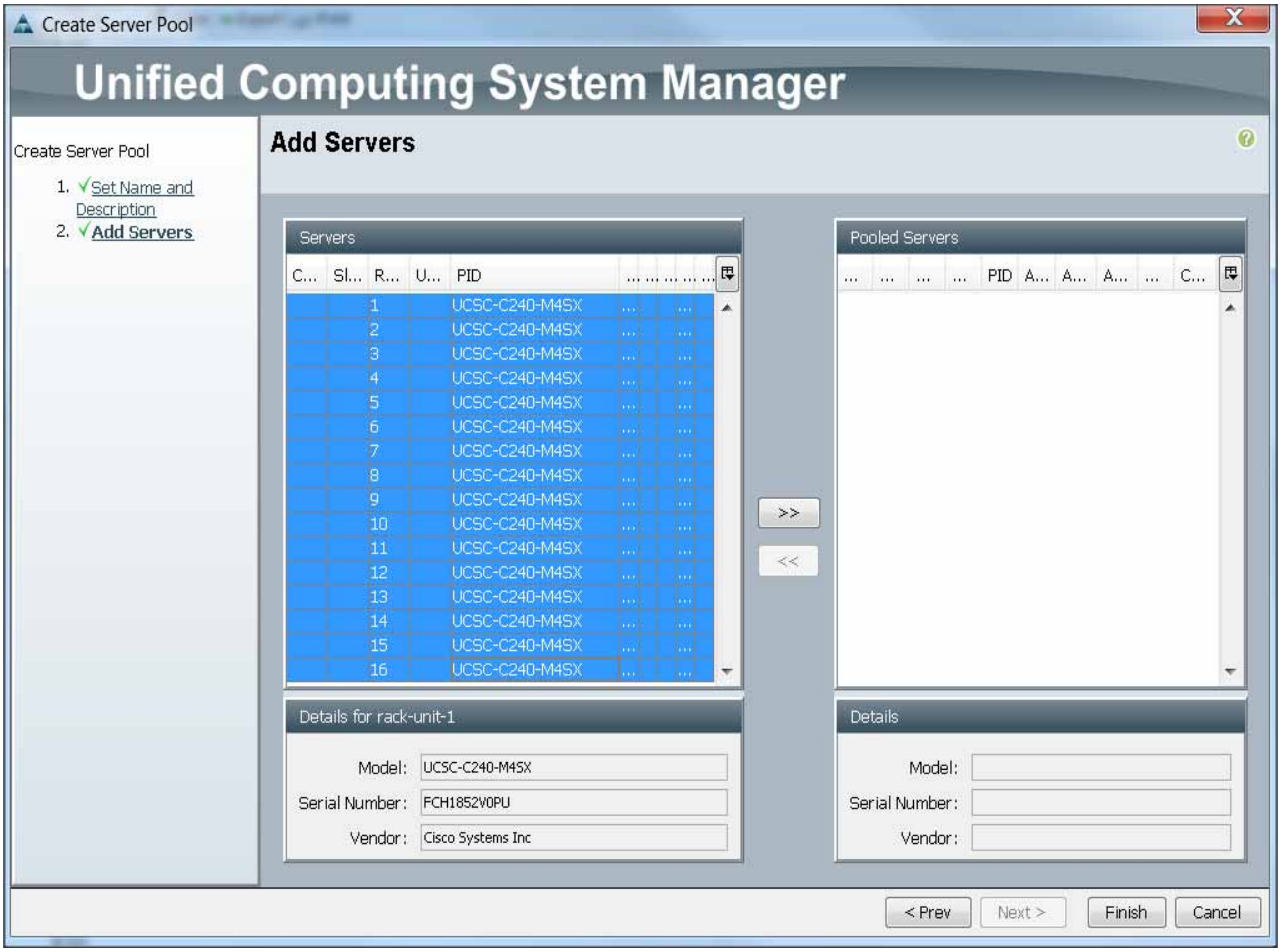
Set Name and Description

Name: ucs

Description:

8. Select all the Cisco UCS C240M4SX servers to be added to the server pool you previously created (ucs), then Click >> to add them to the pool.
9. Click **Finish**.
10. Click **OK**, and then click **Finish**.

Figure 100 Adding Servers to the Server Pool



C...	Sl...	R...	U...	PID	...	...	...	...	...
		1		UCSC-C240-M4SX	...			...	
		2		UCSC-C240-M4SX	...			...	
		3		UCSC-C240-M4SX	...			...	
		4		UCSC-C240-M4SX	...			...	
		5		UCSC-C240-M4SX	...			...	
		6		UCSC-C240-M4SX	...			...	
		7		UCSC-C240-M4SX	...			...	
		8		UCSC-C240-M4SX	...			...	
		9		UCSC-C240-M4SX	...			...	
		10		UCSC-C240-M4SX	...			...	
		11		UCSC-C240-M4SX	...			...	
		12		UCSC-C240-M4SX	...			...	
		13		UCSC-C240-M4SX	...			...	
		14		UCSC-C240-M4SX	...			...	
		15		UCSC-C240-M4SX	...			...	
		16		UCSC-C240-M4SX	...			...	

...	...	...	...	PID	A...	A...	A...	...	C...

Model: UCSC-C240-M4SX
Serial Number: FCH1852V0PU
Vendor: Cisco Systems Inc

Model:
Serial Number:
Vendor:

Creating Policies for Service Profile Templates

Creating Host Firmware Package Policy

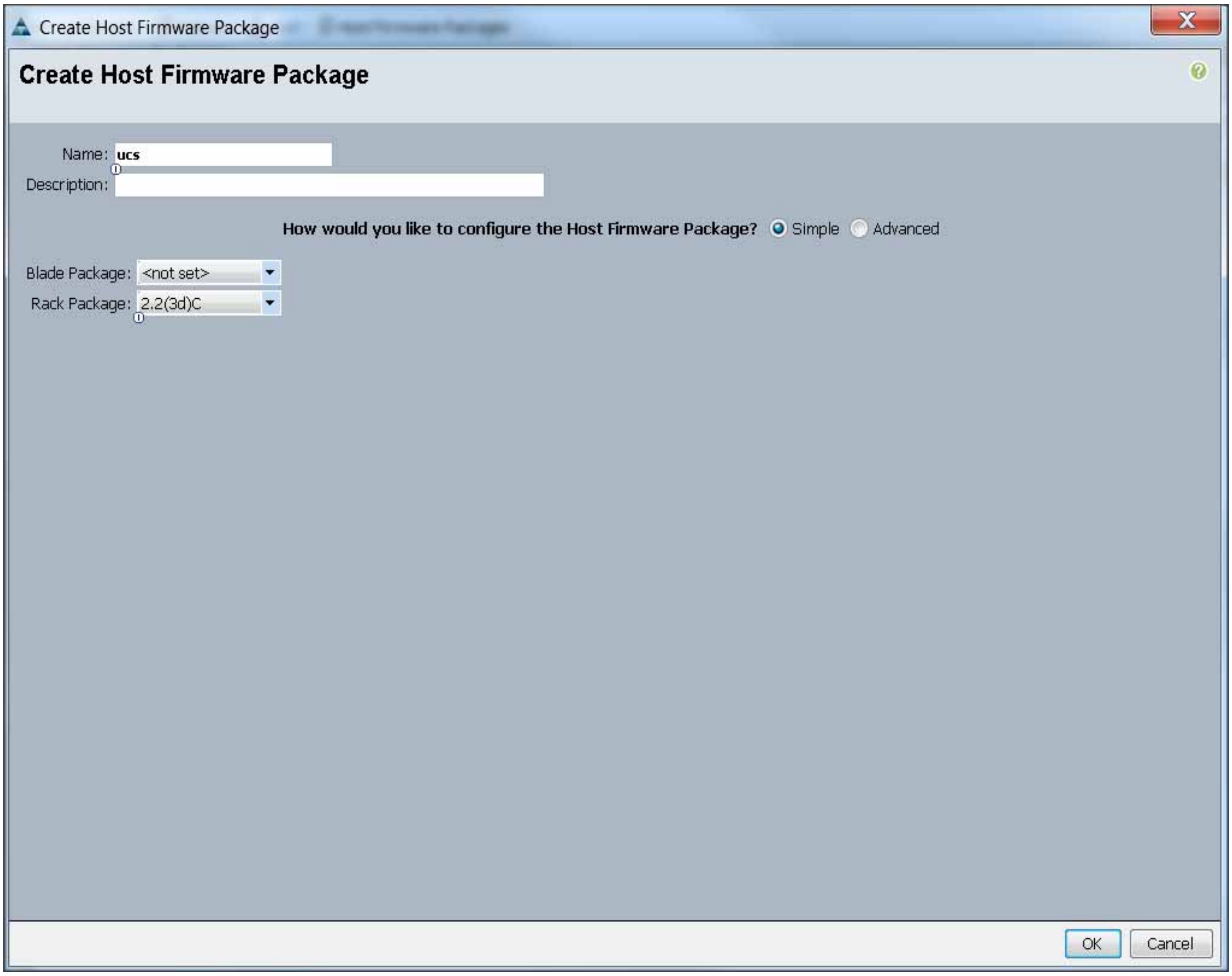
Firmware management policies allow the administrator to select the corresponding packages for a given server configuration. These include adapters, BIOS, board controllers, FC adapters, HBA options, ROM and storage controller properties as applicable.

Follow these steps to create a firmware management policy for a given server configuration using the Cisco UCS Manager GUI:

1. Select the **Servers** tab in the left pane in the UCS Manager GUI.
2. Select **Policies > root**.
3. Right-click **Host Firmware Packages**.
4. Select **Create Host Firmware Package**.
5. Enter your required Host Firmware package name (ucs).

6. Click the **Simple** radio button to configure the Host Firmware package.
7. Select the appropriate Rack package that you have.
8. Click **OK** to complete creating the management firmware package.
9. Click **OK**.

Figure 101 Creating Host Firmware Package



Create Host Firmware Package

Name: ucs

Description:

How would you like to configure the Host Firmware Package? ● Simple ○ Advanced

Blade Package: <not set>

Rack Package: 2.2(3d)C

Creating QoS Policies

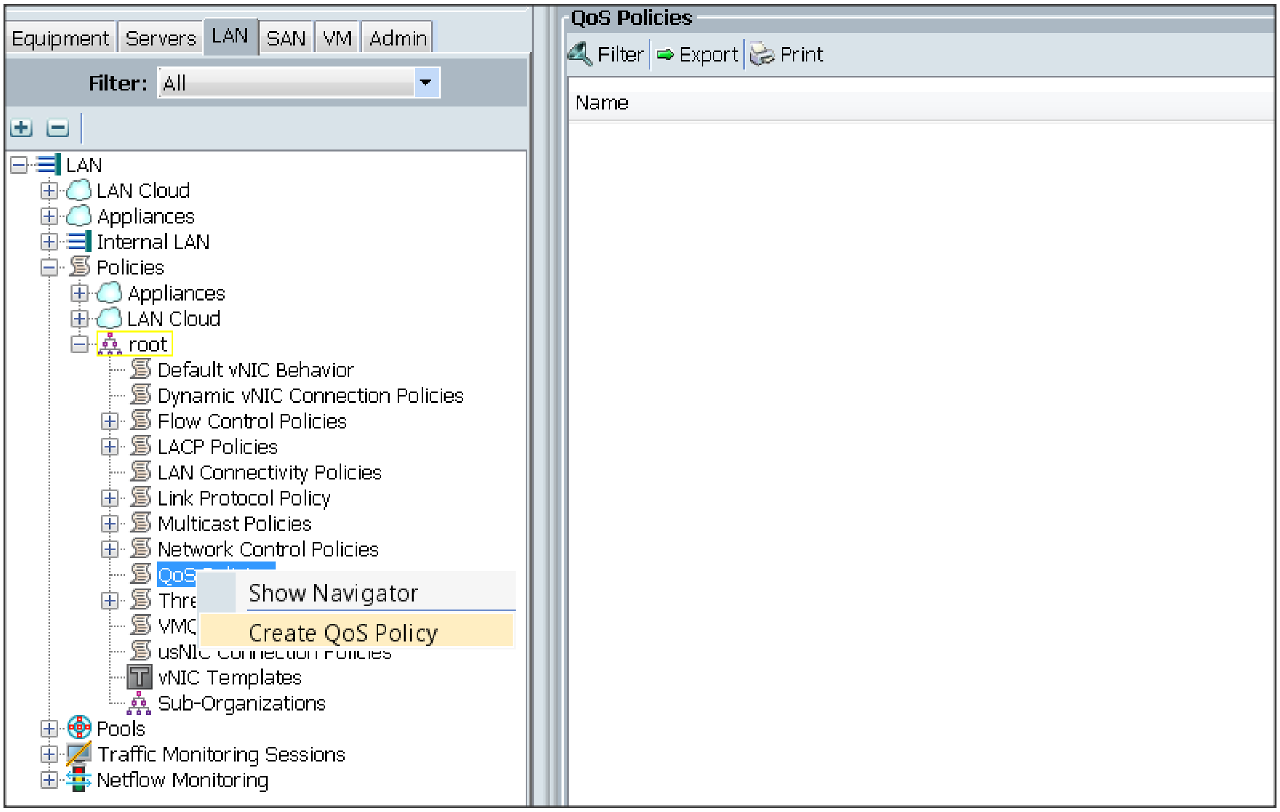
Follow these steps to create the QoS policy for a given server configuration using the Cisco UCS Manager GUI:

Best Effort Policy

1. Select the **LAN** tab in the left pane in the UCS Manager GUI.
2. Select **Policies > root**.

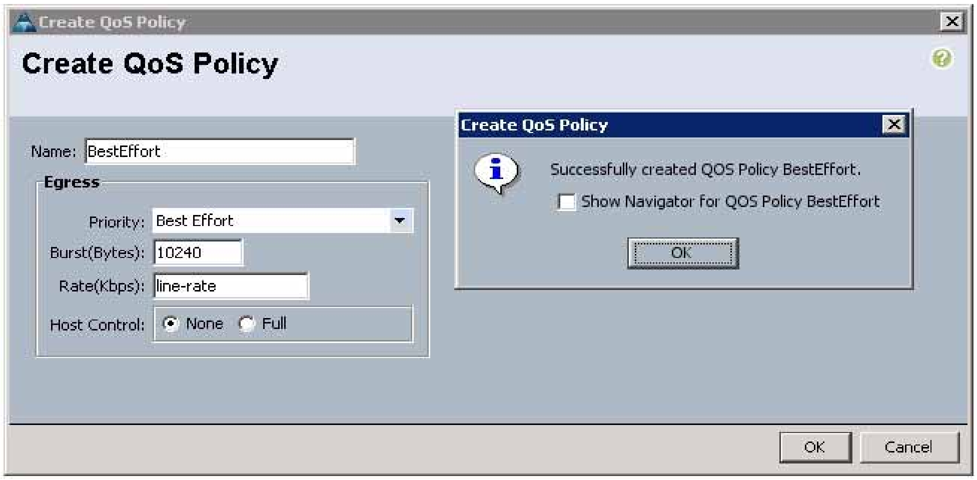
3. Right-click **QoS** Policies.
4. Select **Create QoS Policy**.

Figure 102 Creating QoS Policy



5. Enter BestEffort as the name of the policy.
6. Select BestEffort from the drop down menu.
7. Keep the Burst (Bytes) field as default (10240).
8. Keep the Rate (Kbps) field as default (line-rate).
9. Keep Host Control radio button as default (none).
10. Once the pop-up window appears, click **OK** to complete the creation of the Policy.

Figure 103 Creating BestEffort QoS Policy



Create QoS Policy

Name: BestEffort

Egress

Priority: Best Effort

Burst(Bytes): 10240

Rate(Kbps): line-rate

Host Control: ● None ○ Full

Create QoS Policy

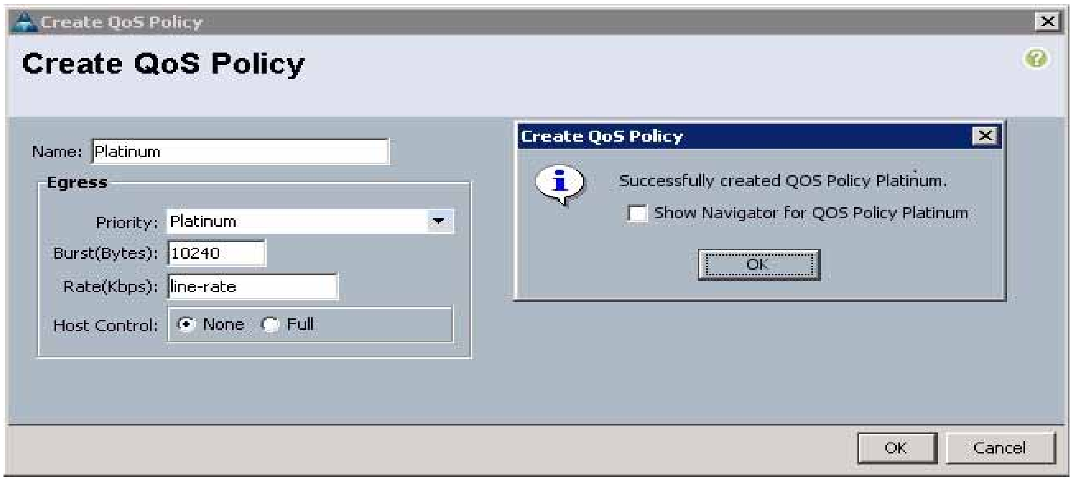
Successfully created QOS Policy BestEffort.

□ Show Navigator for QOS Policy BestEffort

Platinum Policy

1. Select the **LAN** tab in the left pane in the UCS Manager GUI.
2. Select **Policies > root**.
3. Right-click **QoS Policies**.
4. Select **Create QoS Policy**.
5. Enter Platinum as the name of the policy.
6. Select Platinum from the drop down menu.
7. Keep the Burst (Bytes) field as default (10240).
8. Keep the Rate (Kbps) field as default (line-rate).
9. Keep Host Control radio button as default (none).
10. Once the pop-up window appears, click **OK** to complete the creation of the Policy.

Figure 104 Creating Platinum QoS Policy



Name: Platinum

Priority: Platinum

Burst(Bytes): 10240

Rate(Kbps): line-rate

Host Control: ● None ○ Full

Successfully created QOS Policy Platinum.

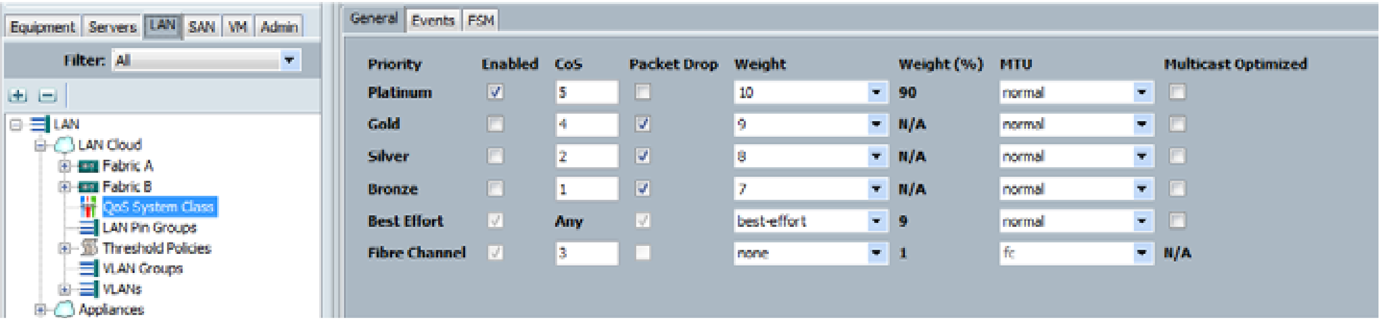
□ Show Navigator for QOS Policy Platinum

Setting Jumbo Frames

Follow these steps for setting up the Jumbo frames and enabling QoS:

1. Select the **LAN** tab in the left pane in the UCS Manager GUI.
2. Select **LAN Cloud > QoS System Class**.
3. In the right pane, select the **General** tab
4. Check the **Enabled** Check box next to Platinum.
5. In the Best Effort row, select best-effort for weight.
6. In the Fiber Channel row, select none for weight.
7. Click **Save Changes**.
8. Click **OK**.

Figure 105 Setting Jumbo Frames



Priority	Enabled	CoS	Packet Drop	Weight	Weight (%)	MTU	Multicast Optimized
Platinum	☑	5	□	10	90	normal	□
Gold	□	4	☑	9	N/A	normal	□
Silver	□	2	☑	8	N/A	normal	□
Bronze	□	1	☑	7	N/A	normal	□
Best Effort	☑	Any	☑	best-effort	9	normal	□
Fibre Channel	☑	3	□	none	1	fc	N/A

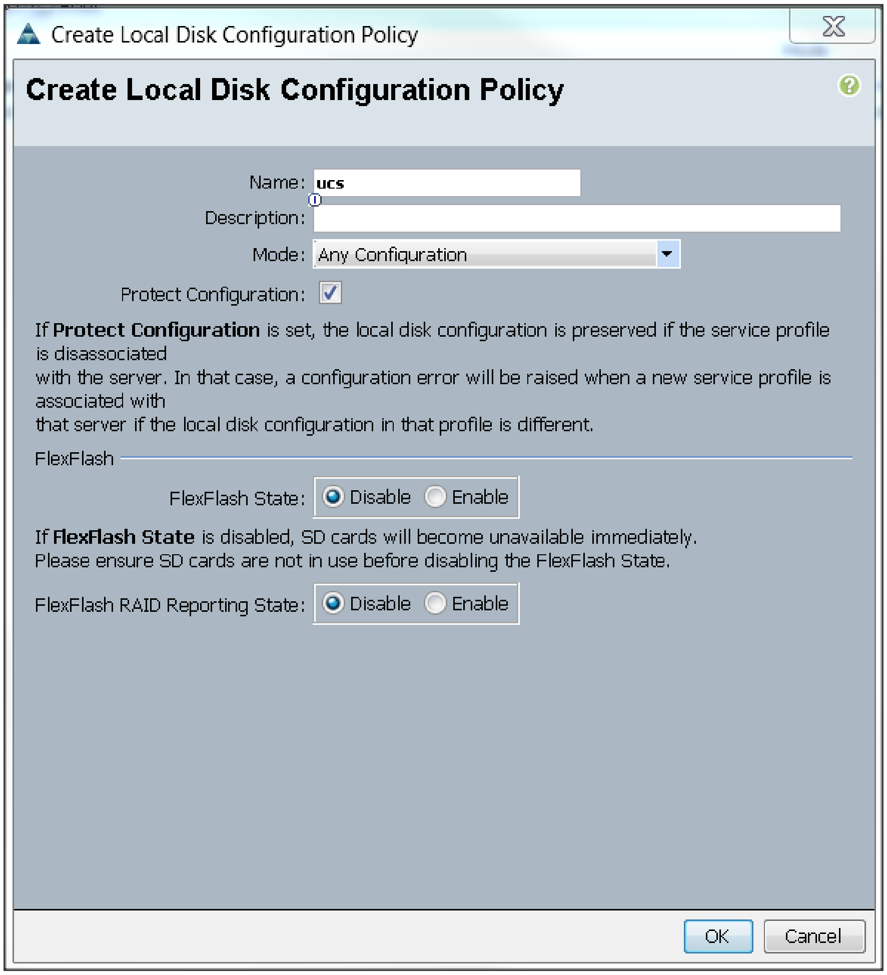
Creating Local Disk Configuration Policy

Follow these steps to create local disk configuration in the Cisco UCS Manager GUI:

1. Select the **Servers** tab on the left pane in the UCS Manager GUI.
2. Go to **Policies > root**.

3. Right-click Local Disk Config Policies.
4. Select Create Local Disk Configuration Policy.
5. Enter ucs as the local disk configuration policy name.
6. Change the Mode to Any Configuration. Check the **Protect Configuration** box.
7. Keep the FlexFlash State field as default (Disable).
8. Keep the FlexFlash RAID Reporting State field as default (Disable).
9. Click **OK** to complete the creation of the Local Disk Configuration Policy.
10. Click **OK**.

Figure 106 Configuring Local Disk Policy



Create Local Disk Configuration Policy

Create Local Disk Configuration Policy

Name: ucs

Description:

Mode: Any Configuration

Protect Configuration: ☑

If **Protect Configuration** is set, the local disk configuration is preserved if the service profile is disassociated
with the server. In that case, a configuration error will be raised when a new service profile is associated with
that server if the local disk configuration in that profile is different.

FlexFlash

FlexFlash State: ● Disable ○ Enable

If **FlexFlash State** is disabled, SD cards will become unavailable immediately.
Please ensure SD cards are not in use before disabling the FlexFlash State.

FlexFlash RAID Reporting State: ● Disable ○ Enable

Creating Server BIOS Policy

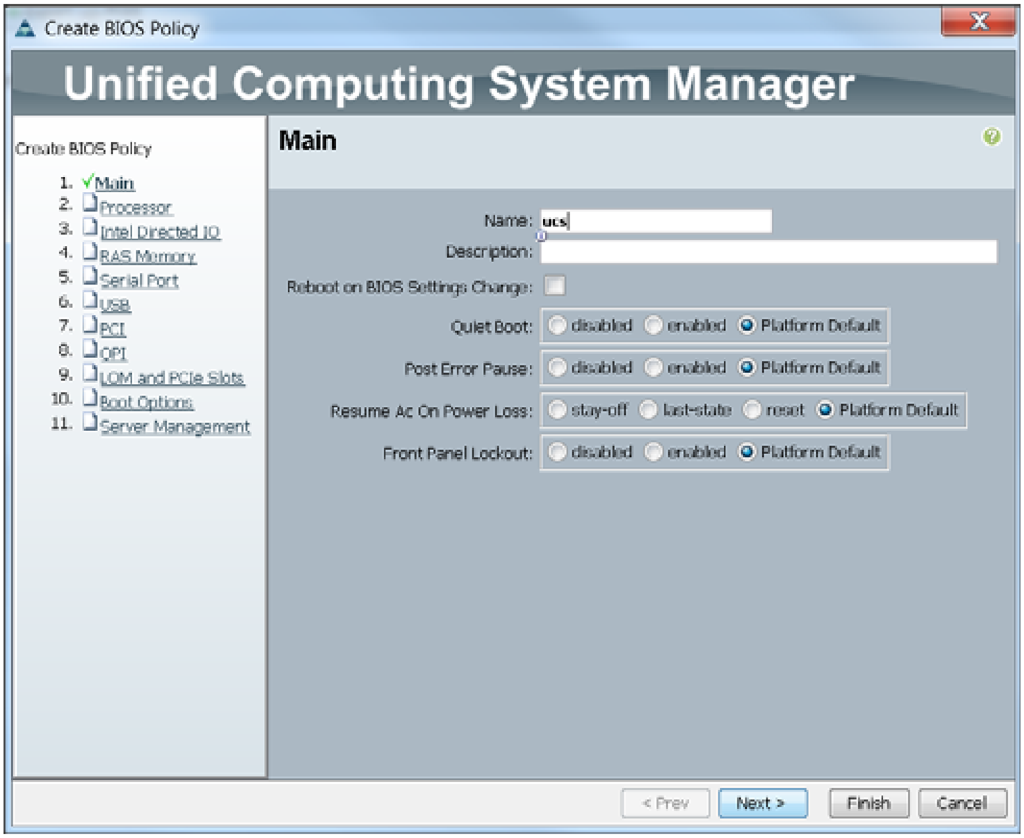
The BIOS policy feature in Cisco UCS automates the BIOS configuration process. The traditional method of setting the BIOS is done manually and is often error-prone. By creating a BIOS policy and assigning the policy to a server or group of servers, you can enable transparency within the BIOS settings configuration.

Note BIOS settings can have a significant performance impact, depending on the workload and the applications. The BIOS settings listed in this section is for configurations optimized for best performance which can be adjusted based on the application, performance and energy efficiency requirements.

Follow these steps to create a server BIOS policy using the Cisco UCS Manager GUI:

1. Select the **Servers** tab in the left pane in the UCS Manager GUI.
2. Select **Policies** > **root**.
3. Right-click **BIOS Policies**.
4. Select Create BIOS Policy.
5. Enter your preferred BIOS policy name (ucs).
6. Change the BIOS settings as per the following figures:

Figure 107 Creating Server BIOS Policy



Name: ucs

Description:

Reboot on BIOS Settings Change: □

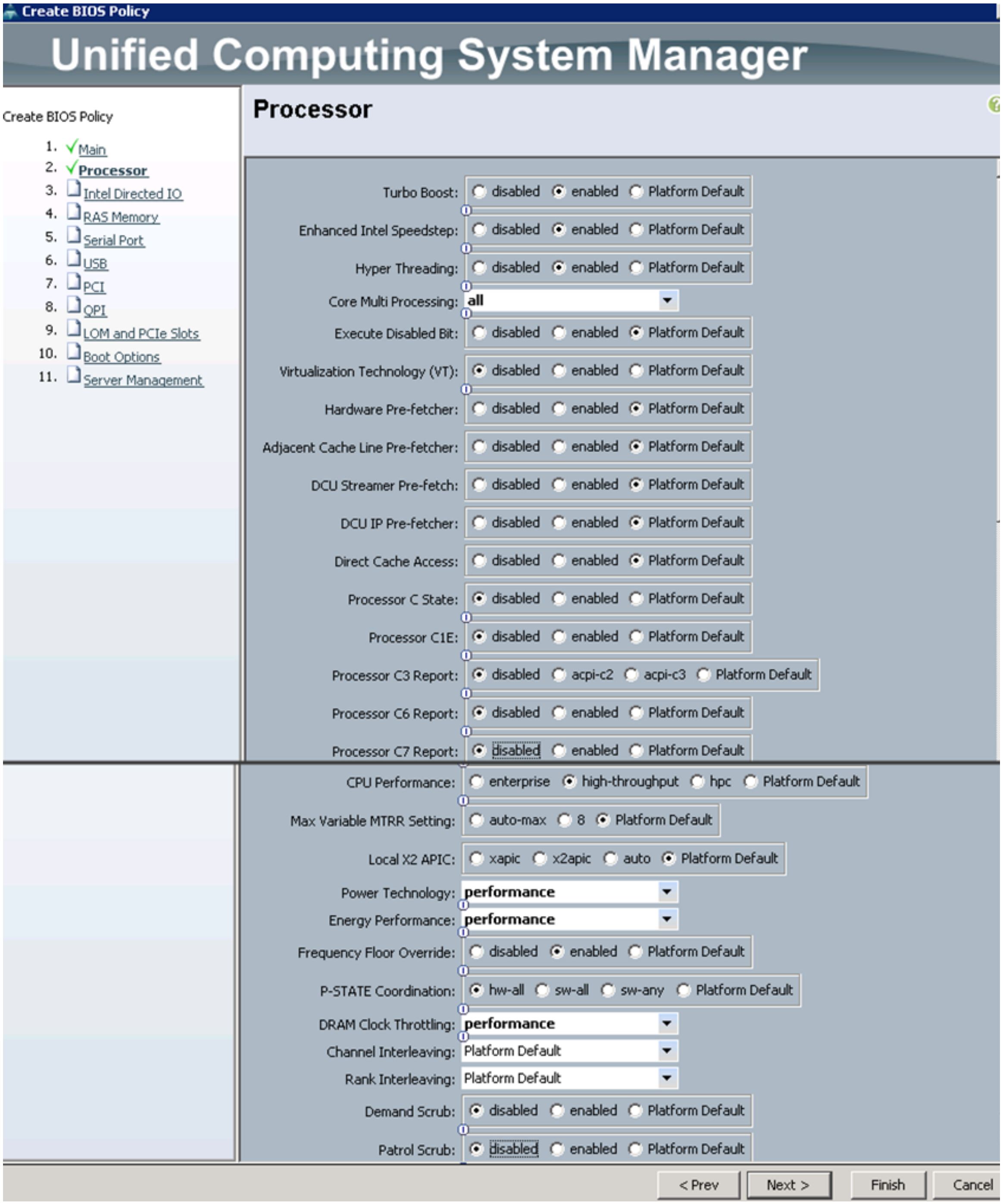
Quiet Boot: ○ disabled ○ enabled ● Platform Default

Post Error Pause: ○ disabled ○ enabled ● Platform Default

Resume Ac On Power Loss: ○ stay-off ○ last-state ○ reset ● Platform Default

Front Panel Lockout: ○ disabled ○ enabled ● Platform Default

Figure 108 Creating Server BIOS Policy for Processor



Processor

Turbo Boost: ○ disabled ● enabled ○ Platform Default

Enhanced Intel Speedstep: ○ disabled ● enabled ○ Platform Default

Hyper Threading: ○ disabled ● enabled ○ Platform Default

Core Multi Processing: all

Execute Disabled Bit: ○ disabled ○ enabled ● Platform Default

Virtualization Technology (VT): ● disabled ○ enabled ○ Platform Default

Hardware Pre-fetcher: ○ disabled ○ enabled ● Platform Default

Adjacent Cache Line Pre-fetcher: ○ disabled ○ enabled ● Platform Default

DCU Streamer Pre-fetch: ○ disabled ○ enabled ● Platform Default

DCU IP Pre-fetcher: ○ disabled ○ enabled ● Platform Default

Direct Cache Access: ○ disabled ○ enabled ● Platform Default

Processor C State: ● disabled ○ enabled ○ Platform Default

Processor C1E: ● disabled ○ enabled ○ Platform Default

Processor C3 Report: ● disabled ○ acpi-c2 ○ acpi-c3 ○ Platform Default

Processor C6 Report: ● disabled ○ enabled ○ Platform Default

Processor C7 Report: ● disabled ○ enabled ○ Platform Default

CPU Performance: ○ enterprise ● high-throughput ○ hpc ○ Platform Default

Max Variable MTRR Setting: ○ auto-max ○ 8 ● Platform Default

Local X2 APIC: ○ xapic ○ x2apic ○ auto ● Platform Default

Power Technology: performance

Energy Performance: performance

Frequency Floor Override: ○ disabled ● enabled ○ Platform Default

P-STATE Coordination: ● hw-all ○ sw-all ○ sw-any ○ Platform Default

DRAM Clock Throttling: performance

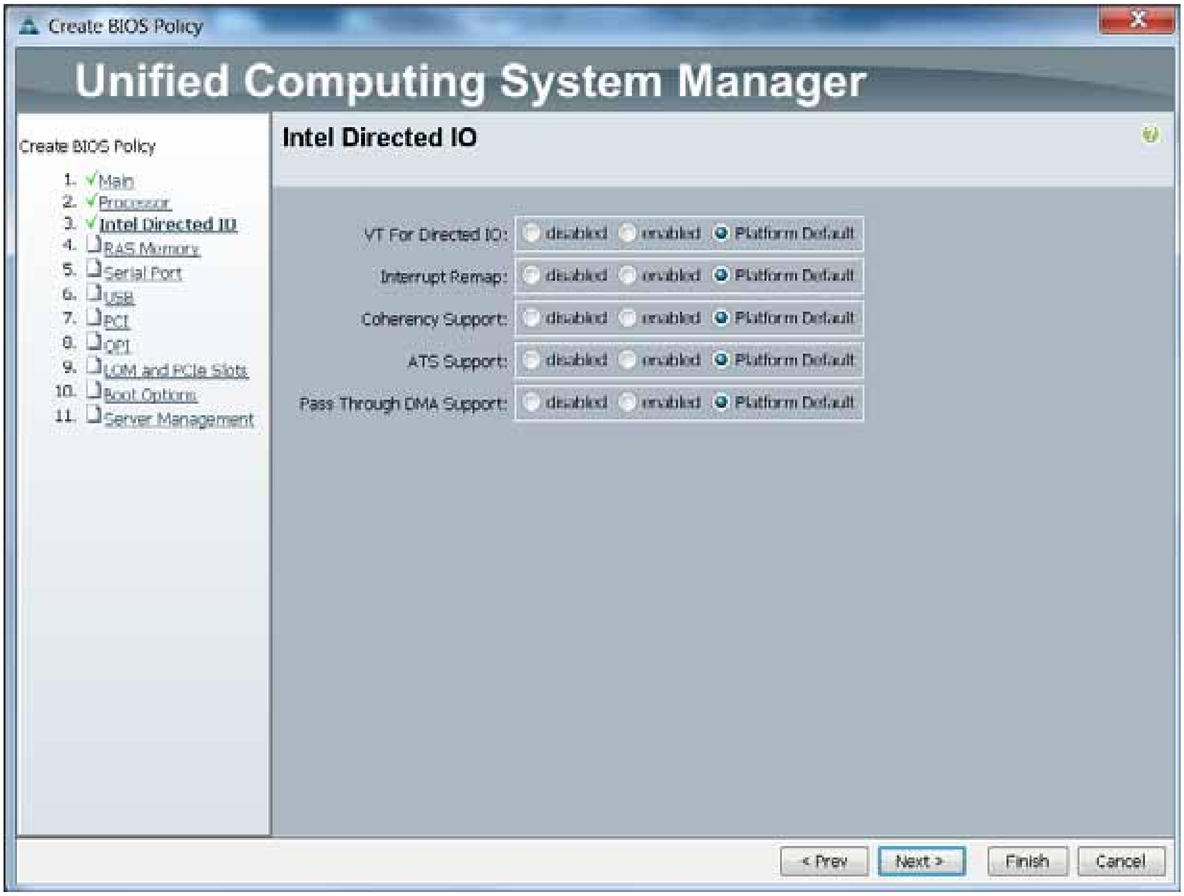
Channel Interleaving: Platform Default

Rank Interleaving: Platform Default

Demand Scrub: ● disabled ○ enabled ○ Platform Default

Patrol Scrub: ● disabled ○ enabled ○ Platform Default

Figure 109 Creating Server BIOS Policy for Intel Directed IO



Intel Directed IO

VT For Directed IO: ○ disabled ○ enabled ● Platform Default

Interrupt Remap: ○ disabled ○ enabled ● Platform Default

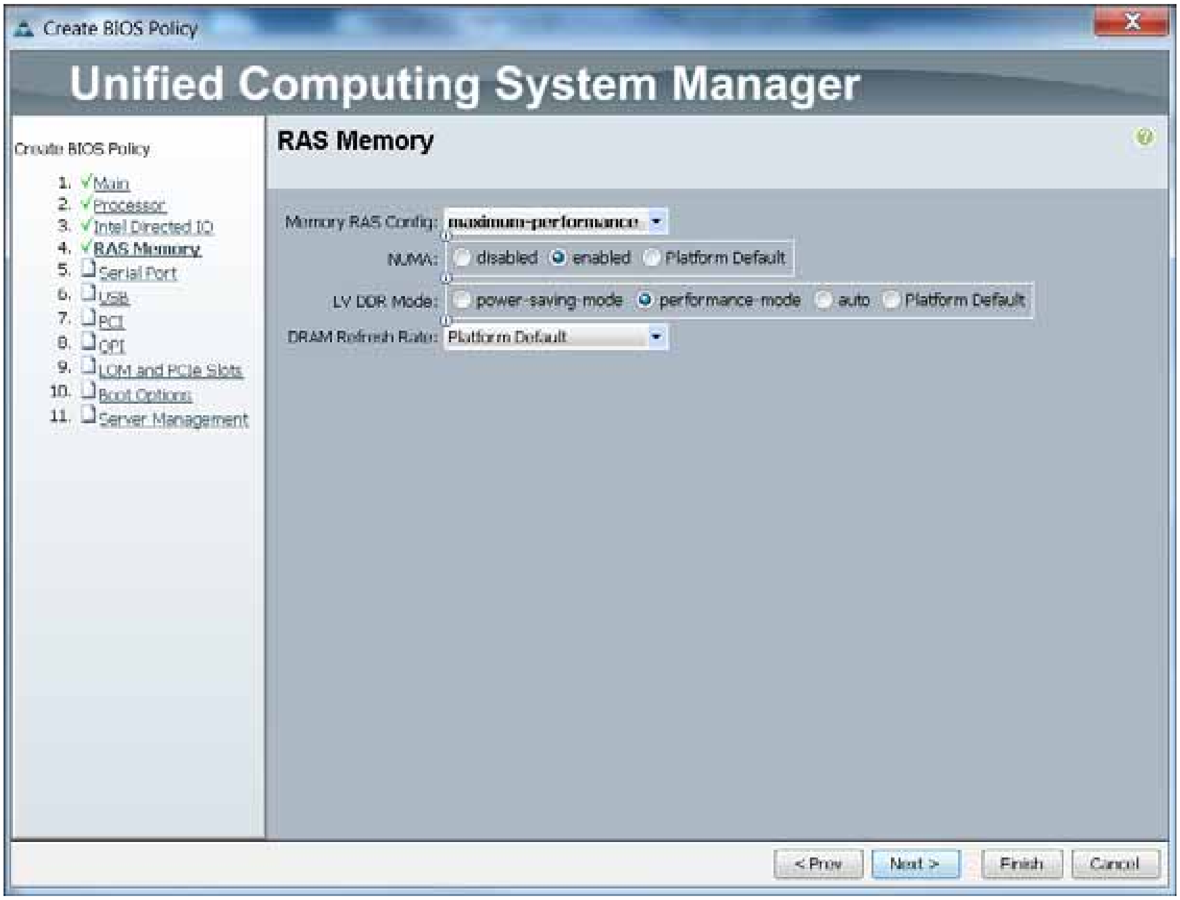
Coherency Support: ○ disabled ○ enabled ● Platform Default

ATS Support: ○ disabled ○ enabled ● Platform Default

Pass Through DMA Support: ○ disabled ○ enabled ● Platform Default

7. Click **Finish** to complete creating the BIOS policy.
8. Click **OK**.

Figure 110 Creating Server BIOS Policy for Memory



Memory RAS Config: maximum-performance

NUMA: ○ disabled ● enabled ○ Platform Default

LV DDR Mode: ○ power-saving-mode ● performance-mode ○ auto ○ Platform Default

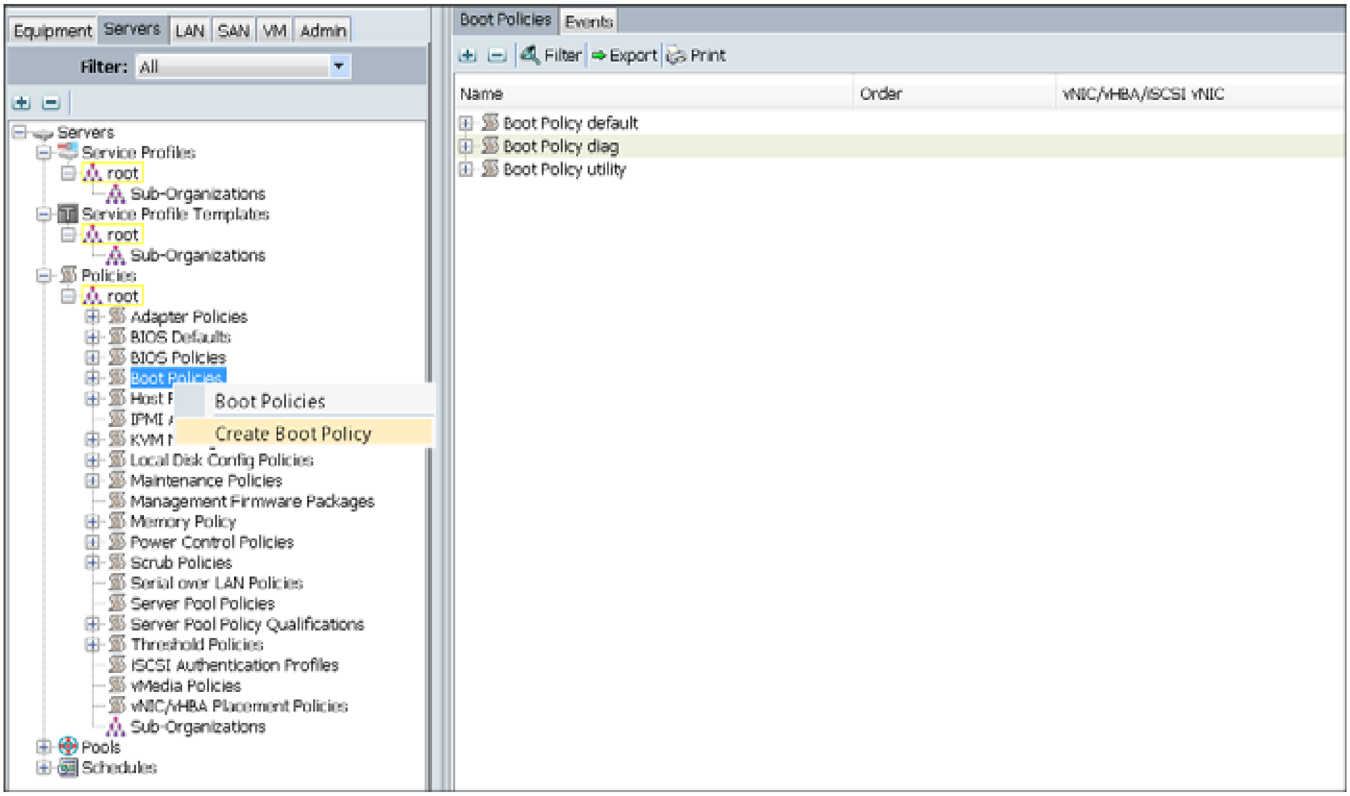
DRAM Refresh Rate: Platform Default

Creating Boot Policy

Follow these steps to create boot policies within the Cisco UCS Manager GUI:

1. Select the **Servers** tab in the left pane in the UCS Manager GUI.
2. Select **Policies > root**.
3. Right-click the **Boot Policies**.
4. Select **Create Boot Policy**.

Figure 111 Creating Boot Policy Part 1

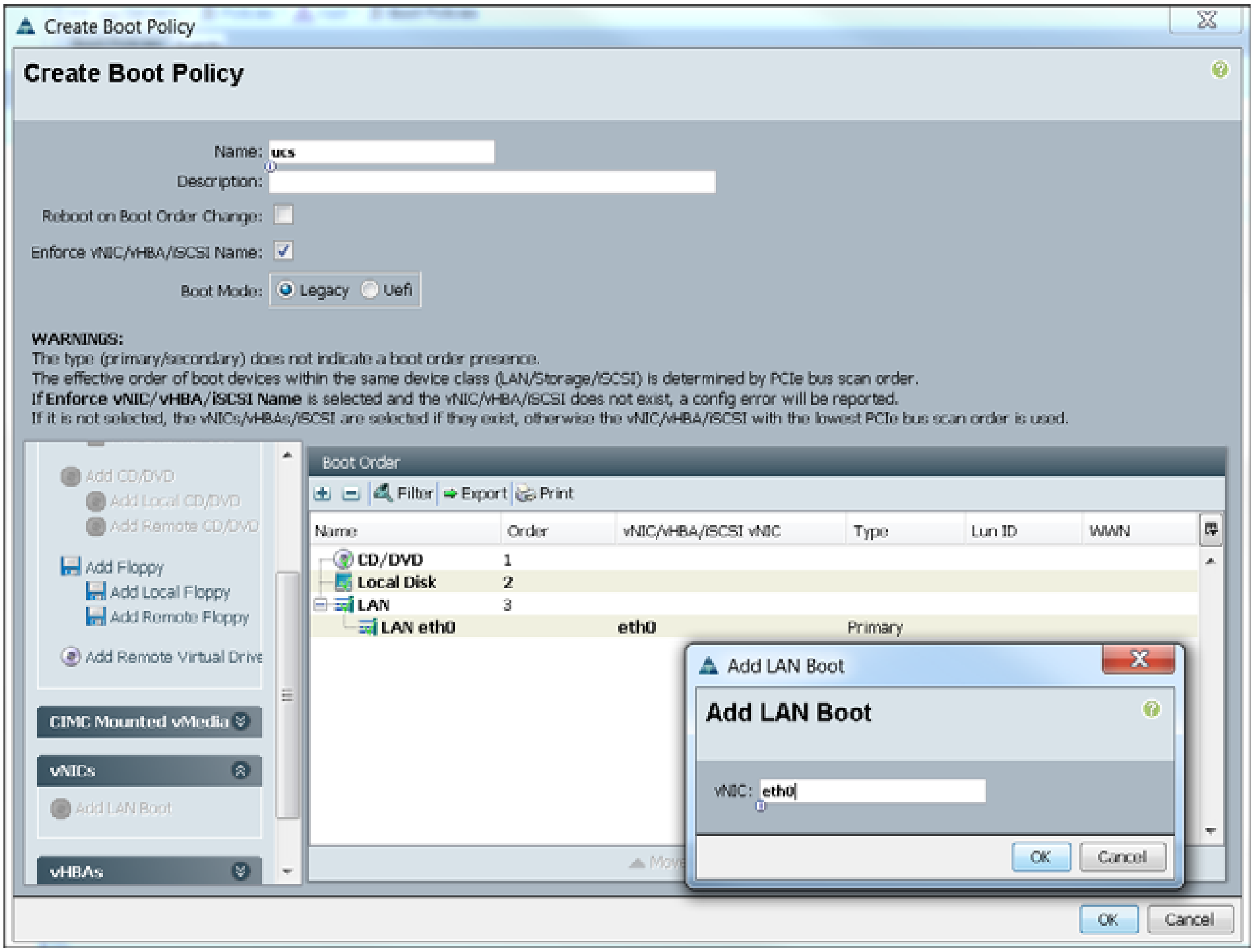


Filter: All

Name	Order	vNIC/vHBA/iSCSI vNIC
Boot Policy default		
Boot Policy diag		
Boot Policy utility		

5. Enter ucs as the boot policy name.
6. (Optional) enter a description for the boot policy.
7. Keep the Reboot on Boot Order Change check box unchecked.
8. Keep Enforce vNIC/vHBA/iSCSI Name check box checked.
9. Keep Boot Mode Default (Legacy).
10. Expand **Local Devices > Add CD/DVD** and select **Add Local CD/DVD**.
11. Expand Local Devices and select **Add Local Disk**.
12. Expand vNICs and select Add LAN Boot and enter eth0.
13. Click **OK** to add the Boot Policy.
14. Click **OK**.

Figure 112 Creating Boot Policy Part 2



Create Boot Policy

Name: ucs

Description:

Reboot on Boot Order Change: □

Enforce vNIC/vHBA/iSCSI Name: ☑

Boot Mode: ● Legacy ○ Uefi

WARNINGS:
The type (primary/secondary) does not indicate a boot order presence.
The effective order of boot devices within the same device class (LAN/Storage/iSCSI) is determined by PCIe bus scan order.
If **Enforce vNIC/ vHBA/ iSCSI Name** is selected and the vNIC/vHBA/iSCSI does not exist, a config error will be reported.
If it is not selected, the vNICs/vHBAs/iSCSI are selected if they exist, otherwise the vNIC/vHBA/iSCSI with the lowest PCIe bus scan order is used.

Name	Order	vNIC/vHBA/iSCSI vNIC	Type	Lun ID	WWN
CD/DVD	1				
Local Disk	2				
LAN	3				
LAN eth0		eth0	Primary		

Add LAN Boot

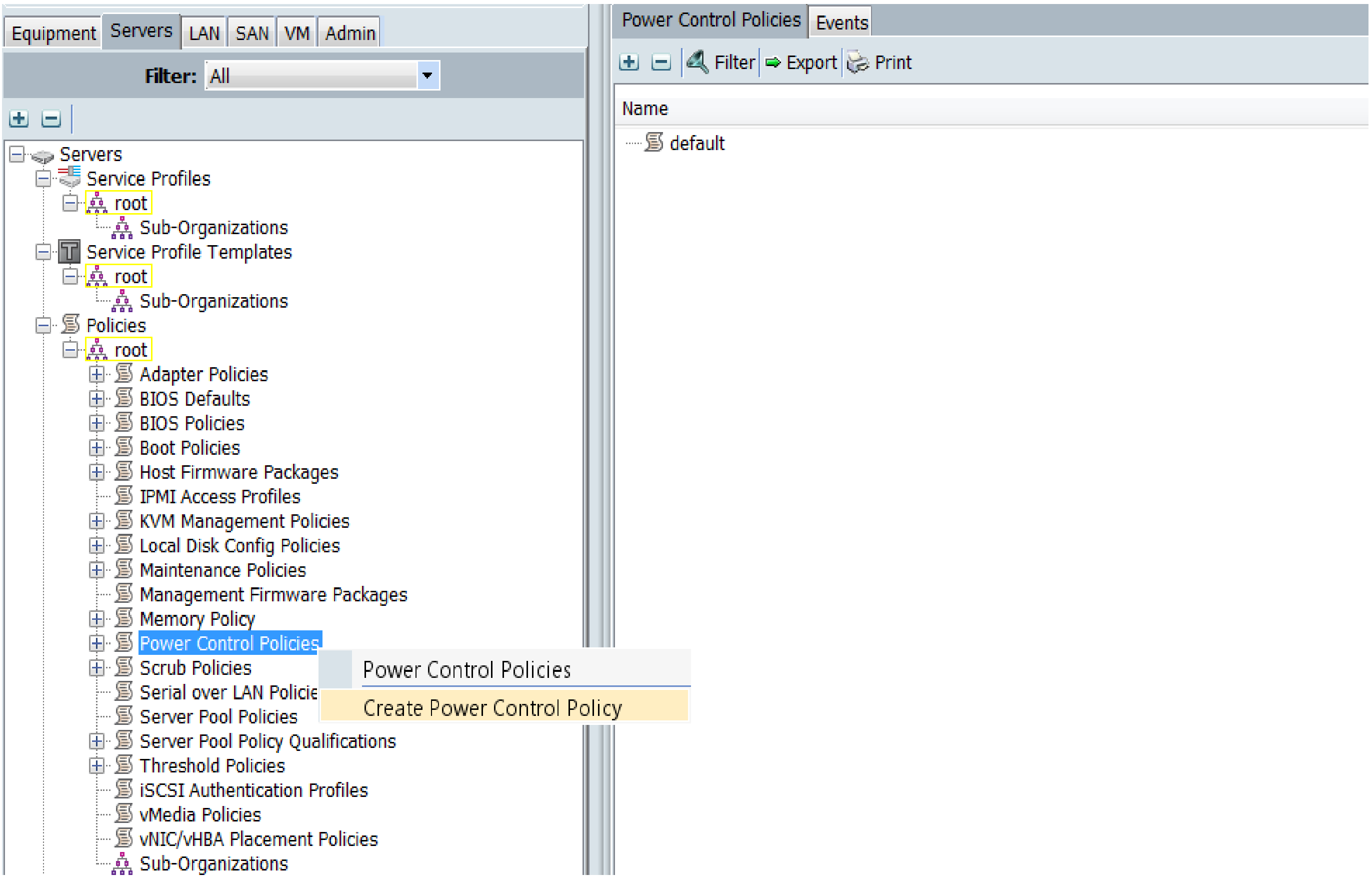
vNIC: eth0

Creating Power Control Policy

Follow these steps to create the Power Control policies within the Cisco UCS Manager GUI:

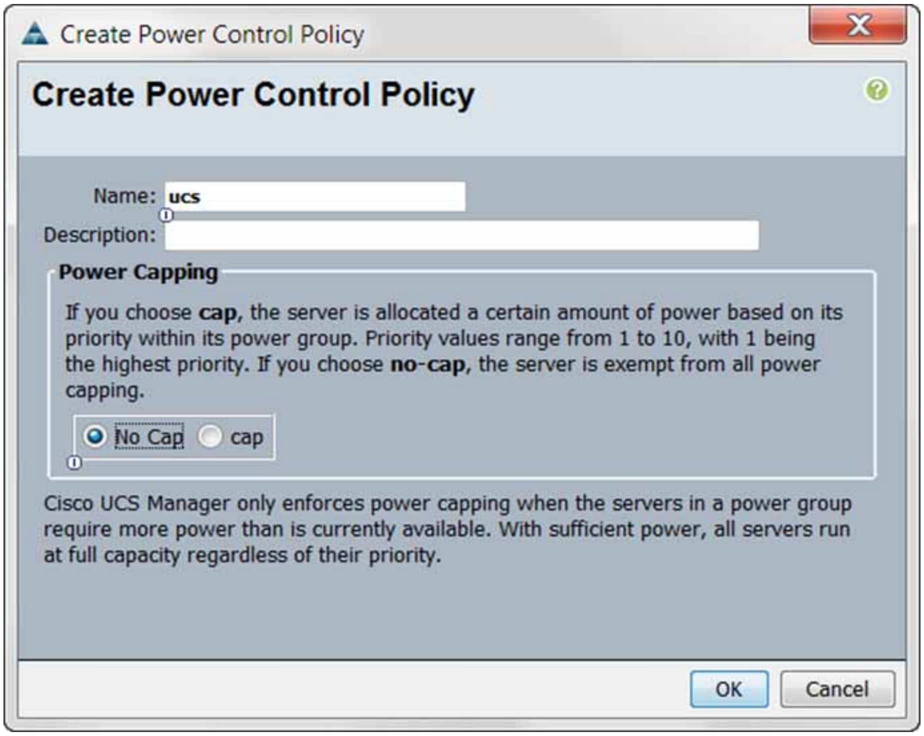
15. Select the **Servers** tab in the left pane in the UCS Manager GUI.
16. Select **Policies** > **root**.
17. Right-click the **Power Control Policies**.
18. Select **Create Power Control Policy.**

Figure 113 Creating Power Control Policy Part 1



19. Enter ucs as the Power Control policy name.
20. (Optional) enter a description for the boot policy.
21. Select **No cap** for Power Capping selection.
22. Click **OK** to the Power Control Policy.
23. Click **OK**.

Figure 114 Creating Power Control Policy Part 2



Create Power Control Policy

Create Power Control Policy

Name: ucs

Description:

Power Capping

If you choose **cap**, the server is allocated a certain amount of power based on its priority within its power group. Priority values range from 1 to 10, with 1 being the highest priority. If you choose **no-cap**, the server is exempt from all power capping.

● No Cap ○ cap

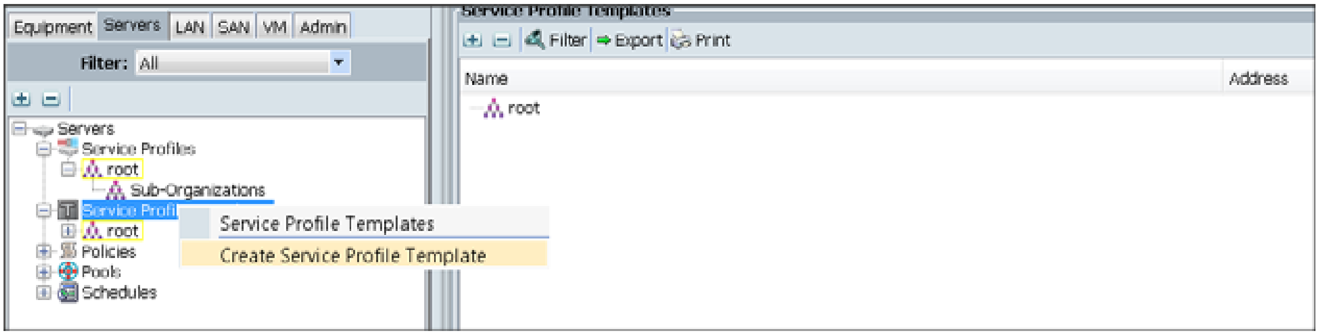
Cisco UCS Manager only enforces power capping when the servers in a power group require more power than is currently available. With sufficient power, all servers run at full capacity regardless of their priority.

Creating Service Profile Template

To create a service profile template, follow these steps:

1. Select the **Servers** tab in the left pane in the UCS Manager GUI.
2. Right-click **Service Profile Templates**.
3. Select **Create Service Profile Template**.

Figure 115 Creating Service Profile Template



4. The Create Service Profile Template window appears.

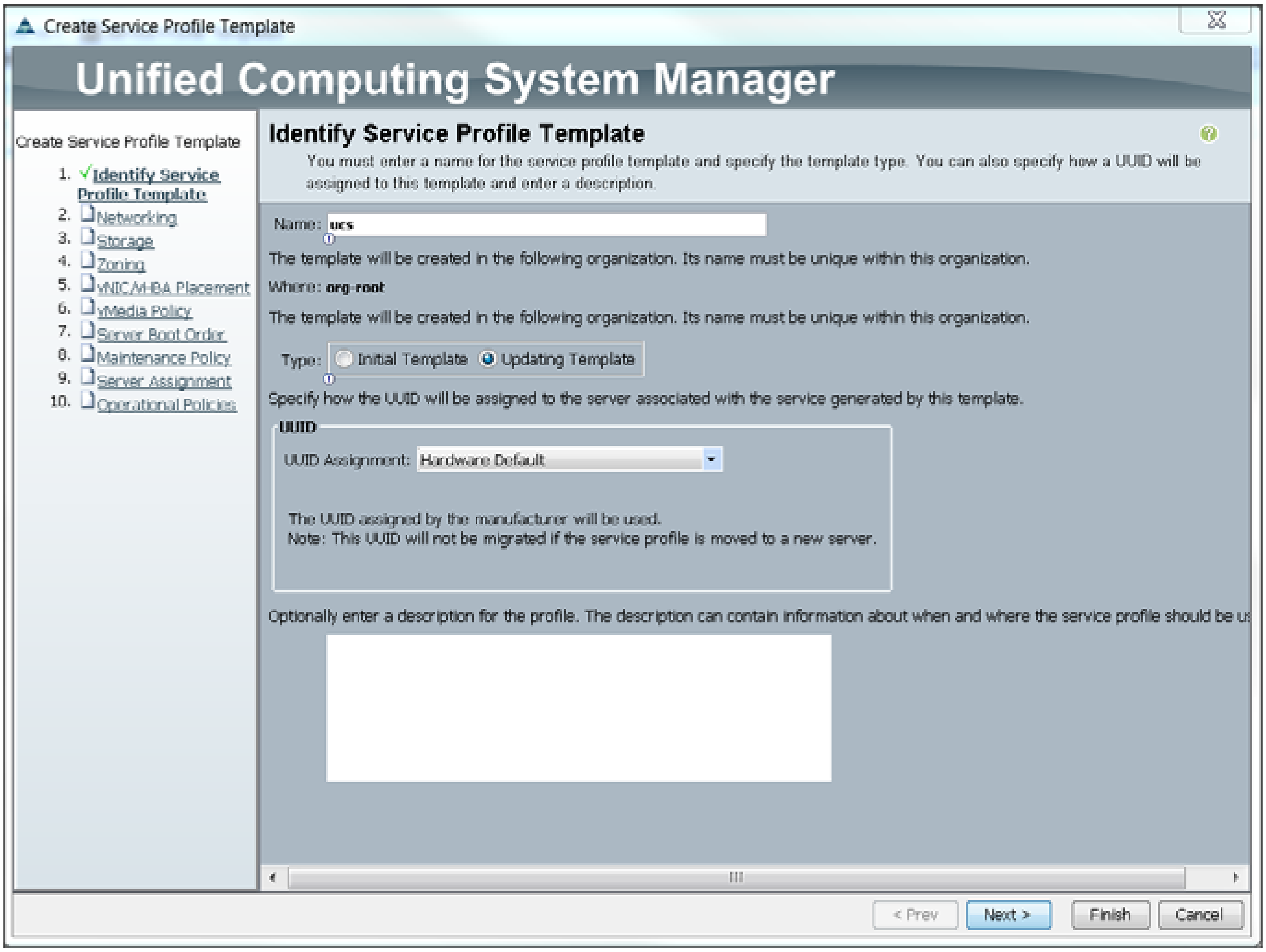
   These steps below provide a detailed configuration procedure to identify the service profile template:

   a. Name the service profile template as ucs. Click the **Updating Template** radio button.

b. In the UUID section, select **Hardware Default** as the UUID pool.

c. Click **Next** to continue to the next section.

Figure 116 Identify Service Profile Template



Identify Service Profile Template

You must enter a name for the service profile template and specify the template type. You can also specify how a UUID will be assigned to this template and enter a description.

Name: ucs

The template will be created in the following organization. Its name must be unique within this organization.

Where: org-root

The template will be created in the following organization. Its name must be unique within this organization.

Type: ○ Initial Template ● Updating Template

Specify how the UUID will be assigned to the server associated with the service generated by this template.

UUID

UUID Assignment: Hardware Default

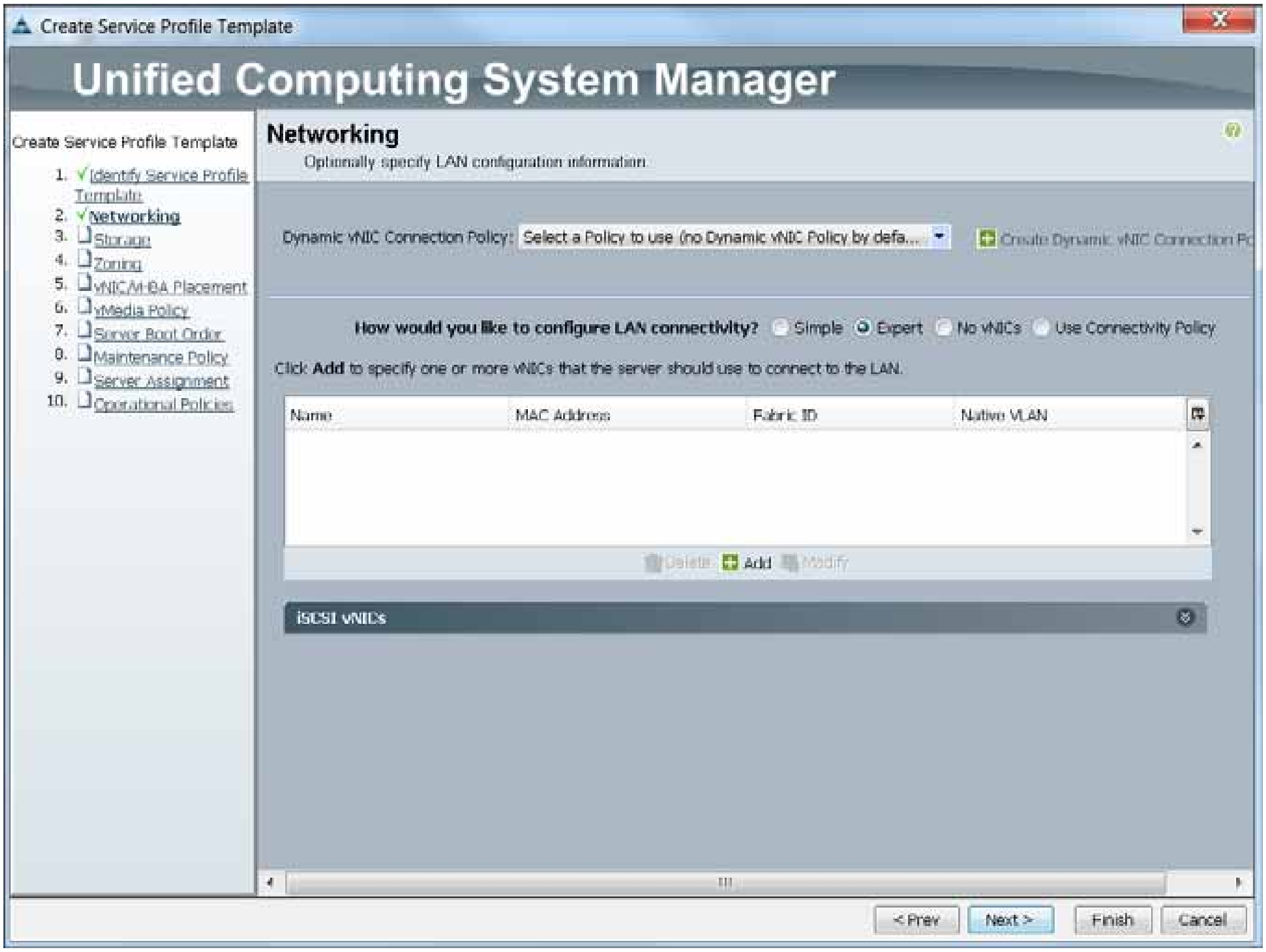
The UUID assigned by the manufacturer will be used.
Note: This UUID will not be migrated if the service profile is moved to a new server.

Optionally enter a description for the profile. The description can contain information about when and where the service profile should be u

Configuring Network Settings for the Template

1. Keep the Dynamic vNIC Connection Policy field at the default.
2. Click the **Expert** radio button for the option, **how would you like to configure LAN connectivity?**
3. Click **Add** to add a vNIC to the template.

Figure 117 Configuring Network Settings for the Template



Create Service Profile Template

Unified Computing System Manager

Create Service Profile Template

1. ✓ Identify Service Profile Template
2. ✓ Networking
3. □ Storage
4. □ Zoning
5. □ vNIC/vHBA Placement
6. □ vMedia Policy
7. □ Server Boot Order
8. □ Maintenance Policy
9. □ Server Assignment
10. □ Operational Policies

Networking

Optionally specify LAN configuration information.

Dynamic vNIC Connection Policy: Select a Policy to use (no Dynamic vNIC Policy by defa...

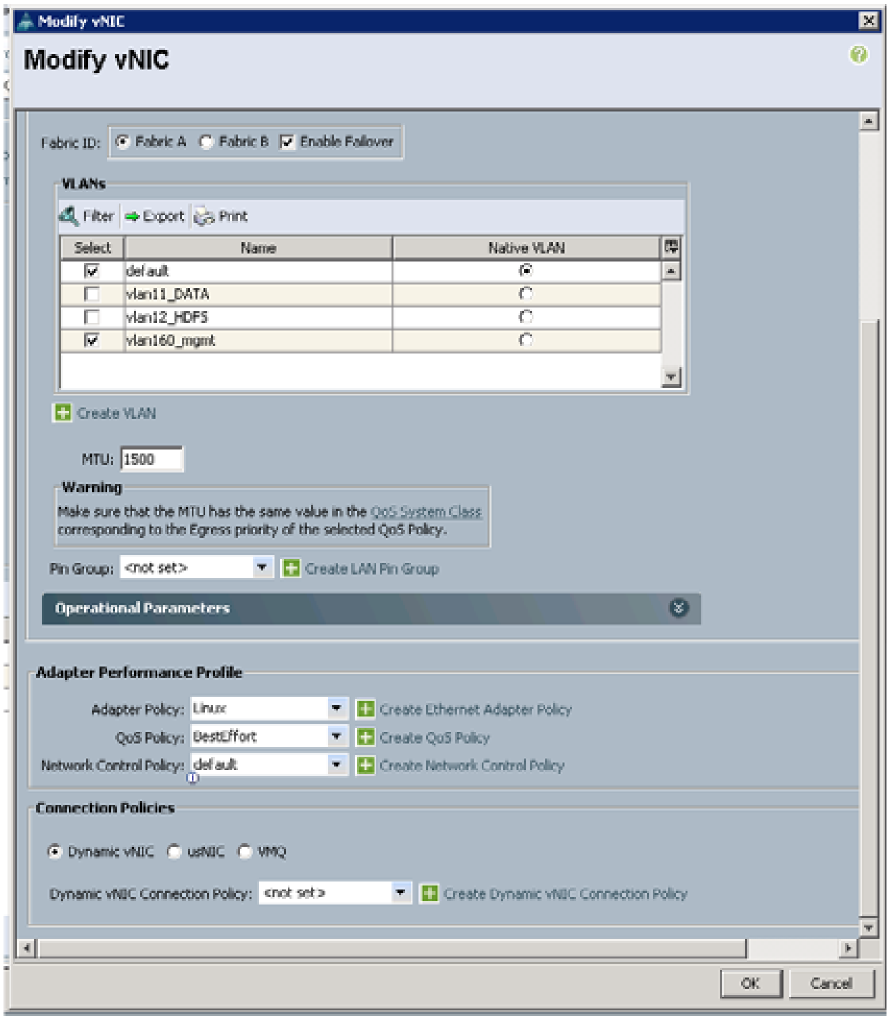
How would you like to configure LAN connectivity? ○ Simple ● Expert ○ No vNICs ○ Use Connectivity Policy

Click **Add** to specify one or more vNICs that the server should use to connect to the LAN.

Name	MAC Address	Fabric ID	Native VLAN

4. The Create vNIC window displays. Name the vNIC as eth0.
5. Select UCS in the Mac Address Assignment pool.
6. Click the **Fabric A** radio button and Check the **Enable failover** check box for the Fabric ID.
7. Check the vlan160_mgmt check box for VLANs and select the Native VLAN default radio button.
8. Select MTU size as 1500.
9. Select adapter policy as Linux
10. Select QoS Policy as BestEffort.
11. Keep the Network Control Policy as Default.
12. Keep the Connection Policies as Dynamic vNIC.
13. Keep the Dynamic vNIC Connection Policy as <not set>.
14. Click **OK**.

Figure 118 Configuring vNIC eth0



Modify vNIC

Fabric ID: ● Fabric A ○ Fabric B ☑ Enable Failover

VLANs

Select	Name	Native VLAN
☑	default	●
□	vlan11_DATA	○
□	vlan12_HDFS	○
☑	vlan160_mgmt	○

MTU: 1500

Warning

Make sure that the MTU has the same value in the QoS System Class corresponding to the Egress priority of the selected QoS Policy.

Pin Group: <not set>

Adapter Performance Profile

Adapter Policy: Linux

QoS Policy: BestEffort

Network Control Policy: default

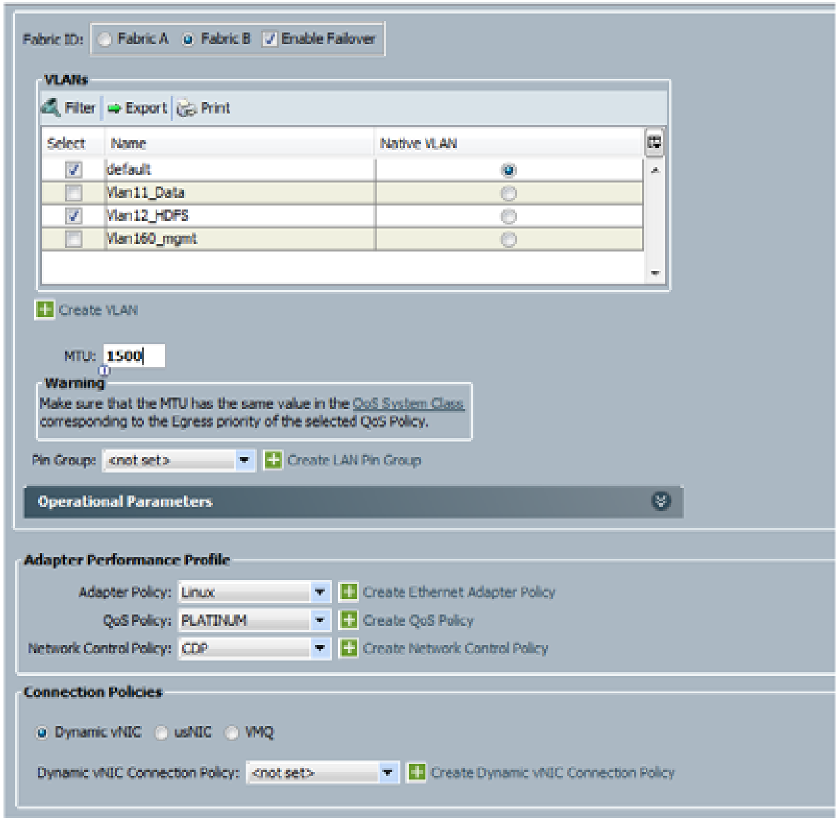
Connection Policies

● Dynamic vNIC ○ usNIC ○ VMQ

Dynamic vNIC Connection Policy: <not set>

15. The Create vNIC window appears. Name the vNIC eth1.
16. Select ucs in the Mac Address Assignment pool.
17. Click the **Fabric B** radio button and Check the **Enable failover** check box for the Fabric ID.
18. Check the **vlan12_HDFS** check box for VLANs and select the Native VLAN default radio button.
19. Select MTU size as 1500.
20. Select adapter policy as Linux.
21. Select QoS Policy as Platinum.
22. Keep the Network Control Policy as Default.
23. Keep the Connection Policies as Dynamic vNIC.
24. Keep the Dynamic vNIC Connection Policy as <not set>.
25. Click **OK**.

Figure 119 Configuring vNIC eth1



Fabric ID: ○ Fabric A ● Fabric B ☑ Enable Failover

VLANs

Select	Name	Native VLAN
☑	default	●
□	Vlan11_Data	○
☑	Vlan12_HDFS	○
□	Vlan160_mgmt	○

MTU: 1500

Warning
Make sure that the MTU has the same value in the QoS System Class corresponding to the Egress priority of the selected QoS Policy.

Pin Group: <not set>

Adapter Performance Profile

Adapter Policy: Linux

QoS Policy: PLATINUM

Network Control Policy: CDP

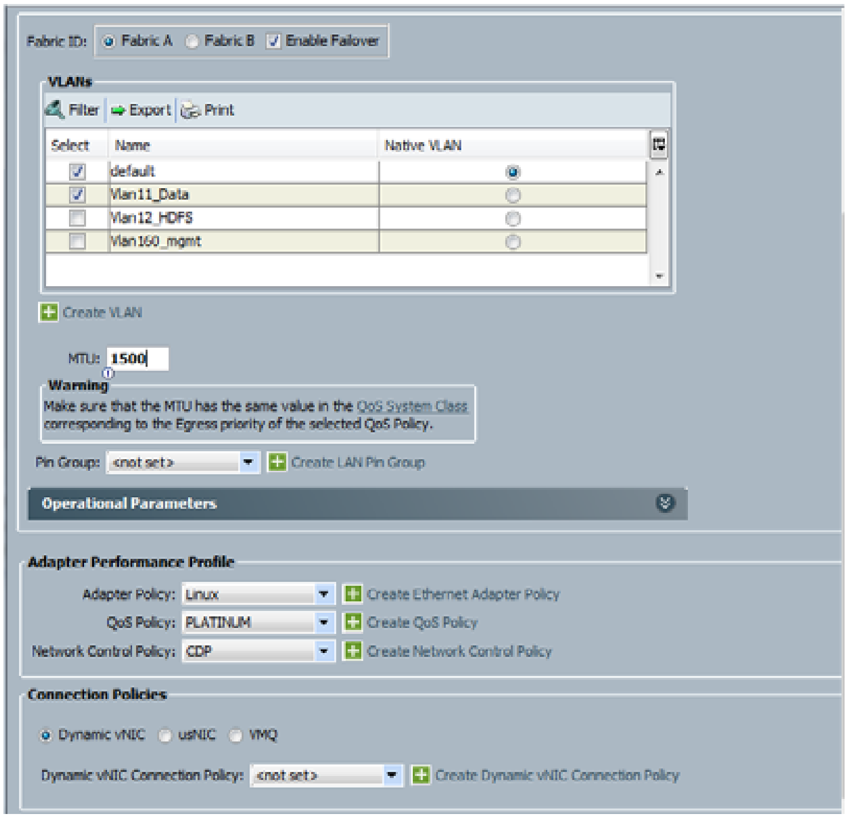
Connection Policies

● Dynamic vNIC ○ usNIC ○ VMQ

Dynamic vNIC Connection Policy: <not set>

26. The Create vNIC window appears. Name the vNIC eth2.
27. Select ucs in the Mac Address Assignment pool.
28. Click the **Fabric A** radio button, and then Check the **Enable failover** check box for the Fabric ID.
29. Check the **vlan11_DATA** check box for VLANs and select the Native VLAN default radio button.
30. Select MTU size as 1500.
31. Select adapter policy as Linux.
32. Select QoS Policy as Platinum.
33. Keep the Network Control Policy as Default.
34. Keep the Connection Policies as Dynamic vNIC.
35. Keep the Dynamic vNIC Connection Policy as <not set>.
36. Click **OK**.

Figure 120 Configuring vNIC eth2



Fabric ID: ● Fabric A ○ Fabric B ☑ Enable Failover

VLANs

Select	Name	Native VLAN
☑	default	●
☑	Vlan11_Data	○
□	Vlan12_HDFS	○
□	Vlan160_mgmt	○

MTU: 1500

Warning
Make sure that the MTU has the same value in the QoS System Class corresponding to the Egress priority of the selected QoS Policy.

Pin Group: <not set>

Adapter Performance Profile

Adapter Policy: Linux

QoS Policy: PLATINUM

Network Control Policy: CDP

Connection Policies

● Dynamic vNIC ○ usNIC ○ VMQ

Dynamic vNIC Connection Policy: <not set>

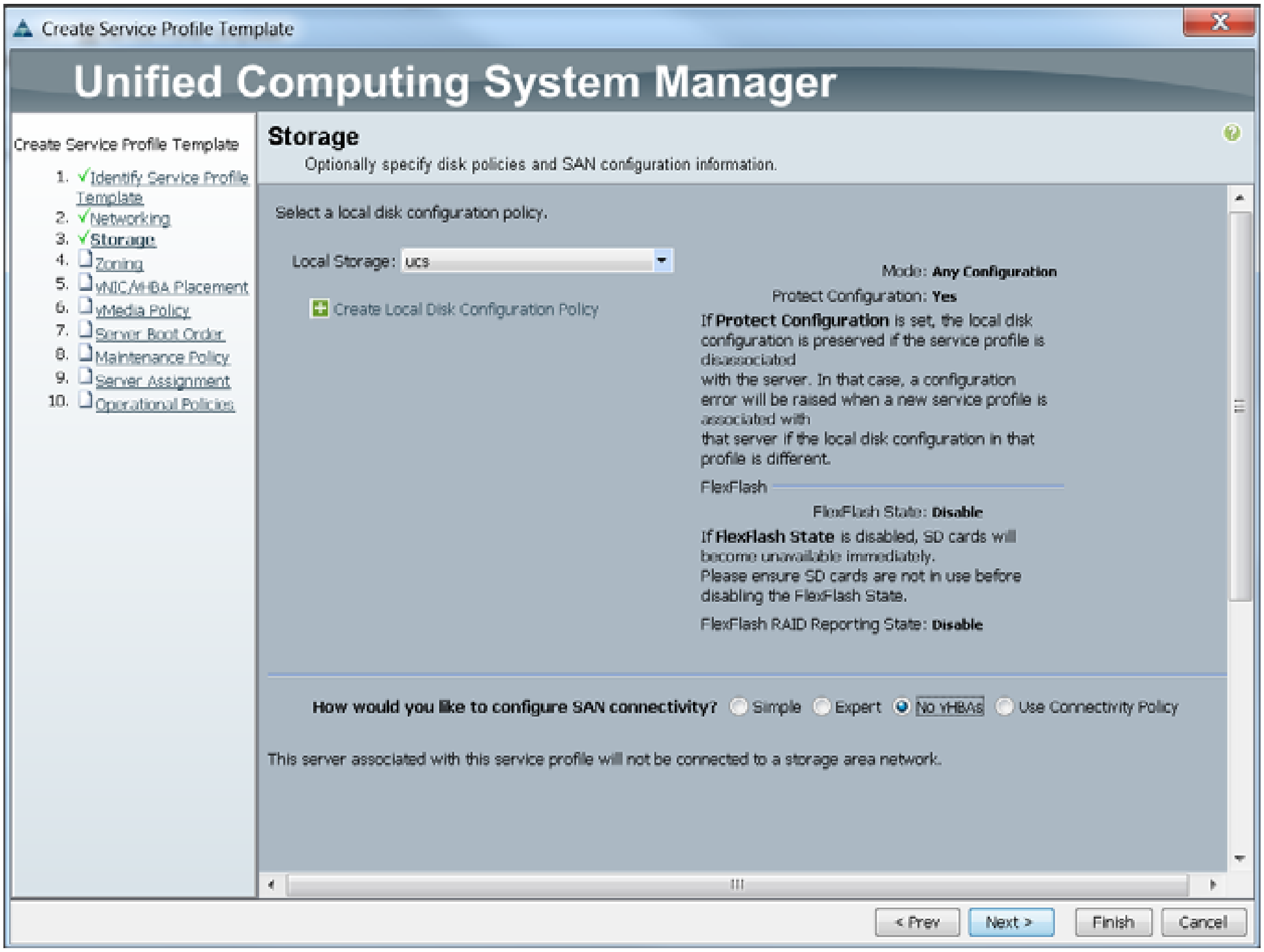
Filter
Export
Print
Create VLAN
Create LAN Pin Group
Operational Parameters
Create Ethernet Adapter Policy
Create QoS Policy
Create Network Control Policy
Create Dynamic vNIC Connection Policy

Configuring Storage Policy for the Template

Follow these steps to configure storage policies:

1. Select ucs for the local disk configuration policy.
2. Click the **No vHBAs** radio button for the option, **How would you like to configure SAN connectivity?**
3. Click **Next** to continue to the next section.

Figure 121 Configuring Storage Settings



Create Service Profile Template
Unified Computing System Manager

Create Service Profile Template

1. ✓Identify Service Profile Template
2. ✓Networking
3. ✓Storage
4. Zoning
5. vNIC/vHBA Placement
6. vMedia Policy
7. Server Boot Order
8. Maintenance Policy
9. Server Assignment
10. Operational Policies

Storage

Optionally specify disk policies and SAN configuration information.

Select a local disk configuration policy.

Local Storage: ucs

Create Local Disk Configuration Policy

Mode: **Any Configuration**

Protect Configuration: **Yes**

If **Protect Configuration** is set, the local disk configuration is preserved if the service profile is disassociated with the server. In that case, a configuration error will be raised when a new service profile is associated with that server if the local disk configuration in that profile is different.

FlexFlash

FlexFlash State: **Disable**

If **FlexFlash State** is disabled, SD cards will become unavailable immediately. Please ensure SD cards are not in use before disabling the FlexFlash State.

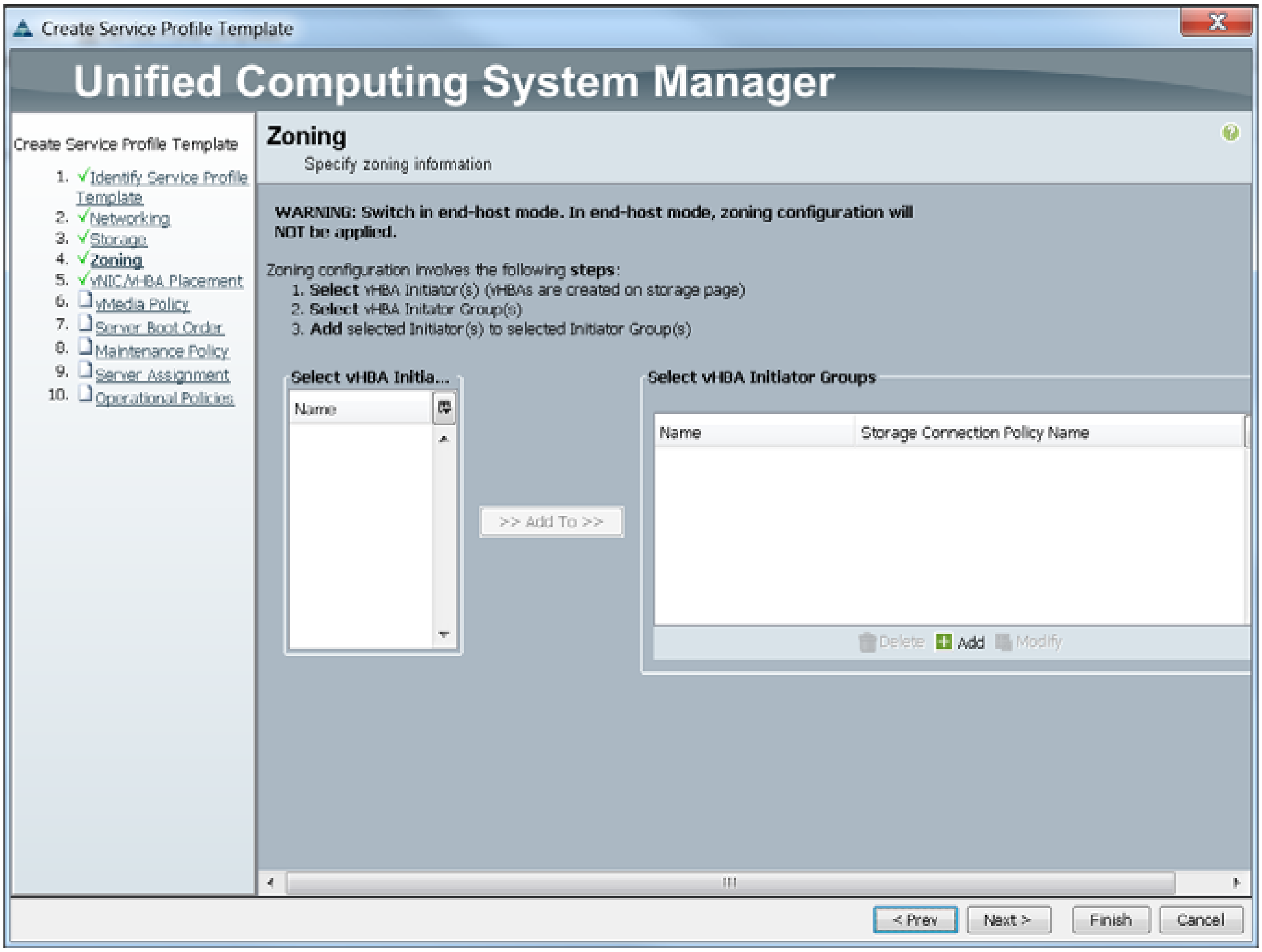
FlexFlash RAID Reporting State: **Disable**

How would you like to configure SAN connectivity? ○ Simple ○ Expert ● No vHBAs ○ Use Connectivity Policy

This server associated with this service profile will not be connected to a storage area network.

4. Click **Next** once the zoning window appears to go to the next section.

Figure 122 Configure Zoning



Create Service Profile Template
Unified Computing System Manager
Create Service Profile Template
1. ✓Identify Service Profile Template
2. ✓Networking
3. ✓Storage
4. ✓Zoning
5. ✓vNIC/vHBA Placement
6. □vMedia Policy
7. □Server Boot Order
8. □Maintenance Policy
9. □Server Assignment
10. □Operational Policies
Zoning
Specify zoning information
Select vHBA Initia...
Name
>> Add To >>
Select vHBA Initiator Groups
Name
Storage Connection Policy Name
Delete
Add
Modify
< Prev
Next >
Finish
Cancel

WARNING: Switch in end-host mode. In end-host mode, zoning configuration will NOT be applied.

Zoning configuration involves the following **steps**:

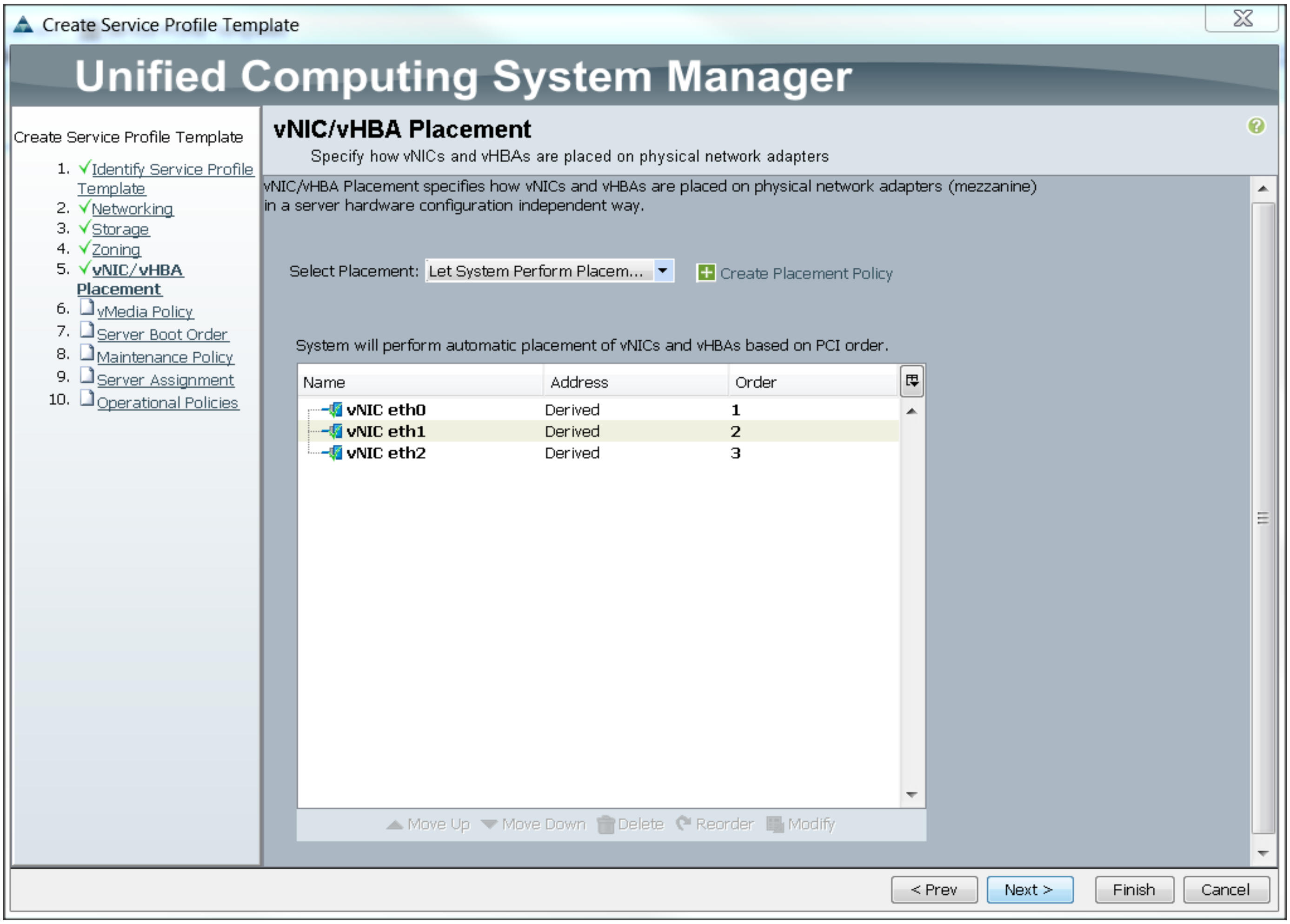
1. **Select** vHBA Initiator(s) (vHBAs are created on storage page)
2. **Select** vHBA Initiator Group(s)
3. **Add** selected Initiator(s) to selected Initiator Group(s)

Configuring vNIC/vHBA Placement for the Template

Follow these steps to configure vNIC/vHBA placement policy:

1. Select the Default Placement Policy option for the Select Placement field.
2. Select eth0, eth1 and eth2 assign the vNICs in the following order:
   a. eth0
   b. eth1
   c. eth2
3. Review to make sure that all of the vNICs were assigned in the appropriate order.
4. Click **Next** to continue to the next section.

Figure 123 vNIC/vHBA Placement



vNIC/vHBA Placement

Specify how vNICs and vHBAs are placed on physical network adapters

vNIC/vHBA Placement specifies how vNICs and vHBAs are placed on physical network adapters (mezzanine) in a server hardware configuration independent way.

Select Placement: Let System Perform Placem...

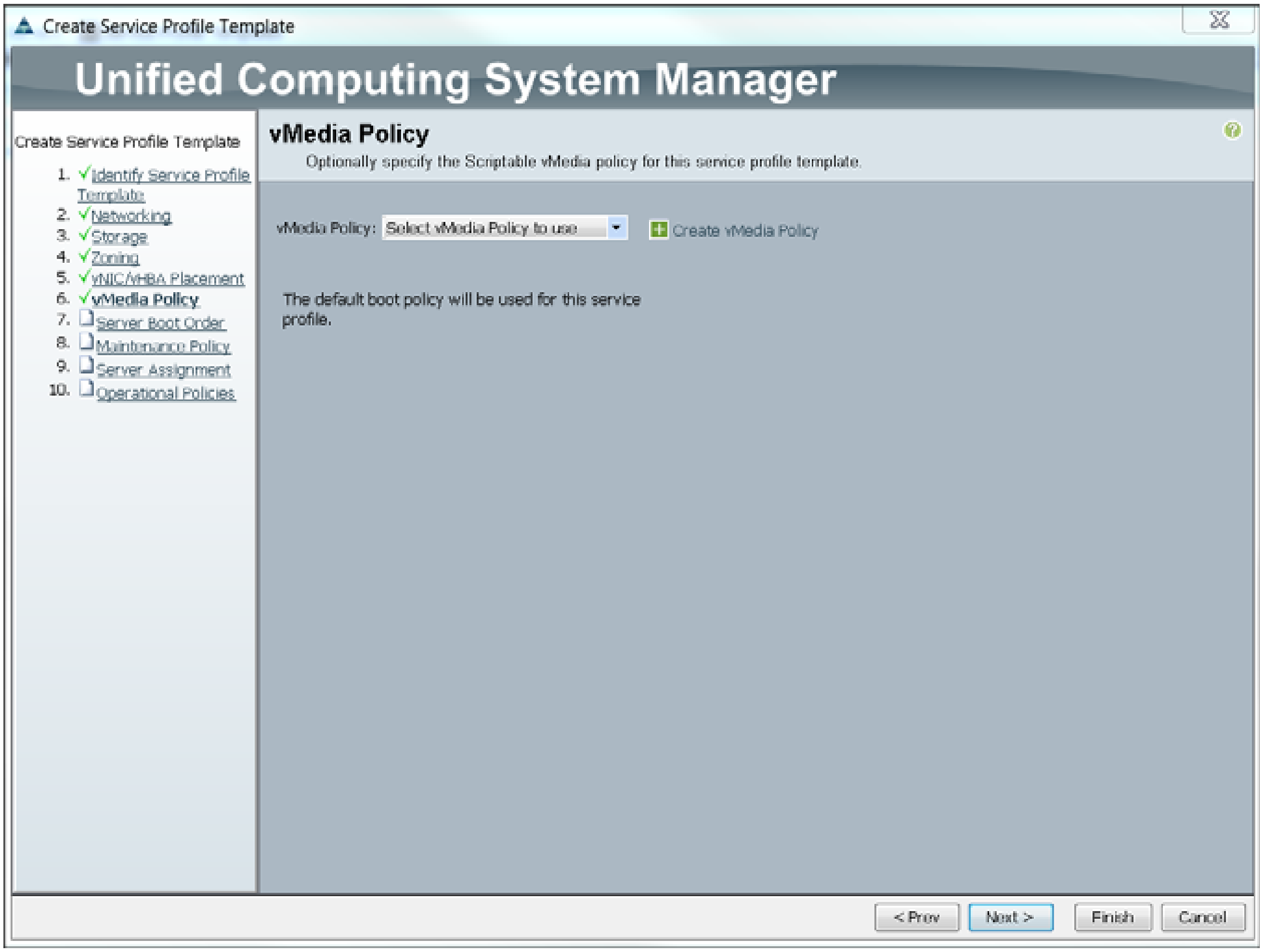
System will perform automatic placement of vNICs and vHBAs based on PCI order.

Name	Address	Order
vNIC eth0	Derived	1
vNIC eth1	Derived	2
vNIC eth2	Derived	3

Configuring vMedia Policy for the Template

1. Click **Next** once the vMedia Policy window appears to go to the next section.

Figure 124 UCSM vMedia Policy Window



vMedia Policy

Optionally specify the Scriptable vMedia policy for this service profile template.

vMedia Policy: Select vMedia Policy to use

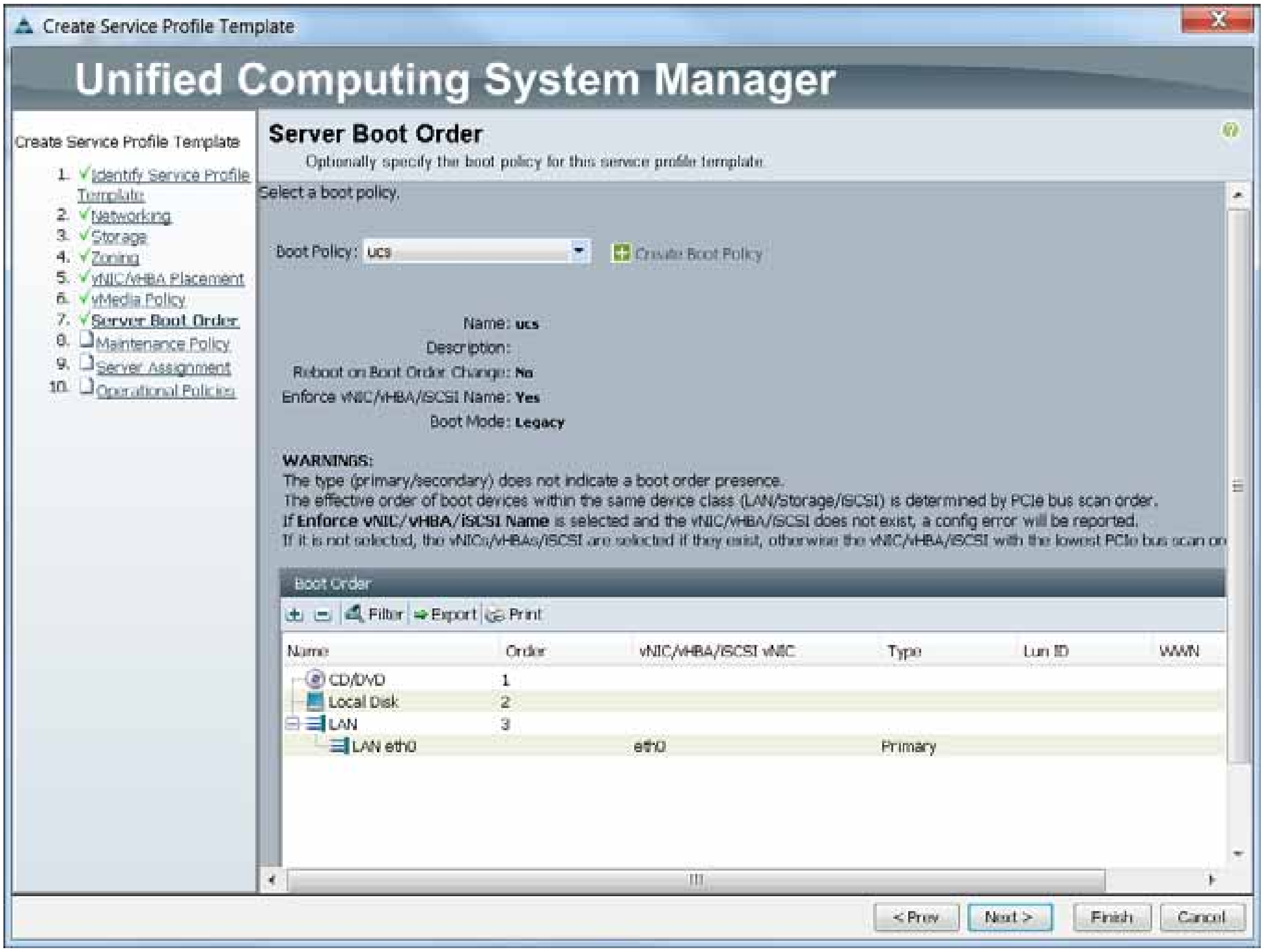
The default boot policy will be used for this service profile.

Configuring Server Boot Order for the Template

Follow these steps to set the boot order for servers:

1. Select ucs in the Boot Policy name field.
2. Review to make sure that all of the boot devices were created and identified.
3. Verify that the boot devices are in the correct boot sequence.
4. Click **OK**.
5. Click **Next** to continue to the next section.

Figure 125 Creating Boot Policy



Server Boot Order

Optionally specify the boot policy for this service profile template.

Select a boot policy.

Boot Policy: ucs

Name: **ucs**
Description:
Reboot on Boot Order Change: **No**
Enforce vNIC/vHBA/iSCSI Name: **Yes**
Boot Mode: **Legacy**

WARNINGS:
The type (primary/secondary) does not indicate a boot order presence.
The effective order of boot devices within the same device class (LAN/Storage/iSCSI) is determined by PCIe bus scan order.
If **Enforce vNIC/vHBA/iSCSI Name** is selected and the vNIC/vHBA/iSCSI does not exist, a config error will be reported.
If it is not selected, the vNICs/vHBAs/iSCSI are selected if they exist, otherwise the vNIC/vHBA/iSCSI with the lowest PCIe bus scan or

Boot Order

Name	Order	vNIC/vHBA/iSCSI vNIC	Type	Lun ID	WWN
CD/DVD	1				
Local Disk	2				
LAN	3				
LAN eth0		eth0	Primary		

In the Maintenance Policy window, follow these steps to apply the maintenance policy:

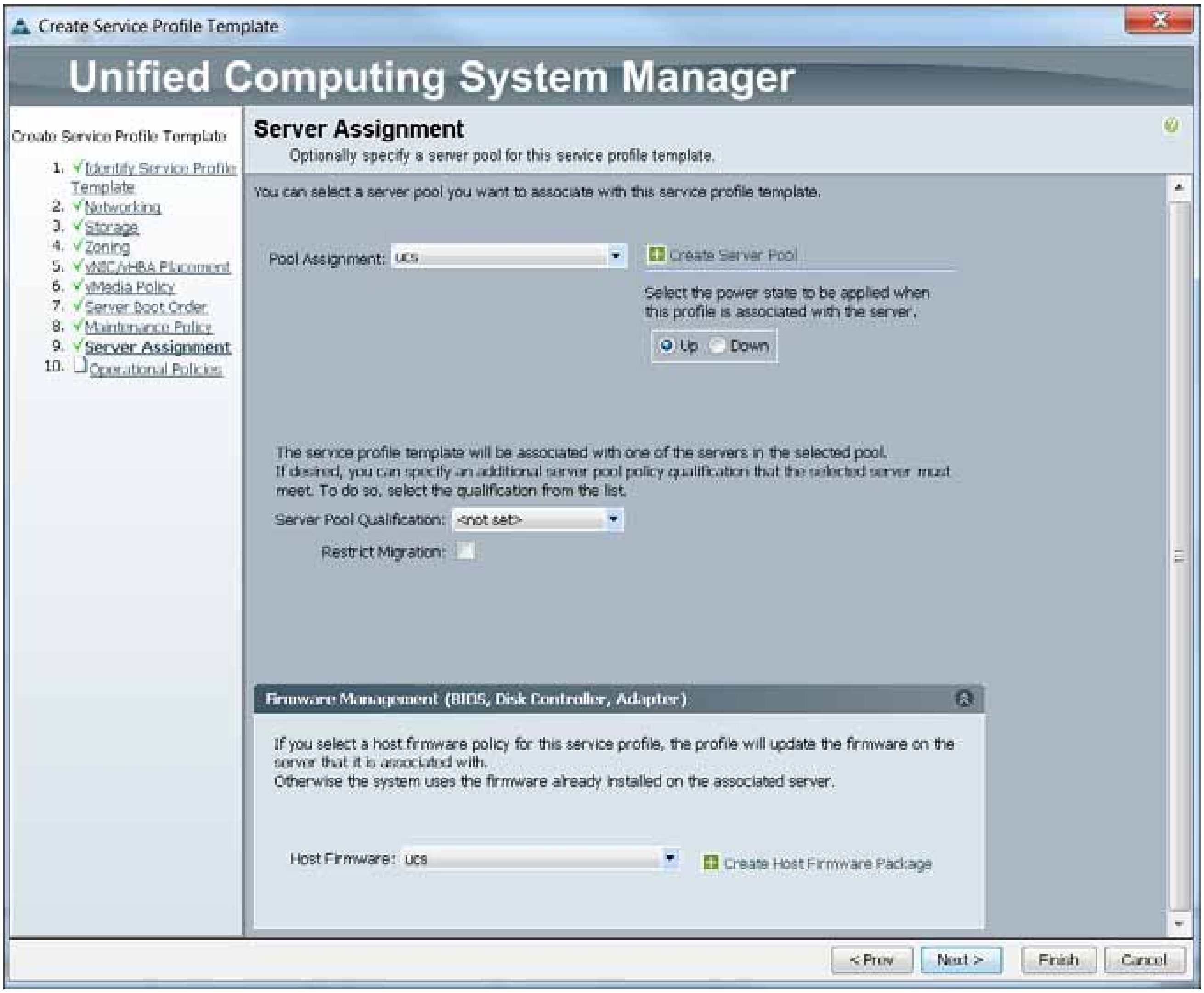
1. Keep the Maintenance policy at no policy used by default.
2. Click **Next** to continue to the next section.

Configuring Server Assignment for the Template

In the Server Assignment window, follow these steps to assign the servers to the pool:

3. Select ucs for the Pool Assignment field.
4. Keep the Server Pool Qualification field at default.
5. Select ucs in Host Firmware Package.

Figure 126 *Server Assignment*



Create Service Profile Template

Unified Computing System Manager

Create Service Profile Template

1. ✓ Identify Service Profile Template
2. ✓ Networking
3. ✓ Storage
4. ✓ Zoning
5. ✓ vNIC/vHBA Placement
6. ✓ vMedia Policy
7. ✓ Server Boot Order
8. ✓ Maintenance Policy
9. ✓ **Server Assignment**
10. □ Operational Policies

Server Assignment

Optionally specify a server pool for this service profile template.

You can select a server pool you want to associate with this service profile template.

Pool Assignment: ucs

Select the power state to be applied when this profile is associated with the server.

● Up ○ Down

The service profile template will be associated with one of the servers in the selected pool.
If desired, you can specify an additional server pool policy qualification that the selected server must meet. To do so, select the qualification from the list.

Server Pool Qualification: <not set>

Restrict Migration: □

Firmware Management (BIOS, Disk Controller, Adapter)

If you select a host firmware policy for this service profile, the profile will update the firmware on the server that it is associated with.
Otherwise the system uses the firmware already installed on the associated server.

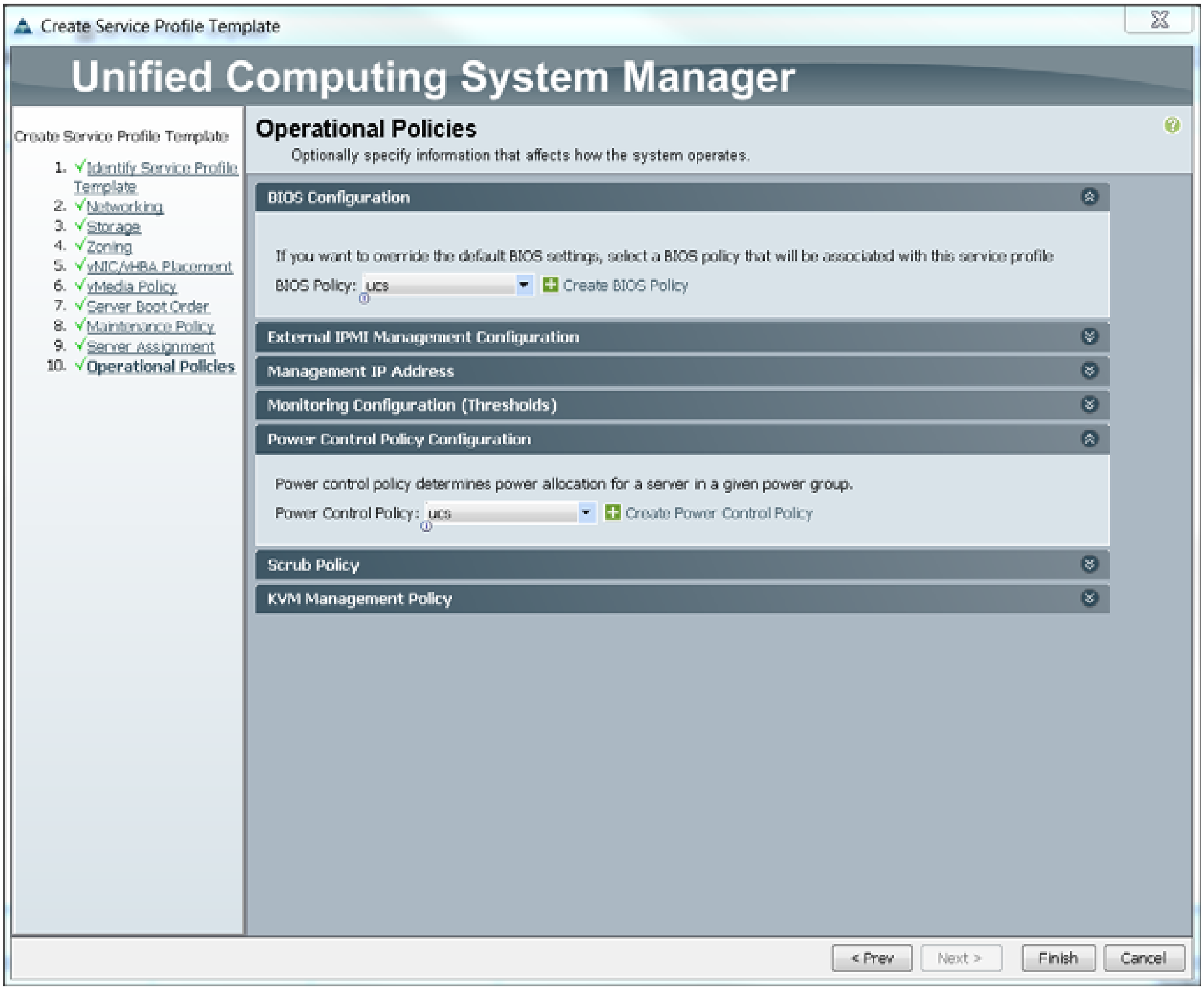
Host Firmware: ucs

Configuring Operational Policies for the Template

In the Operational Policies Window, follow these steps:

6. Select ucs in the BIOS Policy field.
7. Select ucs in the Power Control Policy field.
8. Click **Finish** to create the Service Profile template.
9. Click **OK** in the pop-up window to proceed.

Figure 127 Selecting BIOS and Power Control Policy



Create Service Profile Template

Unified Computing System Manager

Create Service Profile Template

1. ✓Identify Service Profile Template
2. ✓Networking
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5. ✓vNIC/vHBA Placement
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7. ✓Server Boot Order
8. ✓Maintenance Policy
9. ✓Server Assignment
10. ✓Operational Policies

Operational Policies

Optionally specify information that affects how the system operates.

BIOS Configuration

If you want to override the default BIOS settings, select a BIOS policy that will be associated with this service profile

BIOS Policy: ucs

Create BIOS Policy
External IPMI Management Configuration
Management IP Address
Monitoring Configuration (Thresholds)
Power Control Policy Configuration

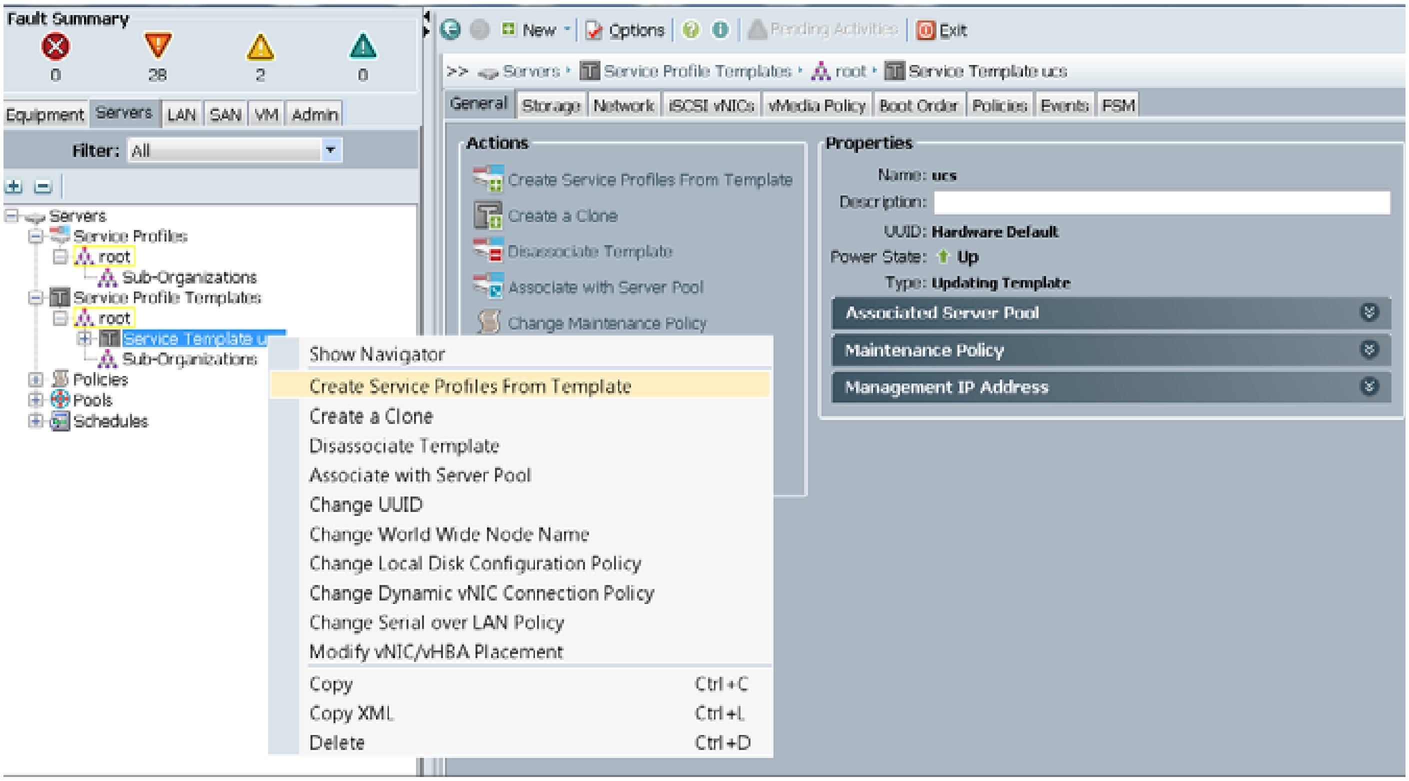
Power control policy determines power allocation for a server in a given power group.

Power Control Policy: ucs

Select the **Servers** tab in the left pane of the UCS Manager GUI.

1. Go to Service Profile **Templates > root**.
2. Right-click Service Profile Templates ucs.
3. Select Create Service Profiles From Template.

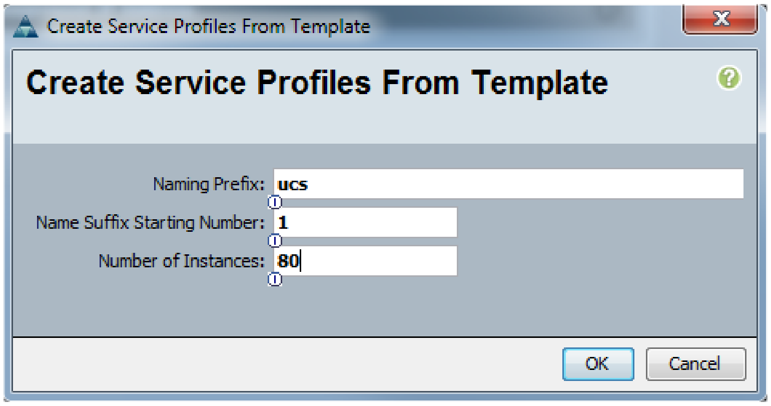
Figure 128 Creating Service Profiles from Template



Name: ucs
Description:
UUID: Hardware Default
Power State: Up
Type: Updating Template

4. The Create Service Profile from Template window appears.

Figure 129 Selecting Name and Total number of Service Profiles

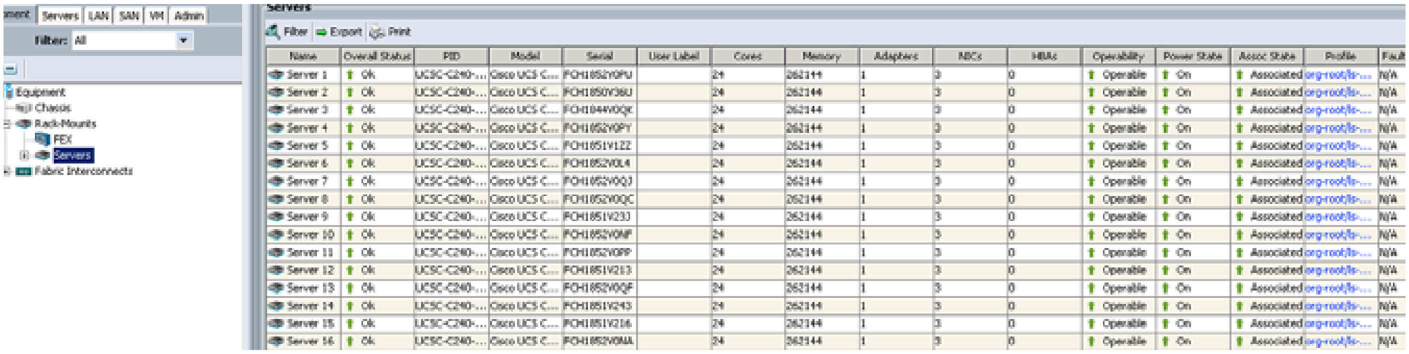

Create Service Profiles From Template
Create Service Profiles From Template
OK
Cancel

Naming Prefix: ucs
Name Suffix Starting Number: 1
Number of Instances: 80

Association of the Service Profiles will take place automatically.

The Final Cisco UCS Manager window is shown in Figure 131.

Figure 130 UCS Manager showing all Nodes



Name	Overall Status	PID	Model	Serial	User Label	Cores	Memory	Adapters	NICs	HBAs	Operability	Power State	Assoc State	Profile	Faul
Server 1	Ok	UCSC-C240-...	Cisco UCS C...	FCH1852Y0PU		24	262144	1	3	0	Operable	On	Associated	org-root/ls-...	N/A
Server 2	Ok	UCSC-C240-...	Cisco UCS C...	FCH1850Y36U		24	262144	1	3	0	Operable	On	Associated	org-root/ls-...	N/A
Server 3	Ok	UCSC-C240-...	Cisco UCS C...	FCH1844V0QK		24	262144	1	3	0	Operable	On	Associated	org-root/ls-...	N/A
Server 4	Ok	UCSC-C240-...	Cisco UCS C...	FCH1852Y0PY		24	262144	1	3	0	Operable	On	Associated	org-root/ls-...	N/A
Server 5	Ok	UCSC-C240-...	Cisco UCS C...	FCH1851V1ZZ		24	262144	1	3	0	Operable	On	Associated	org-root/ls-...	N/A
Server 6	Ok	UCSC-C240-...	Cisco UCS C...	FCH1852V0L4		24	262144	1	3	0	Operable	On	Associated	org-root/ls-...	N/A
Server 7	Ok	UCSC-C240-...	Cisco UCS C...	FCH1852V0QJ		24	262144	1	3	0	Operable	On	Associated	org-root/ls-...	N/A
Server 8	Ok	UCSC-C240-...	Cisco UCS C...	FCH1852V0QC		24	262144	1	3	0	Operable	On	Associated	org-root/ls-...	N/A
Server 9	Ok	UCSC-C240-...	Cisco UCS C...	FCH1851V23J		24	262144	1	3	0	Operable	On	Associated	org-root/ls-...	N/A
Server 10	Ok	UCSC-C240-...	Cisco UCS C...	FCH1852V0NF		24	262144	1	3	0	Operable	On	Associated	org-root/ls-...	N/A
Server 11	Ok	UCSC-C240-...	Cisco UCS C...	FCH1852V0PP		24	262144	1	3	0	Operable	On	Associated	org-root/ls-...	N/A
Server 12	Ok	UCSC-C240-...	Cisco UCS C...	FCH1851V213		24	262144	1	3	0	Operable	On	Associated	org-root/ls-...	N/A
Server 13	Ok	UCSC-C240-...	Cisco UCS C...	FCH1852V0QF		24	262144	1	3	0	Operable	On	Associated	org-root/ls-...	N/A
Server 14	Ok	UCSC-C240-...	Cisco UCS C...	FCH1851V243		24	262144	1	3	0	Operable	On	Associated	org-root/ls-...	N/A
Server 15	Ok	UCSC-C240-...	Cisco UCS C...	FCH1851V216		24	262144	1	3	0	Operable	On	Associated	org-root/ls-...	N/A
Server 16	Ok	UCSC-C240-...	Cisco UCS C...	FCH1852V0NA		24	262144	1	3	0	Operable	On	Associated	org-root/ls-...	N/A

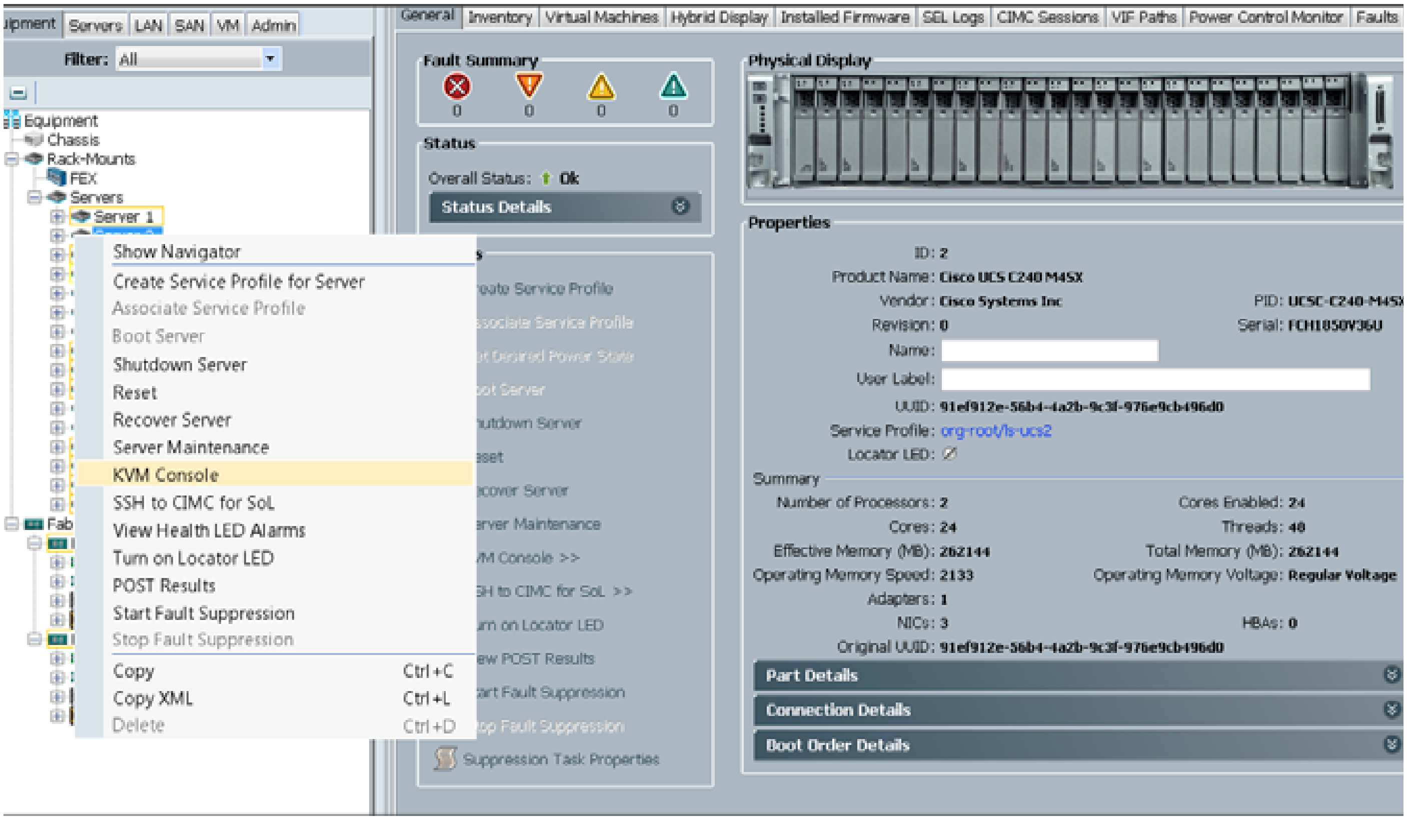
Installing Redhat Enterprise Linux 6.5 software RAID on Cisco UCS C240M4 Servers

The following section provides detailed procedure for installing Red Hat Linux 6.5 using Software RAID (OS Based Mirroring) on cisco UCS C240 M4 Servers.

There are multiple methods to install Red Hat Linux operating system. The installation procedure described in this deployment guide uses KVM console and virtual media from Cisco UCS Manager.

1. Log in to the Cisco UCS 6296 Fabric Interconnect and launch the Cisco UCS Manager application.
2. Select the **Equipment** tab.
3. In the navigation pane expand Rack-mounts and Servers.
4. Right-click the server and select **KVM Console**.

Figure 131 Selecting KVM Console Option



Overall Status: ⬆ Ok

Properties

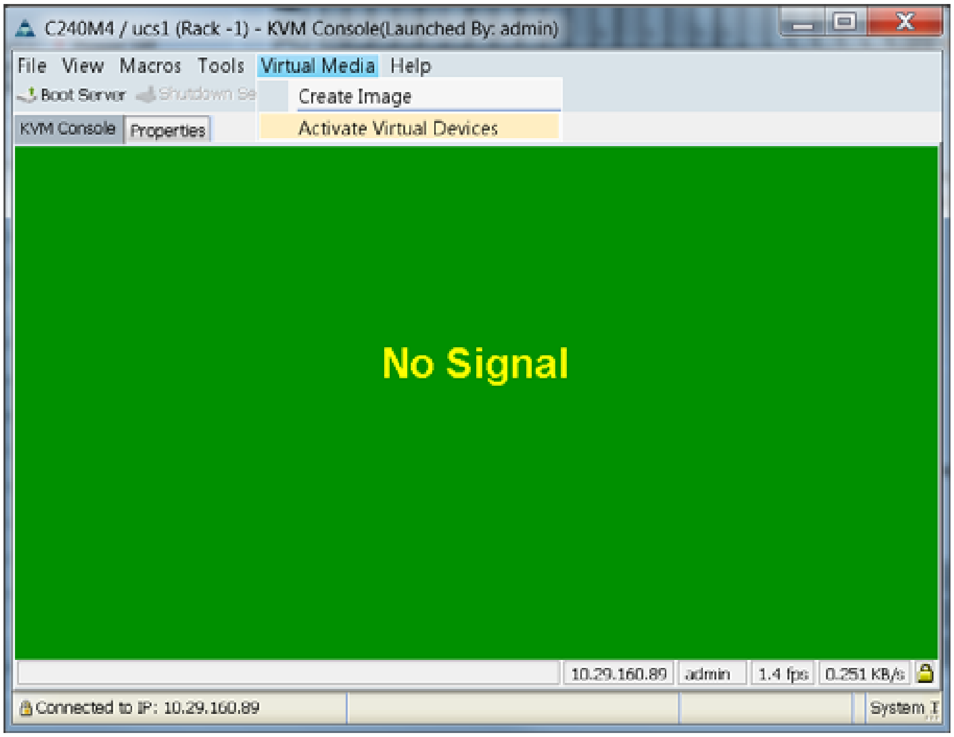
ID: 2
Product Name: Cisco UCS C240 M4SX
Vendor: Cisco Systems Inc
PID: UCSC-C240-M4SX
Revision: 0
Serial: FCH1850V36U
Name:
User Label:
UUID: 91ef912e-56b4-4a2b-9c3f-976e9cb496d0
Service Profile: org-root/ls-ucs2
Locator LED: ⊘

Summary

Number of Processors: 2
Cores Enabled: 24
Cores: 24
Threads: 48
Effective Memory (MB): 262144
Total Memory (MB): 262144
Operating Memory Speed: 2133
Operating Memory Voltage: Regular Voltage
Adapters: 1
NICs: 3
HBAs: 0
Original UUID: 91ef912e-56b4-4a2b-9c3f-976e9cb496d0

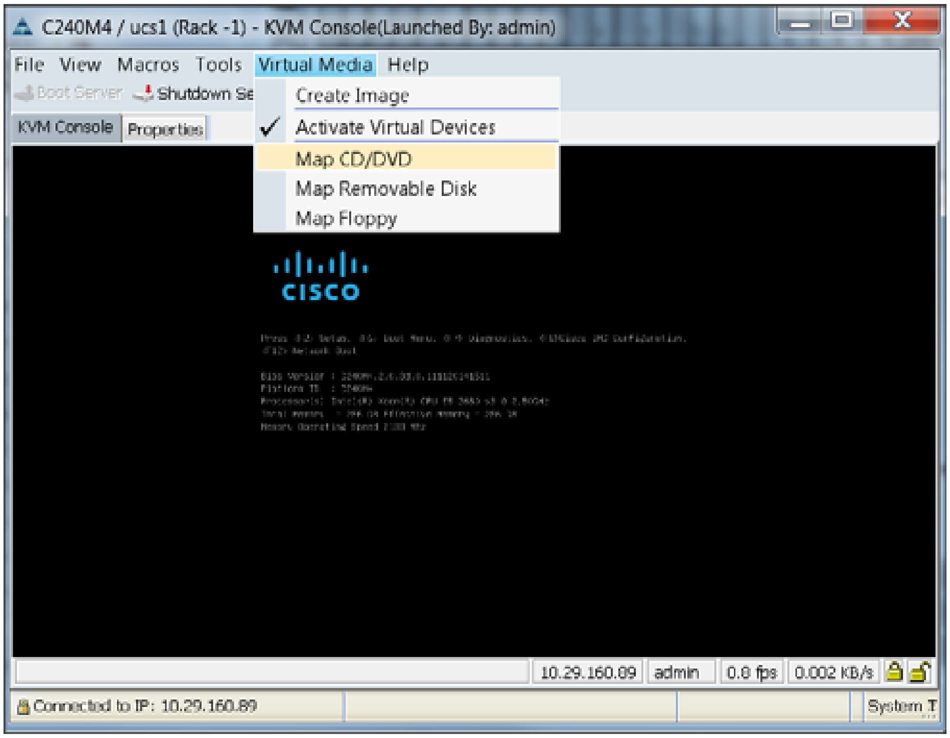
1. In the KVM window, select the **Virtual Media** tab.
2. Click the **Activate Virtual Devices** found under **Virtual Media** tab.

Figure 132 Selecting Activate Virtual Devices


C240M4 / ucs1 (Rack -1) - KVM Console(Launched By: admin)
File View Macros Tools Virtual Media Help
Boot Server Shutdown Se
KVM Console Properties
Create Image
Activate Virtual Devices
No Signal
10.29.160.89 admin 1.4 fps 0.251 KB/s
Connected to IP: 10.29.160.89
System T

3. In the KVM window, select the Virtual Media tab and Click the **Map CD/DVD**.

Figure 133 Mapping ISO Image

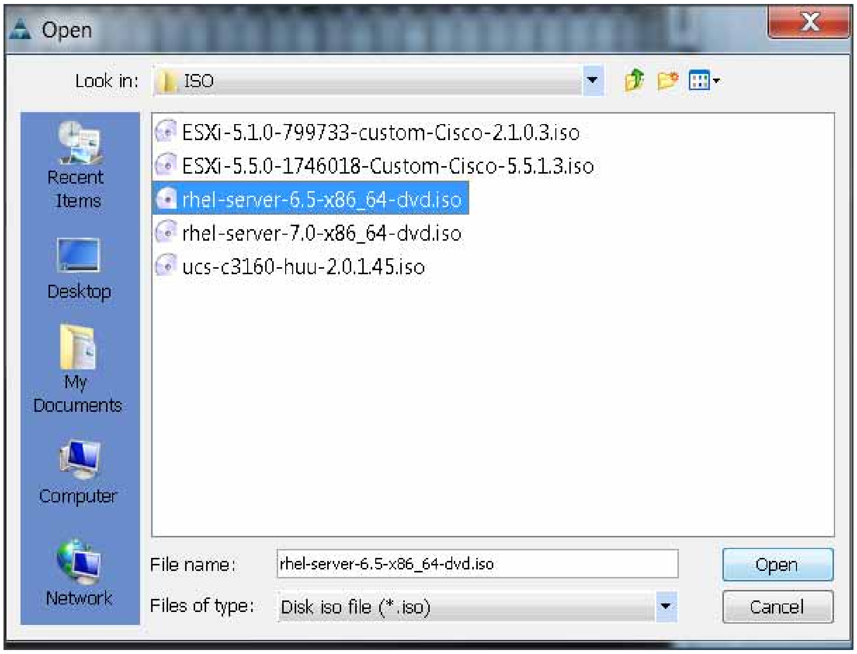

C240M4 / ucs1 (Rack -1) - KVM Console(Launched By: admin)
File View Macros Tools Virtual Media Help
Boot Server Shutdown Se
KVM Console Properties
Create Image
✓ Activate Virtual Devices
Map CD/DVD
Map Removable Disk
Map Floppy
cisco
10.29.160.89 admin 0.8 fps 0.002 KB/s
Connected to IP: 10.29.160.89
System T

4. Browse to the Red Hat Enterprise Linux Server 6.5 installer ISO image file.

Note The Red Hat Enterprise Linux 6.5 DVD is assumed to be on the client machine.

5. Click **Open** to add the image to the list of virtual media.

Figure 134 Browse to Red Hat Enterprise Linux ISO Image

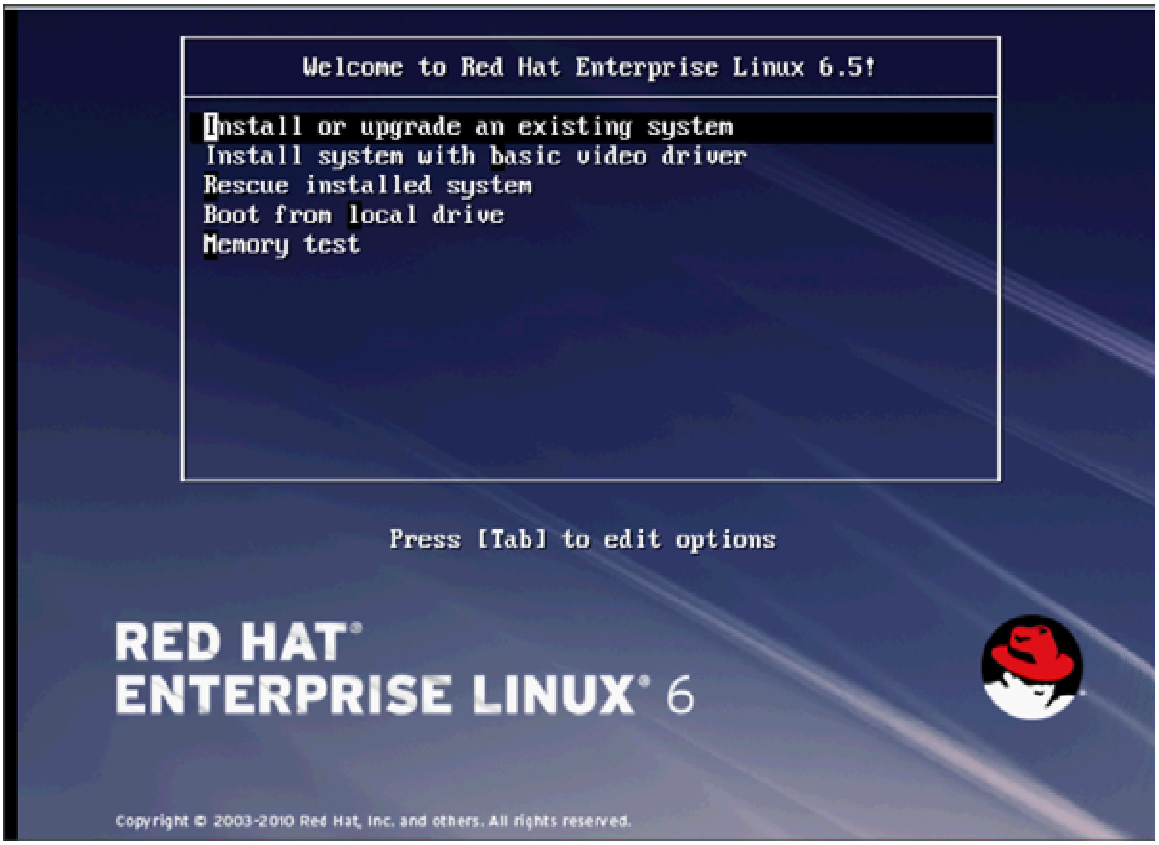


ESXi-5.1.0-799733-custom-Cisco-2.1.0.3.iso
ESXi-5.5.0-1746018-Custom-Cisco-5.5.1.3.iso
rhel-server-6.5-x86_64-dvd.iso
rhel-server-7.0-x86_64-dvd.iso
ucs-c3160-huu-2.0.1.45.iso

File name: rhel-server-6.5-x86_64-dvd.iso
Files of type: Disk iso file (*.iso)

6. In the KVM window, select the **KVM** tab to monitor during boot.
7. In the KVM window, select the **Macros > Static Macros > Ctrl-Alt-Del** button in the upper left corner.
8. Click **OK**.
9. Click **OK** to reboot the system.
10. On reboot, the machine detects the presence of the Red Hat Enterprise Linux Server 6.5 install media.
11. Select the **Install or upgrade an existing system.**

Figure 135 Red Hat Enterprise Linux Server 6.5 Install Media



Welcome to Red Hat Enterprise Linux 6.5!

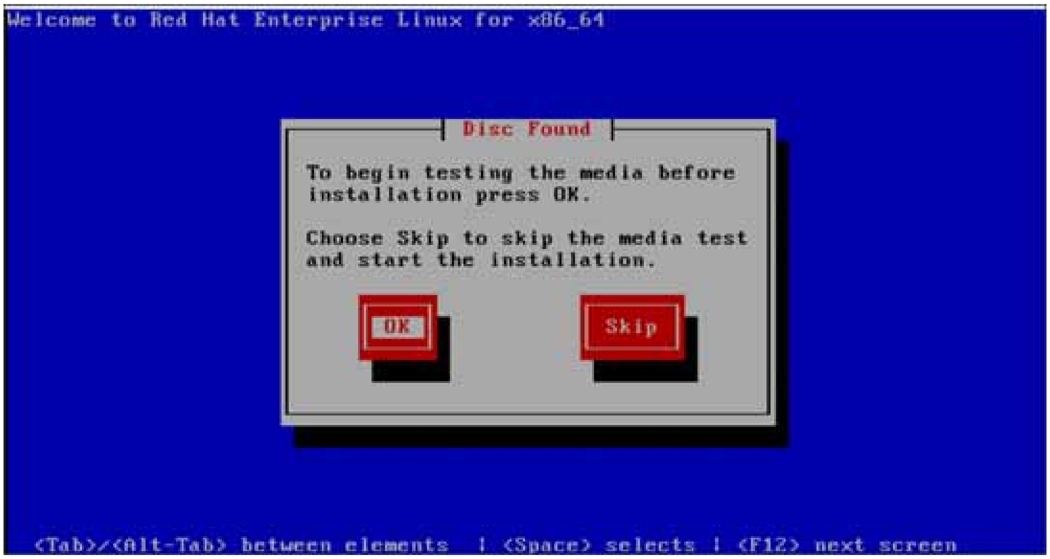
Install or upgrade an existing system
Install system with basic video driver
Rescue installed system
Boot from local drive
Memory test

Press [Tab] to edit options

Copyright © 2003-2010 Red Hat, Inc. and others. All rights reserved.

12. Skip the Media test and start the installation

Figure 136 RHEL: Media Test and Start of Installation



Welcome to Red Hat Enterprise Linux for x86_64

Disc Found

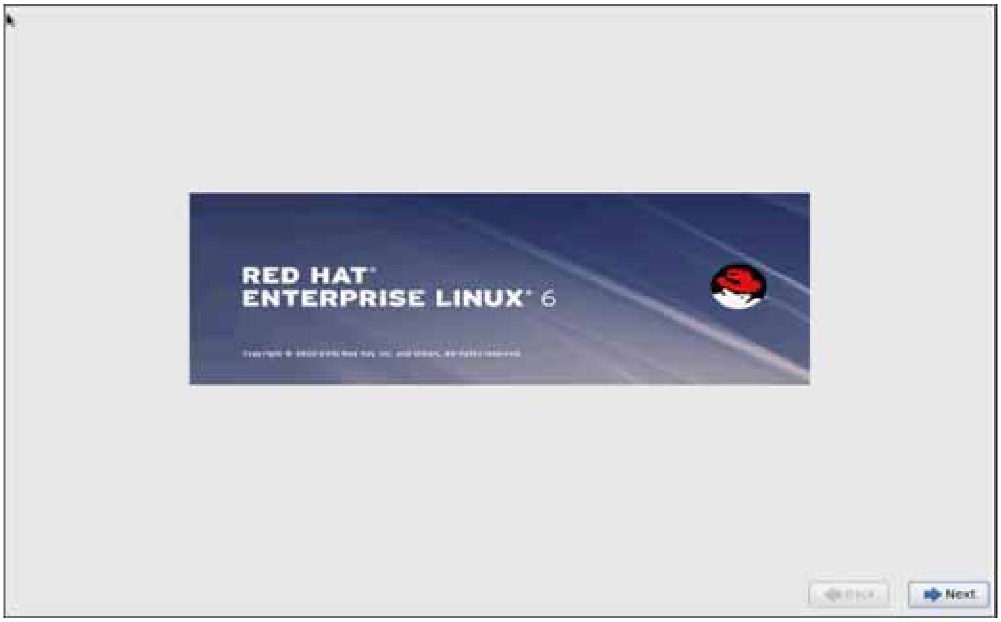
To begin testing the media before installation press OK.

Choose Skip to skip the media test and start the installation.

<Tab>/<Alt-Tab> between elements | <Space> selects | <F12> next screen

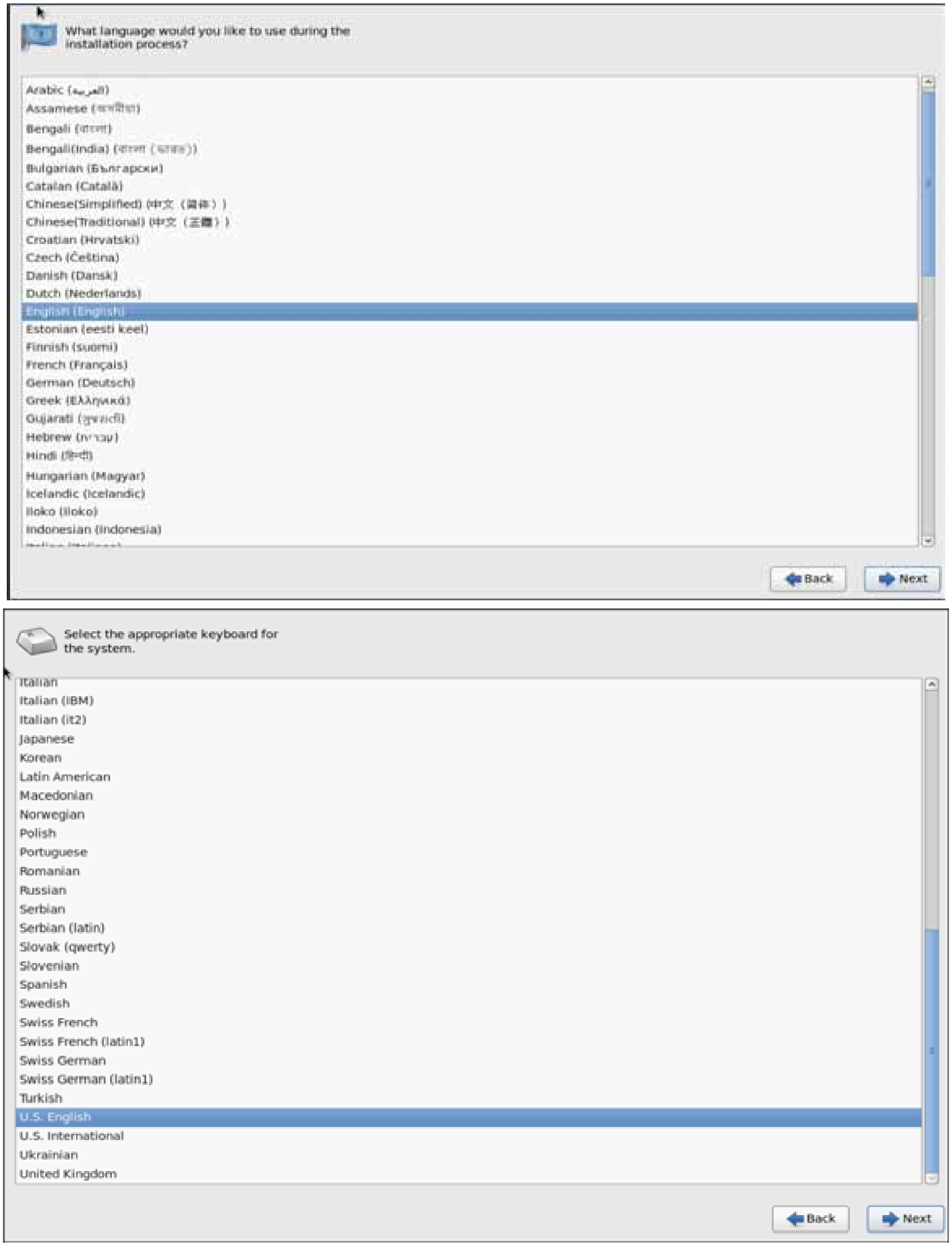
13. Click **Next**

Figure 137 Red Hat Enterprise Linux Server 6.5 Install Media



14. Select language of installation, and then Click **Next**

Figure 138 RHEL Installation: Language and Keyboard Selection



What language would you like to use during the installation process?

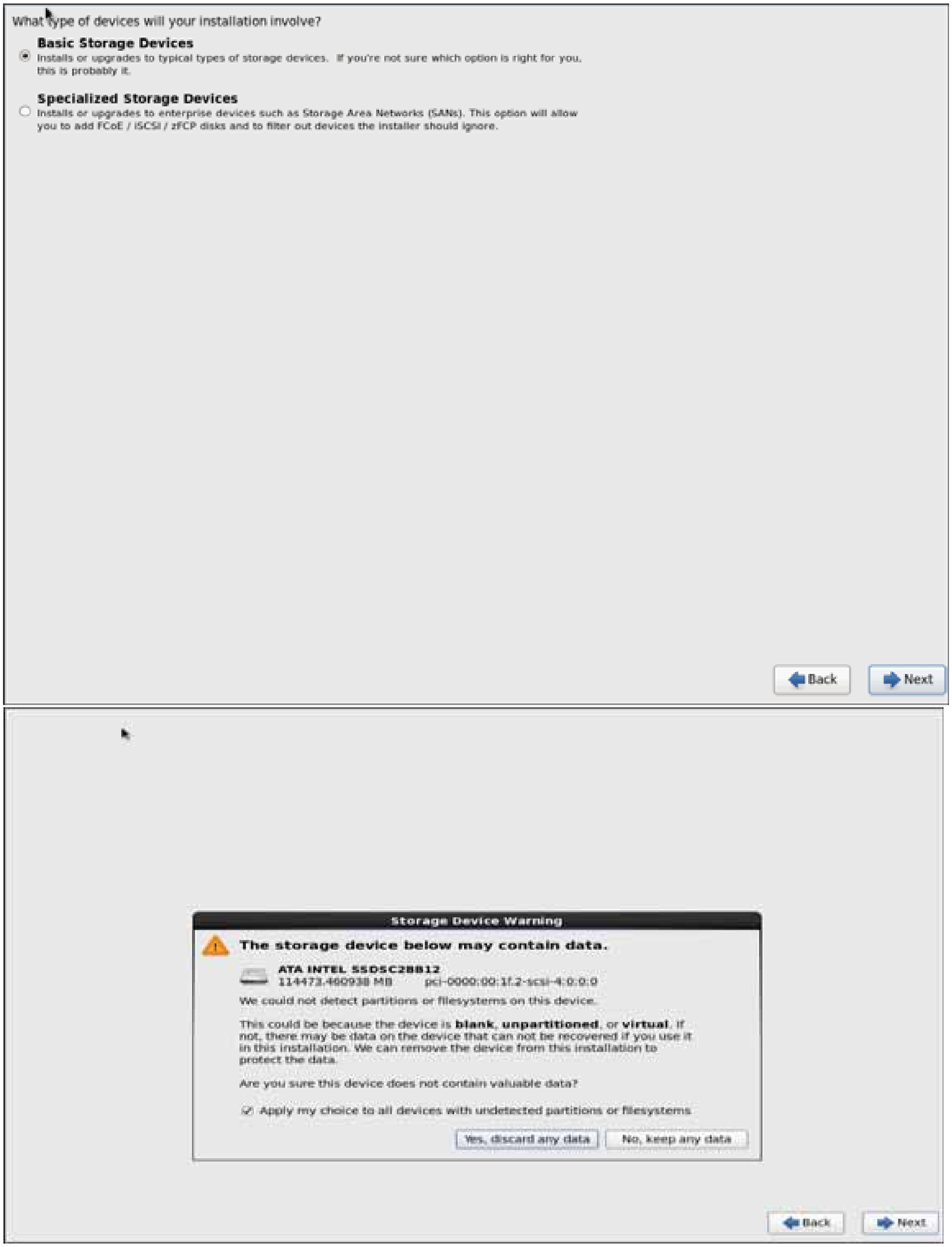
Arabic (العربية)
Assamese (অসমীয়া)
Bengali (বাংলা)
Bengali(India) (বাংলা (ভারত))
Bulgarian (Български)
Catalan (Català)
Chinese(Simplified) (中文（简体）)
Chinese(Traditional) (中文（正體）)
Croatian (Hrvatski)
Czech (Čeština)
Danish (Dansk)
Dutch (Nederlands)
English (English)
Estonian (eesti keel)
Finnish (suomi)
French (Français)
German (Deutsch)
Greek (Ελληνικά)
Gujarati (ગુજરાતી)
Hebrew (עברית)
Hindi (हिन्दी)
Hungarian (Magyar)
Icelandic (Icelandic)
Iloko (Iloko)
Indonesian (Indonesia)

Select the appropriate keyboard for the system.

Italian
Italian (IBM)
Italian (it2)
Japanese
Korean
Latin American
Macedonian
Norwegian
Polish
Portuguese
Romanian
Russian
Serbian
Serbian (latin)
Slovak (qwerty)
Slovenian
Spanish
Swedish
Swiss French
Swiss French (latin1)
Swiss German
Swiss German (latin1)
Turkish
U.S. English
U.S. International
Ukrainian
United Kingdom

15. Select Basic Storage Devices and Click **Next.**

Figure 139 RHEL Installation: Storage Devices Selection



What type of devices will your installation involve?

● **Basic Storage Devices**
Installs or upgrades to typical types of storage devices. If you're not sure which option is right for you, this is probably it.

○ **Specialized Storage Devices**
Installs or upgrades to enterprise devices such as Storage Area Networks (SANs). This option will allow you to add FCoE / iSCSI / zFCP disks and to filter out devices the installer should ignore.

Storage Device Warning

The storage device below may contain data.

ATA INTEL SSDSC2BB12
114473.460938 MB pci-0000:00:1f.2-scsi-4:0:0:0

We could not detect partitions or filesystems on this device.

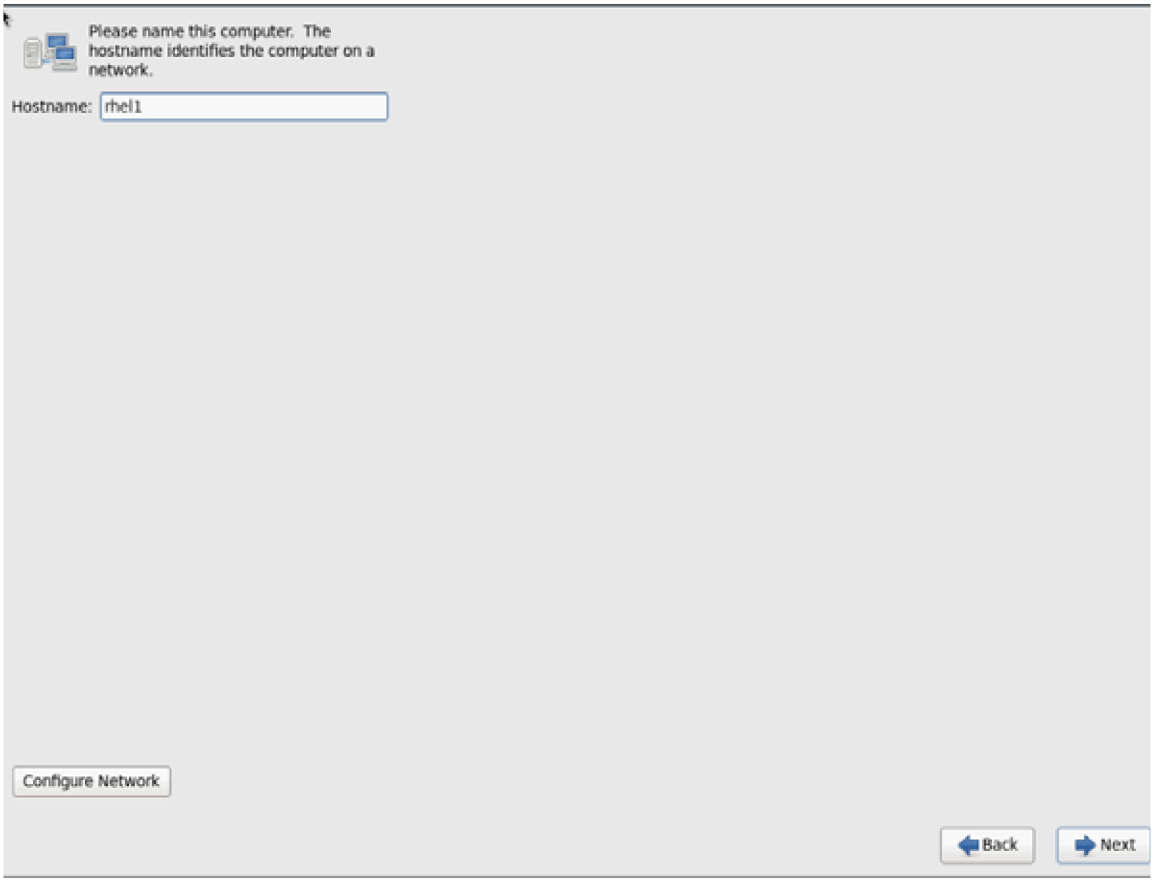
This could be because the device is **blank**, **unpartitioned**, or **virtual**. If not, there may be data on the device that can not be recovered if you use it in this installation. We can remove the device from this installation to protect the data.

Are you sure this device does not contain valuable data?

☑ Apply my choice to all devices with undetected partitions or filesystems

16. Provide hostname and configure Network for the host.

Figure 140 RHEL Installation: Specify Hostname

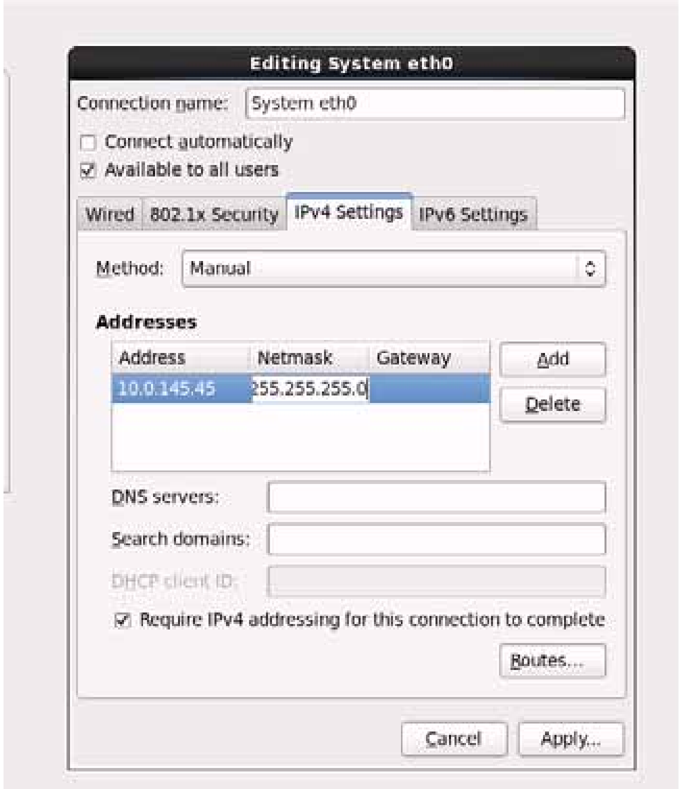


Please name this computer. The hostname identifies the computer on a network.

Hostname: rhel1

17. Select System eth0 and click **Edit**.
18. In the “Editing System eth0” window select the **IPv4 Settings** tab**,** from the Method drop-down list choose **Manual** and click **Add** to assign the IP address.

Figure 141 RHEL Installation: IPv4 Settings for eth0



Editing System eth0

Connection name: System eth0

□ Connect automatically

☑ Available to all users

Method: Manual

Addresses

Address	Netmask	Gateway
10.0.145.45	255.255.255.0	

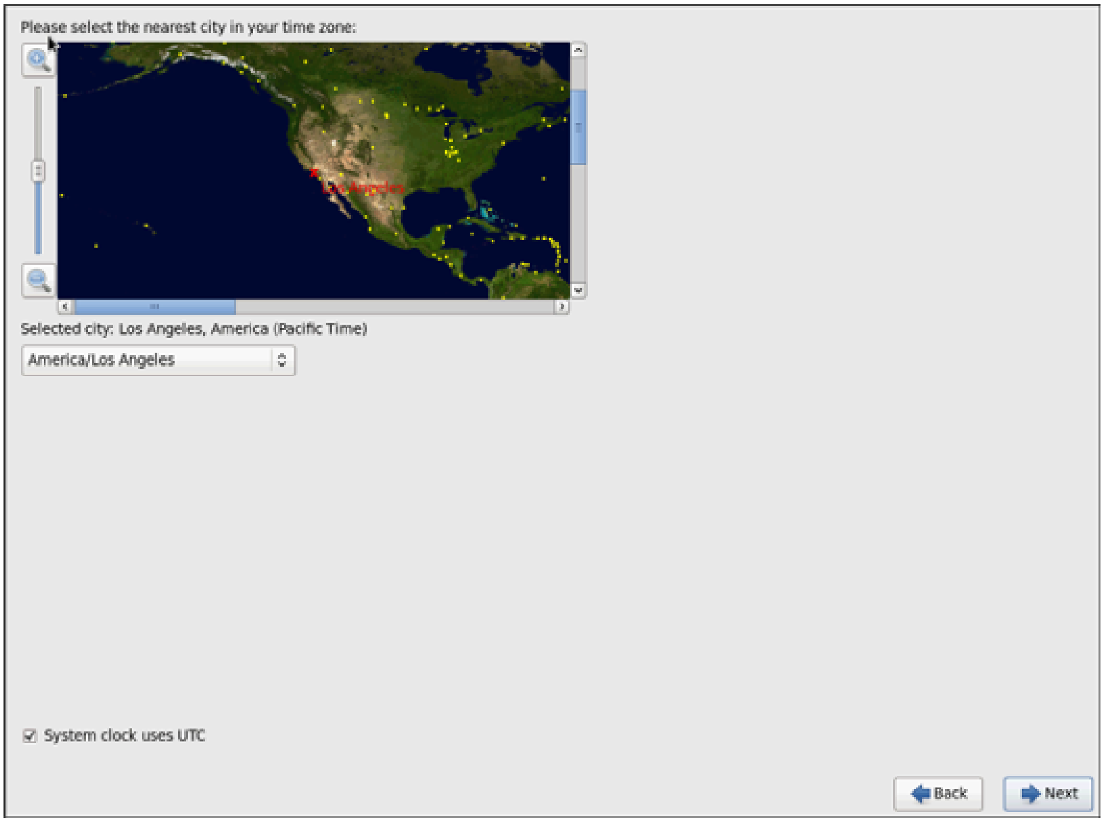
DNS servers:

Search domains:

DHCP client ID:

☑ Require IPv4 addressing for this connection to complete

Figure 142 RHEL Installation: Location Selection



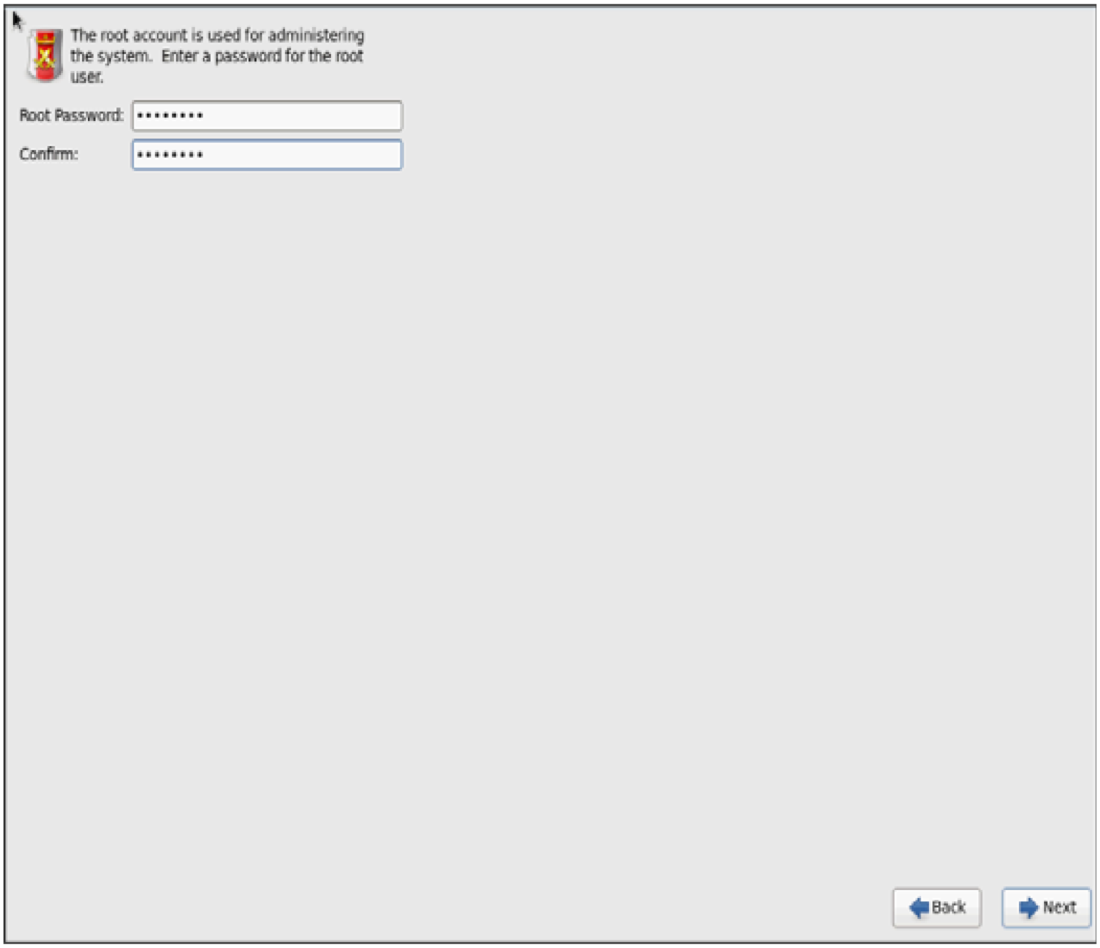
Please select the nearest city in your time zone:

Selected city: Los Angeles, America (Pacific Time)

America/Los Angeles

☑ System clock uses UTC

Figure 143 RHEL Installation: Enter Root Credentials



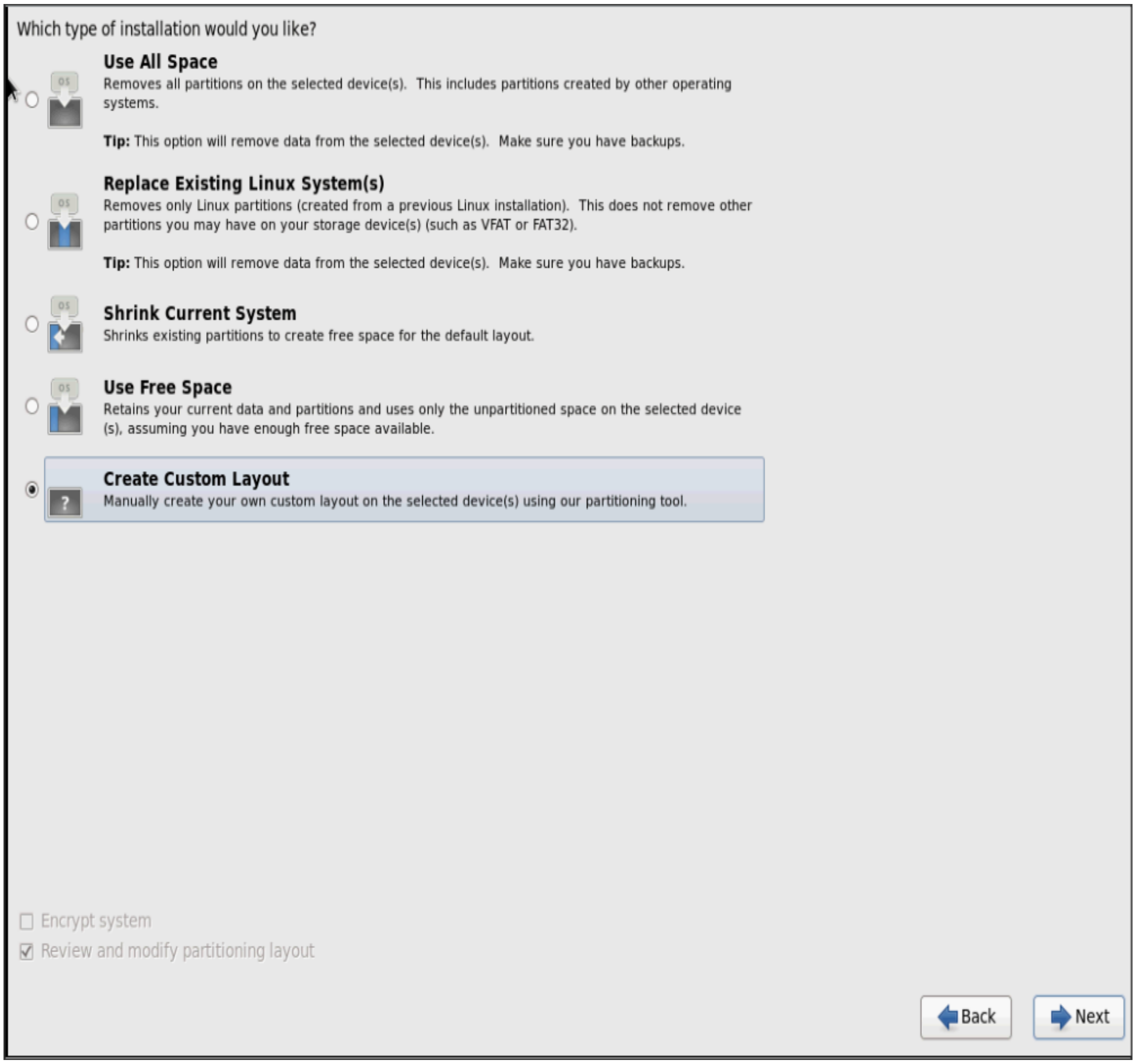
The root account is used for administering the system. Enter a password for the root user.

Root Password: ••••••••

Confirm: ••••••••

19. Choose **Create Custom Layout** for Installation type.

Figure 144 RHEL Installation: Custom Layout Creation



Which type of installation would you like?

○ **Use All Space**
Removes all partitions on the selected device(s). This includes partitions created by other operating systems.

Tip: This option will remove data from the selected device(s). Make sure you have backups.

○ **Replace Existing Linux System(s)**
Removes only Linux partitions (created from a previous Linux installation). This does not remove other partitions you may have on your storage device(s) (such as VFAT or FAT32).

Tip: This option will remove data from the selected device(s). Make sure you have backups.

○ **Shrink Current System**
Shrinks existing partitions to create free space for the default layout.

○ **Use Free Space**
Retains your current data and partitions and uses only the unpartitioned space on the selected device (s), assuming you have enough free space available.

● **Create Custom Layout**
Manually create your own custom layout on the selected device(s) using our partitioning tool.

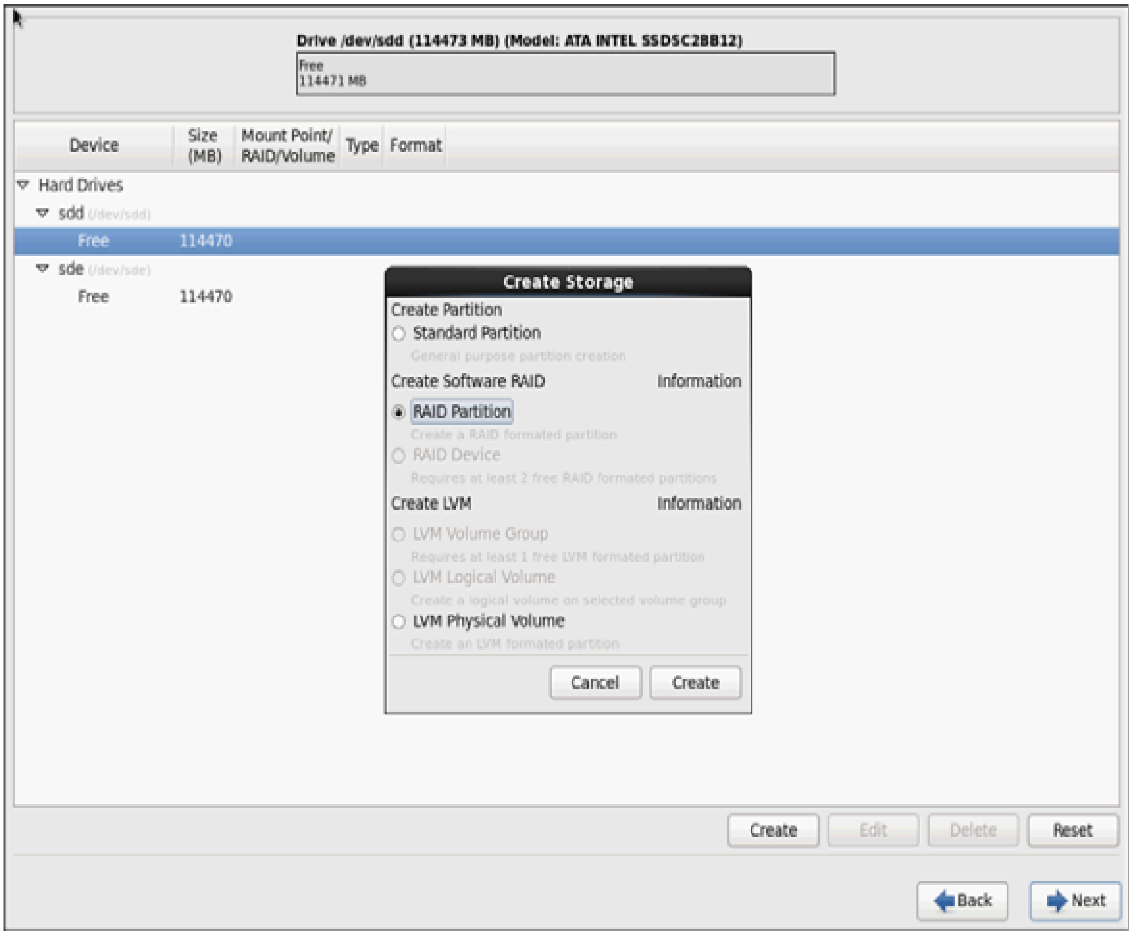
□ Encrypt system

☑ Review and modify partitioning layout

20. Following steps can be used to create two software RAID 1 partitions for boot and, or (root) partitions.

a. Choose free volume and click on **Create** and choose **RAID Partition.**

Figure 145 RHEL Installation: Create RAID Partition



Drive /dev/sdd (114473 MB) (Model: ATA INTEL SSDSC2BB12)

Free
114471 MB

Device	Size (MB)	Mount Point/ RAID/Volume	Type	Format
Hard Drives				
sdd (/dev/sdd)				
Free	114470			
sde (/dev/sde)				
Free	114470			

Create Storage

Create Partition

○ Standard Partition
General purpose partition creation

Create Software RAID — Information

● RAID Partition
Create a RAID formated partition

○ RAID Device
Requires at least 2 free RAID formated partitions

Create LVM — Information

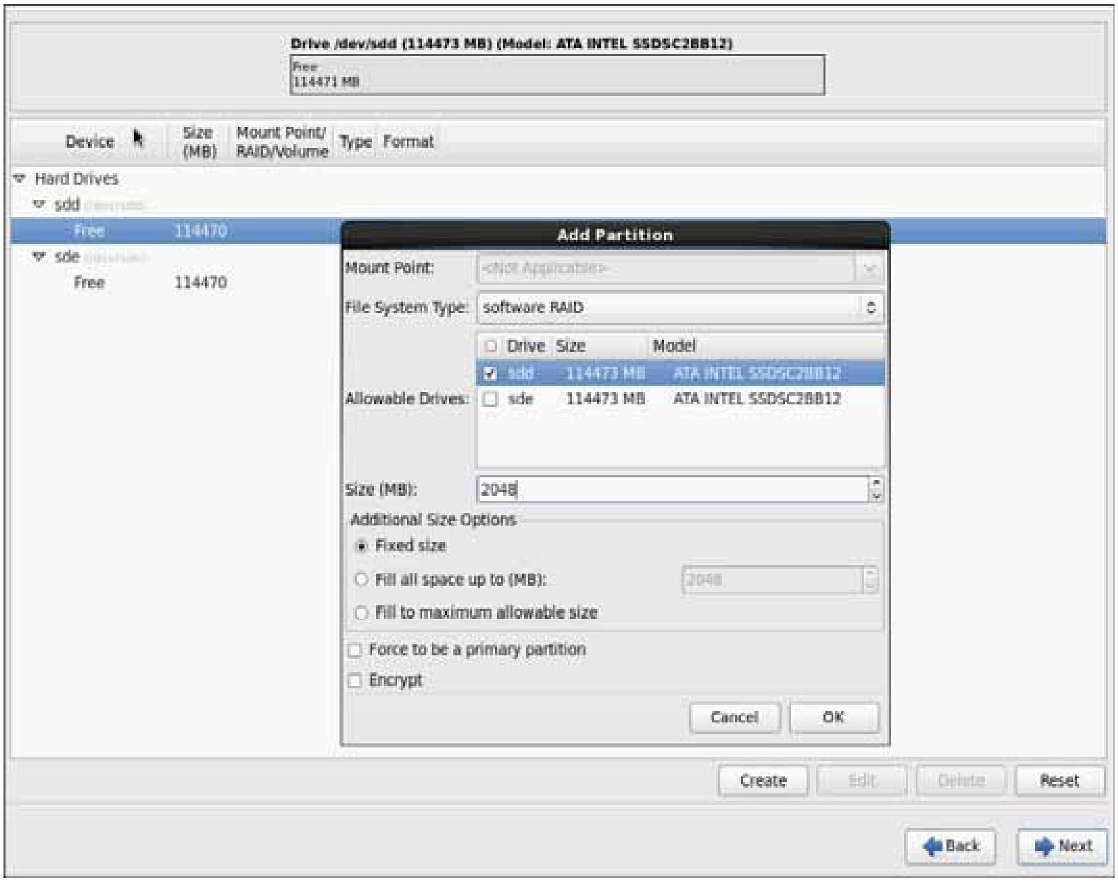
○ LVM Volume Group
Requires at least 1 free LVM formated partition

○ LVM Logical Volume
Create a logical volume on selected volume group

○ LVM Physical Volume
Create an LVM formated partition

b. Choose “Software RAID” for File system Type and set size for Boot volume

Figure 146 *RHEL Installation: Add RAID Partition*



Drive /dev/sdd (114473 MB) (Model: ATA INTEL SSDSC2BB12)

Free
114471 MB

Device	Size (MB)	Mount Point/ RAID/Volume	Type	Format
Hard Drives				
sdd				
Free	114470			
sde				
Free	114470			

Add Partition

Mount Point: <Not Applicable>

File System Type: software RAID

Allowable Drives:

	Drive	Size	Model
☑	sdd	114473 MB	ATA INTEL SSDSC2BB12
□	sde	114473 MB	ATA INTEL SSDSC2BB12

Size (MB): 2048

Additional Size Options

● Fixed size

○ Fill all space up to (MB): 2048

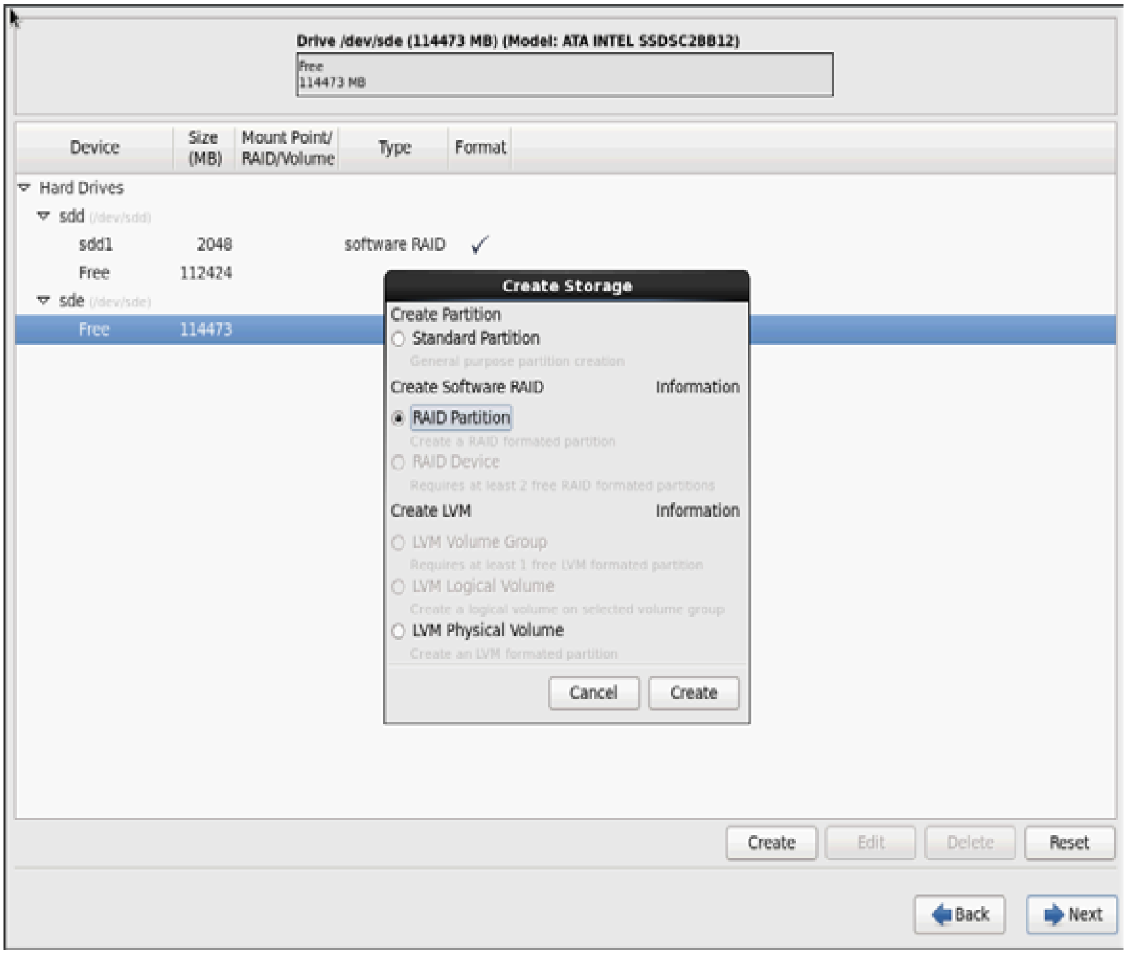
○ Fill to maximum allowable size

□ Force to be a primary partition

□ Encrypt

21. Similarly, do the RAID configuration for the other free volume.

Figure 147 RHEL Installation: Create RAID Partition



Drive /dev/sde (114473 MB) (Model: ATA INTEL SSDSC2BB12)

Free
114473 MB

Device	Size (MB)	Mount Point/ RAID/Volume	Type	Format
Hard Drives				
sdd (/dev/sdd)				
sdd1	2048		software RAID	✓
Free	112424			
sde (/dev/sde)				
Free	114473			

Create Storage

Create Partition

○ Standard Partition
General purpose partition creation

Create Software RAID Information

● RAID Partition
Create a RAID formated partition

○ RAID Device
Requires at least 2 free RAID formated partitions

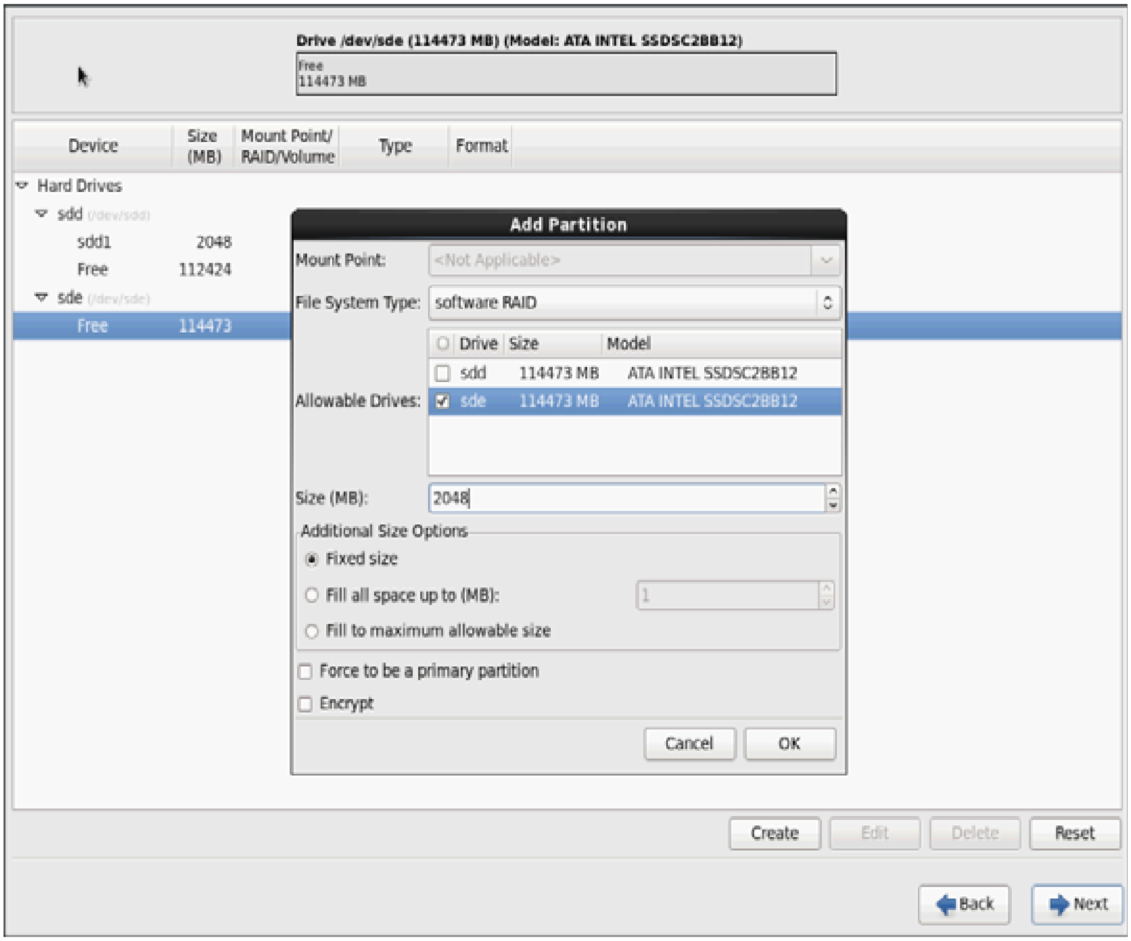
Create LVM Information

○ LVM Volume Group
Requires at least 1 free LVM formated partition

○ LVM Logical Volume
Create a logical volume on selected volume group

○ LVM Physical Volume
Create an LVM formated partition

Figure 148 RHEL Installation: Add RAID Partition



Drive /dev/sde (114473 MB) (Model: ATA INTEL SSDSC2BB12)

Free
114473 MB

Device	Size (MB)	Mount Point/ RAID/Volume	Type	Format
Hard Drives				
sdd (/dev/sdd)				
sdd1	2048			
Free	112424			
sde (/dev/sde)				
Free	114473			

Add Partition

Mount Point: <Not Applicable>

File System Type: software RAID

Allowable Drives:

○	Drive	Size	Model
□	sdd	114473 MB	ATA INTEL SSDSC2BB12
☑	sde	114473 MB	ATA INTEL SSDSC2BB12

Size (MB): 2048

Additional Size Options

● Fixed size

○ Fill all space up to (MB): 1

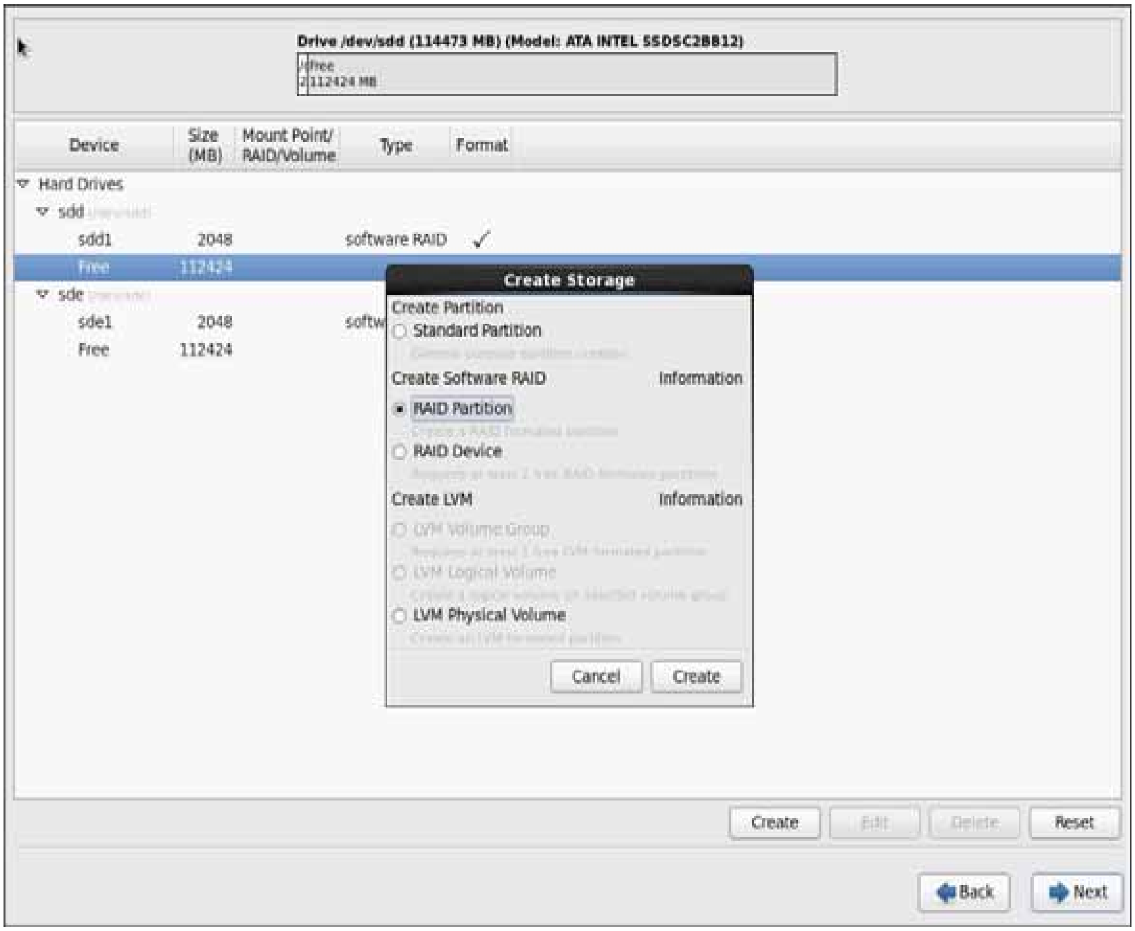
○ Fill to maximum allowable size

□ Force to be a primary partition

□ Encrypt

22. Now similarly create RAID partitions for root (/) partition on both the devices and use rest of the available space

Figure 149 RHEL Installation: Create RAID Partition



Drive /dev/sdd (114473 MB) (Model: ATA INTEL SSDSC2BB12)

Device	Size (MB)	Mount Point/ RAID/Volume	Type	Format
Hard Drives				
sdd (/dev/sdd)				
sdd1	2048		software RAID	✓
Free	112424			
sde (/dev/sde)				
sde1	2048		softw	
Free	112424			

Create Storage

Create Partition

○ Standard Partition

General purpose partition creation

Create Software RAID Information

● RAID Partition

Create a RAID formatted partition

○ RAID Device

Requires at least 2 free RAID formatted partitions

Create LVM Information

○ LVM Volume Group

Requires at least 1 free LVM formatted partition

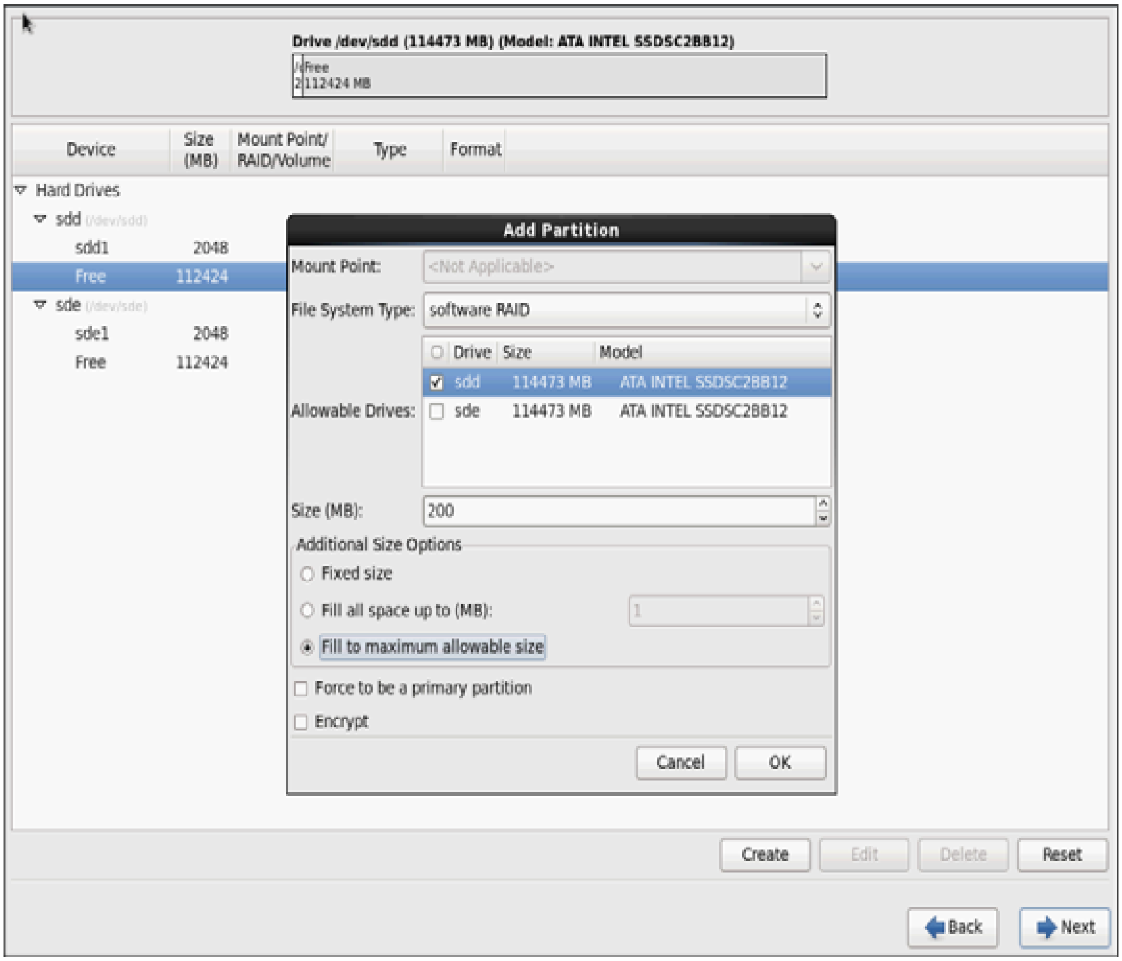
○ LVM Logical Volume

Create a logical volume on selected volume group

○ LVM Physical Volume

Create an LVM formatted partition

Figure 150 RHEL Installation: Add RAID Partition



Drive /dev/sdd (114473 MB) (Model: ATA INTEL SSDSC2BB12)

Free
112424 MB

Device	Size (MB)	Mount Point/ RAID/Volume	Type	Format
Hard Drives				
sdd (/dev/sdd)				
sdd1	2048			
Free	112424			
sde (/dev/sde)				
sde1	2048			
Free	112424			

Add Partition

Mount Point: <Not Applicable>

File System Type: software RAID

Allowable Drives:

○	Drive	Size	Model
☑	sdd	114473 MB	ATA INTEL SSDSC2BB12
□	sde	114473 MB	ATA INTEL SSDSC2BB12

Size (MB): 200

Additional Size Options

○ Fixed size

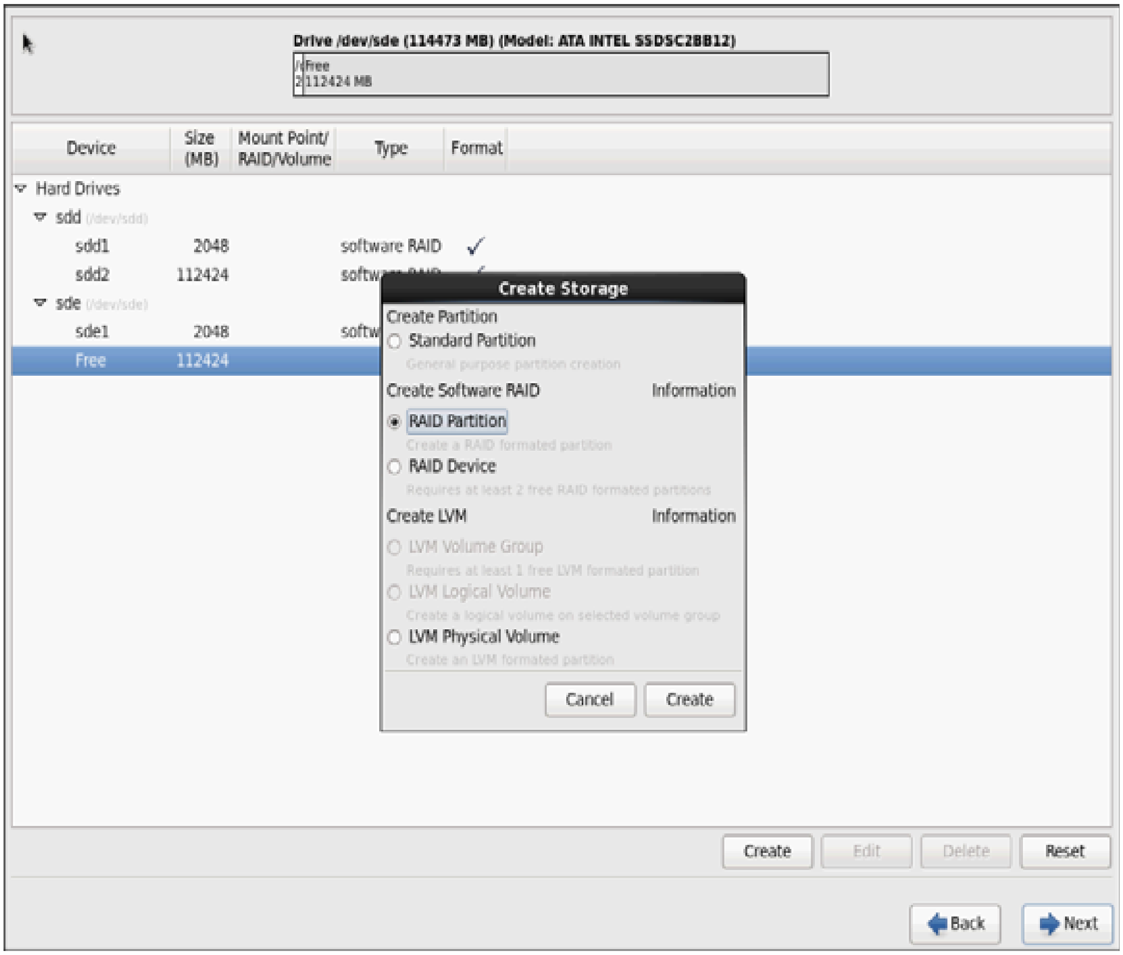
○ Fill all space up to (MB): 1

● Fill to maximum allowable size

□ Force to be a primary partition

□ Encrypt

Figure 151 RHEL Installation: Create RAID Partition



Drive /dev/sde (114473 MB) (Model: ATA INTEL SSDSC2BB12)

Free
112424 MB

Device	Size (MB)	Mount Point/ RAID/Volume	Type	Format
Hard Drives				
sdd (/dev/sdd)				
sdd1	2048		software RAID	✓
sdd2	112424		software RAID	✓
sde (/dev/sde)				
sde1	2048		software RAID	
Free	112424			

Create Storage

Create Partition

○ Standard Partition
General purpose partition creation

Create Software RAID Information

● RAID Partition
Create a RAID formated partition

○ RAID Device
Requires at least 2 free RAID formated partitions

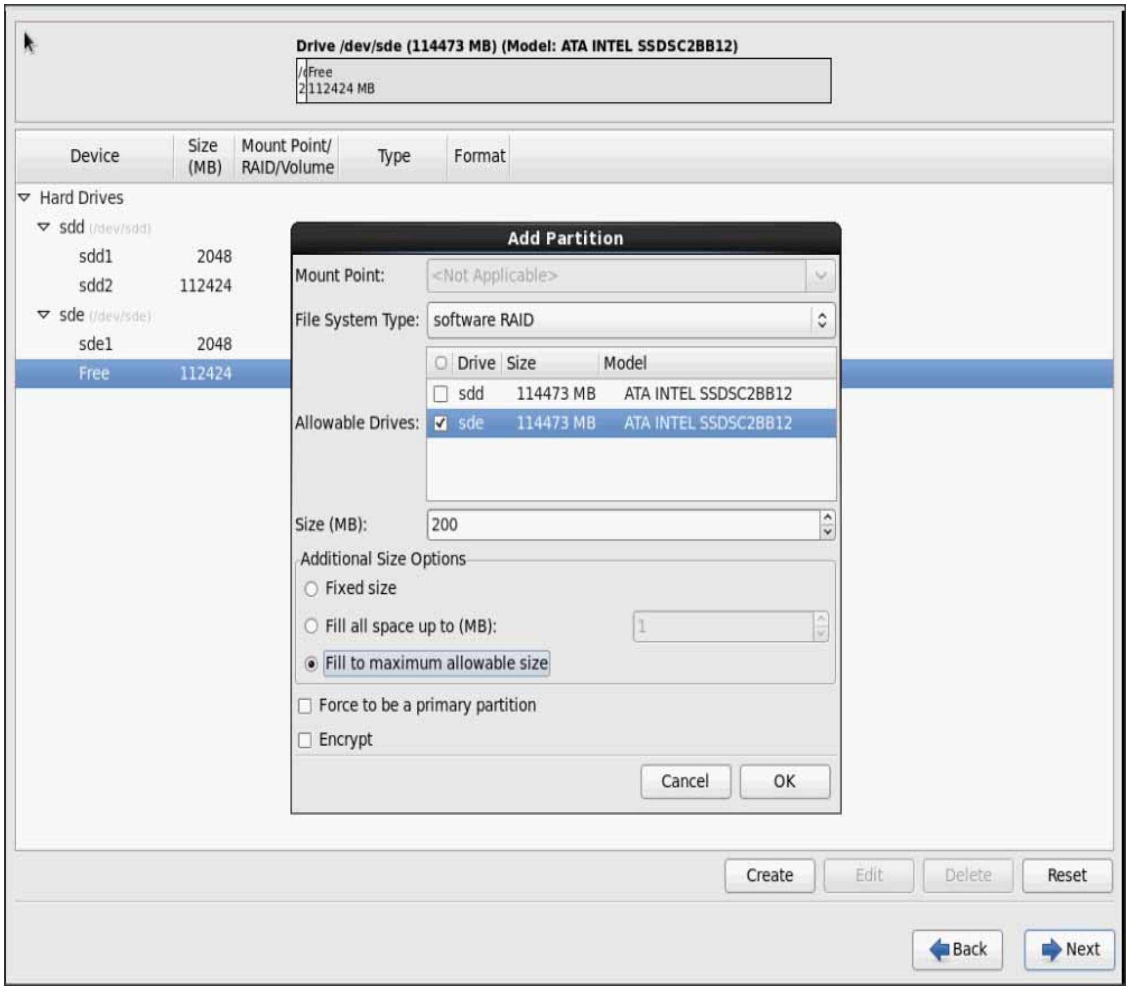
Create LVM Information

○ LVM Volume Group
Requires at least 1 free LVM formated partition

○ LVM Logical Volume
Create a logical volume on selected volume group

○ LVM Physical Volume
Create an LVM formated partition

Figure 152 RHEL Installation: Add RAID Partition



Drive /dev/sde (114473 MB) (Model: ATA INTEL SSDSC2BB12)

/(2 | Free 112424 MB

Device	Size (MB)	Mount Point/ RAID/Volume	Type	Format
Hard Drives				
sdd (/dev/sdd)				
sdd1	2048			
sdd2	112424			
sde (/dev/sde)				
sde1	2048			
Free	112424			

Add Partition

Mount Point: <Not Applicable>

File System Type: software RAID

Allowable Drives:

○	Drive	Size	Model
□	sdd	114473 MB	ATA INTEL SSDSC2BB12
☑	sde	114473 MB	ATA INTEL SSDSC2BB12

Size (MB): 200

Additional Size Options

○ Fixed size

○ Fill all space up to (MB): 1

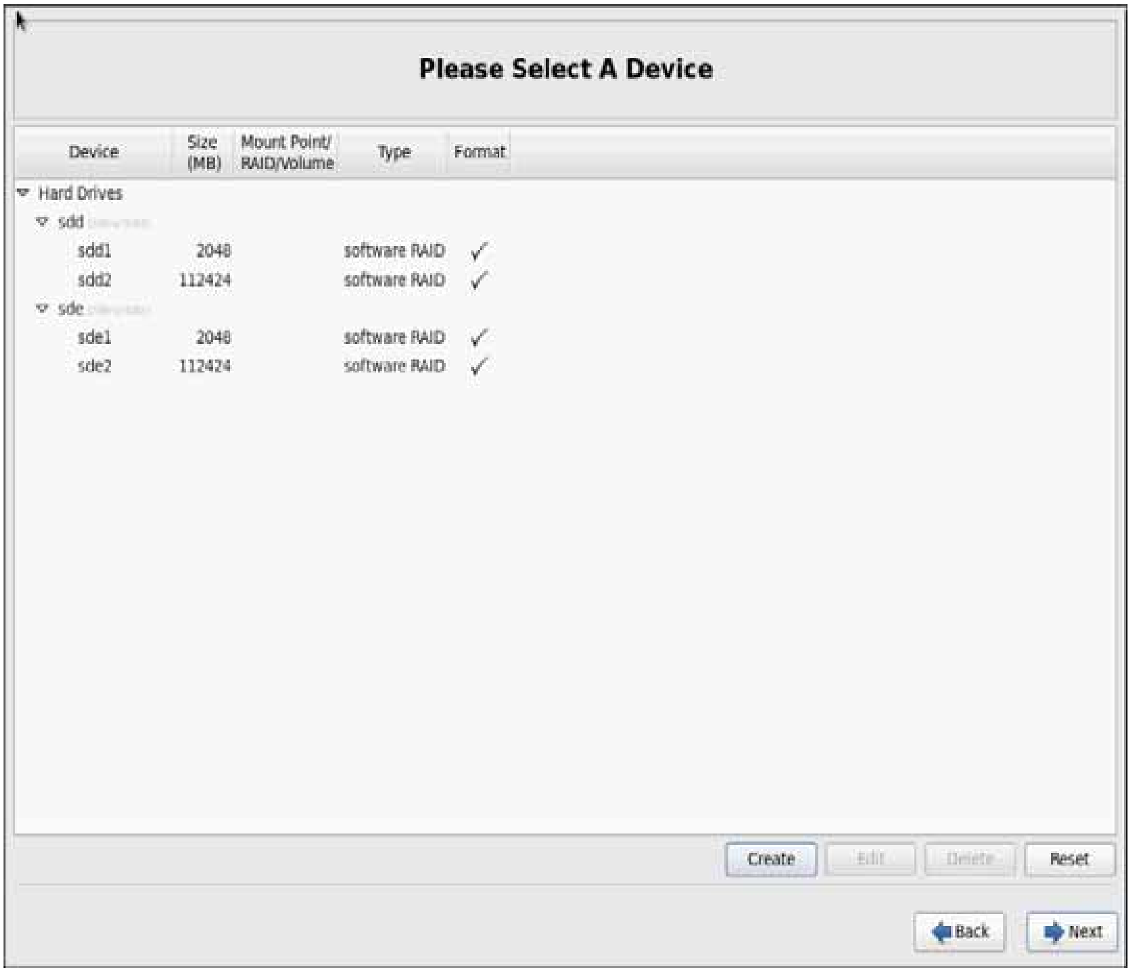
● Fill to maximum allowable size

□ Force to be a primary partition

□ Encrypt

23. The above steps created 2 boot and 2 root (/) partitions. Following steps will RAID1 Devices

Figure 153 RHEL Installation: Selected RAID Devices

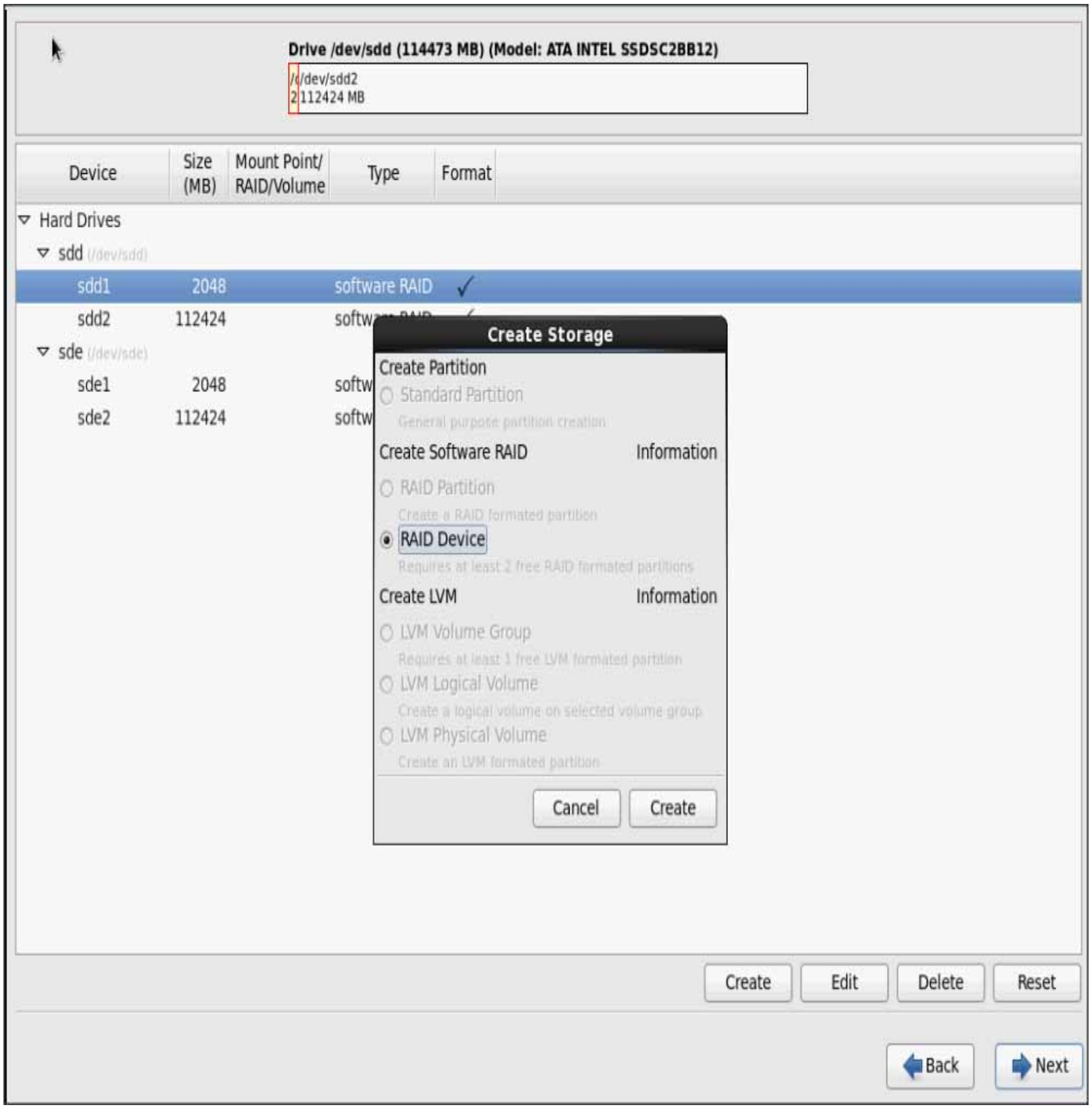


Please Select A Device

Device	Size (MB)	Mount Point/ RAID/Volume	Type	Format
Hard Drives				
sdd				
sdd1	2048		software RAID	✓
sdd2	112424		software RAID	✓
sde				
sde1	2048		software RAID	✓
sde2	112424		software RAID	✓

24. Choose one of the boot partitions and click on **Create > RAID Device.**

Figure 154 RHEL Installation: Select RAID Device



Drive /dev/sdd (114473 MB) (Model: ATA INTEL SSDSC2BB12)

/dev/sdd2
112424 MB

Device	Size (MB)	Mount Point/ RAID/Volume	Type	Format
▽ Hard Drives				
▽ sdd (/dev/sdd)				
sdd1	2048		software RAID	✓
sdd2	112424		softw	
▽ sde (/dev/sde)				
sde1	2048		softw	
sde2	112424		softw	

Create Storage

Create Partition

○ Standard Partition
General purpose partition creation

Create Software RAID Information

○ RAID Partition
Create a RAID formated partition

● RAID Device
Requires at least 2 free RAID formated partitions

Create LVM Information

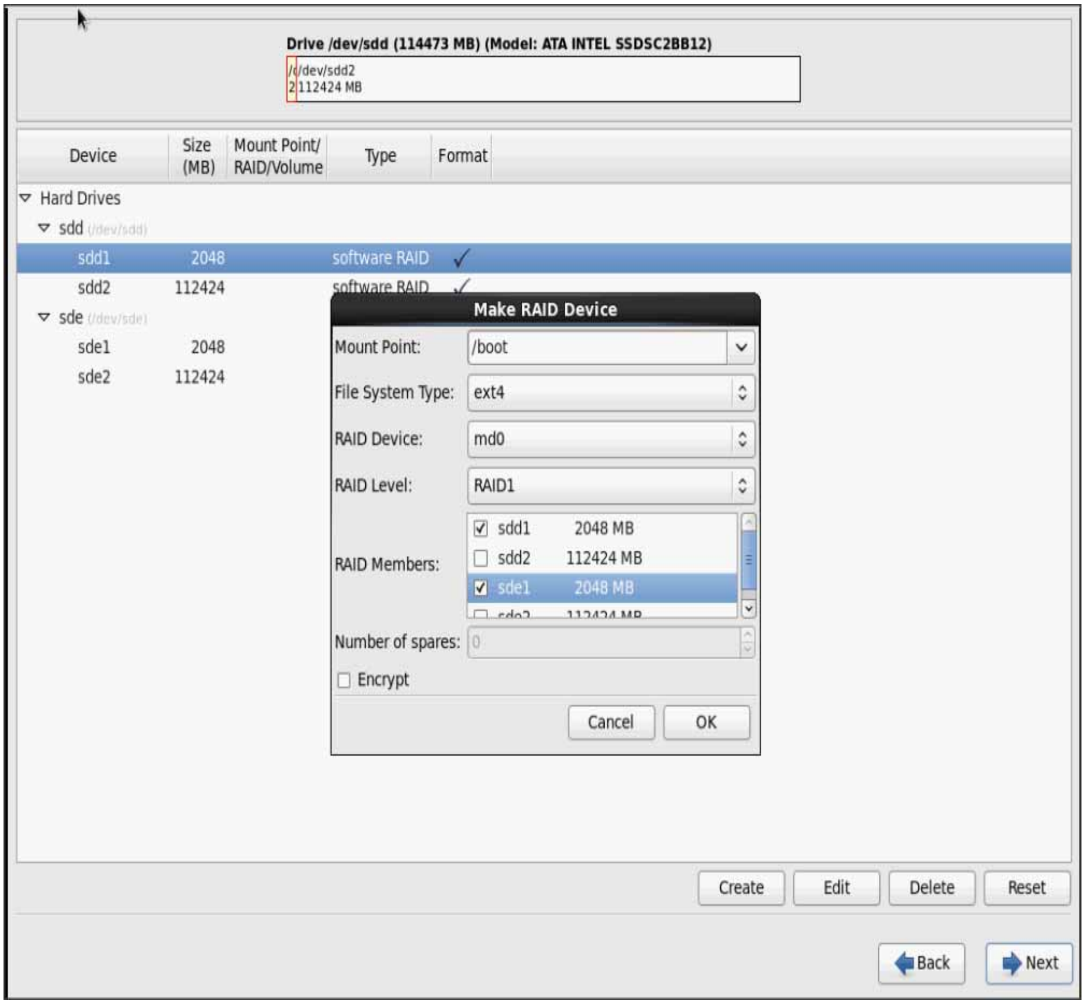
○ LVM Volume Group
Requires at least 1 free LVM formated partition

○ LVM Logical Volume
Create a logical volume on selected volume group

○ LVM Physical Volume
Create an LVM formated partition

25. Choose this as /boot (boot device) and in RAID members, choose all the boot partitions created above in order to create a software RAID 1 for boot.

Figure 155 RHEL Installation: Make RAID Device



Drive /dev/sdd (114473 MB) (Model: ATA INTEL SSDSC2BB12)

/dev/sdd2 112424 MB

Device	Size (MB)	Mount Point/ RAID/Volume	Type	Format
▽ Hard Drives				
▽ sdd (/dev/sdd)				
sdd1	2048		software RAID	✓
sdd2	112424		software RAID	✓
▽ sde (/dev/sde)				
sde1	2048			
sde2	112424			

Make RAID Device

Mount Point: /boot

File System Type: ext4

RAID Device: md0

RAID Level: RAID1

RAID Members:

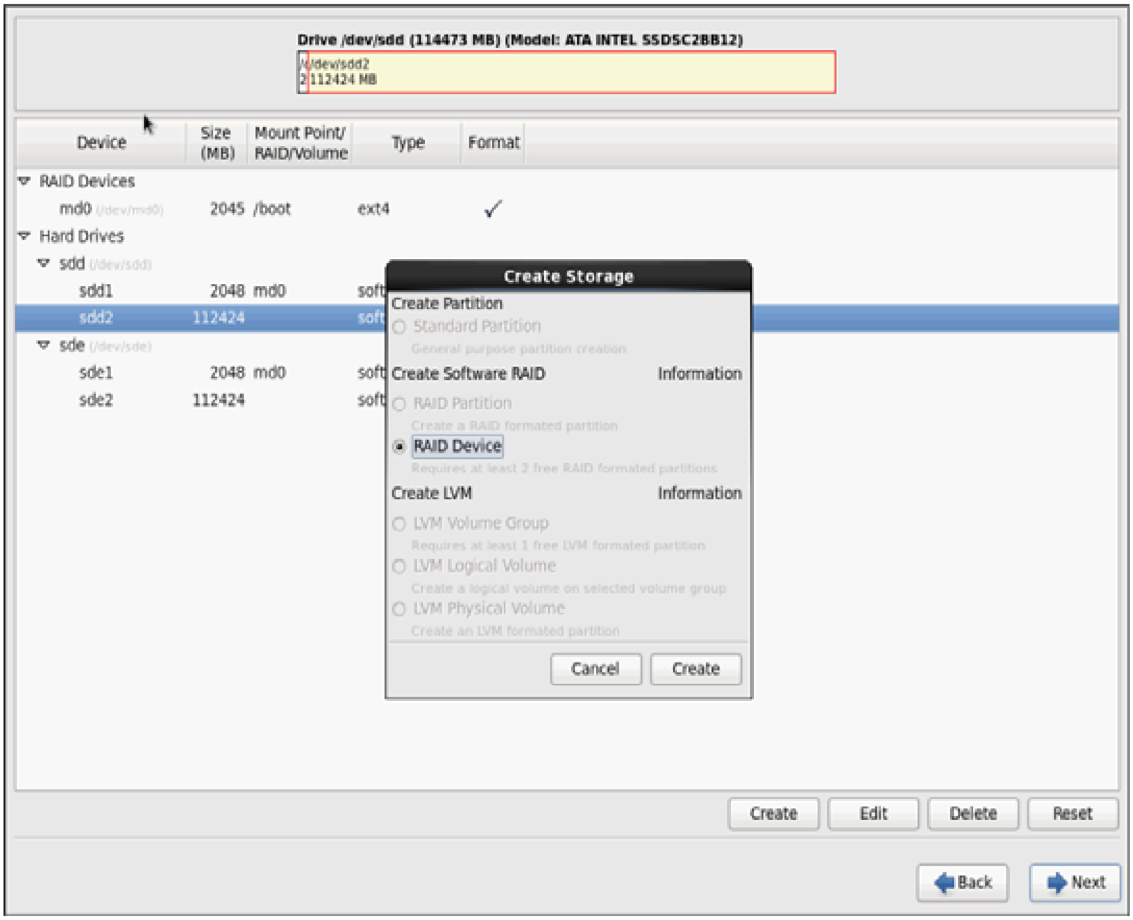
☑ sdd1 2048 MB
☐ sdd2 112424 MB
☑ sde1 2048 MB
☐ sde2 112424 MB

Number of spares: 0

☐ Encrypt

26. Similarly repeat for / partitions created above choosing both members with mount point as “/”.

Figure 156 RHEL Installation: Select RAID Device



Drive /dev/sdd (114473 MB) (Model: ATA INTEL SSDSC2BB12)

/dev/sdd2
112424 MB

Device	Size (MB)	Mount Point/ RAID/Volume	Type	Format
RAID Devices				
md0 (/dev/md0)	2045	/boot	ext4	✓
Hard Drives				
sdd (/dev/sdd)				
sdd1	2048	md0	soft	
sdd2	112424		soft	
sde (/dev/sde)				
sde1	2048	md0	soft	
sde2	112424		soft	

Create Storage

Create Partition

○ Standard Partition
General purpose partition creation

Create Software RAID Information

○ RAID Partition
Create a RAID formated partition

● RAID Device
Requires at least 2 free RAID formated partitions

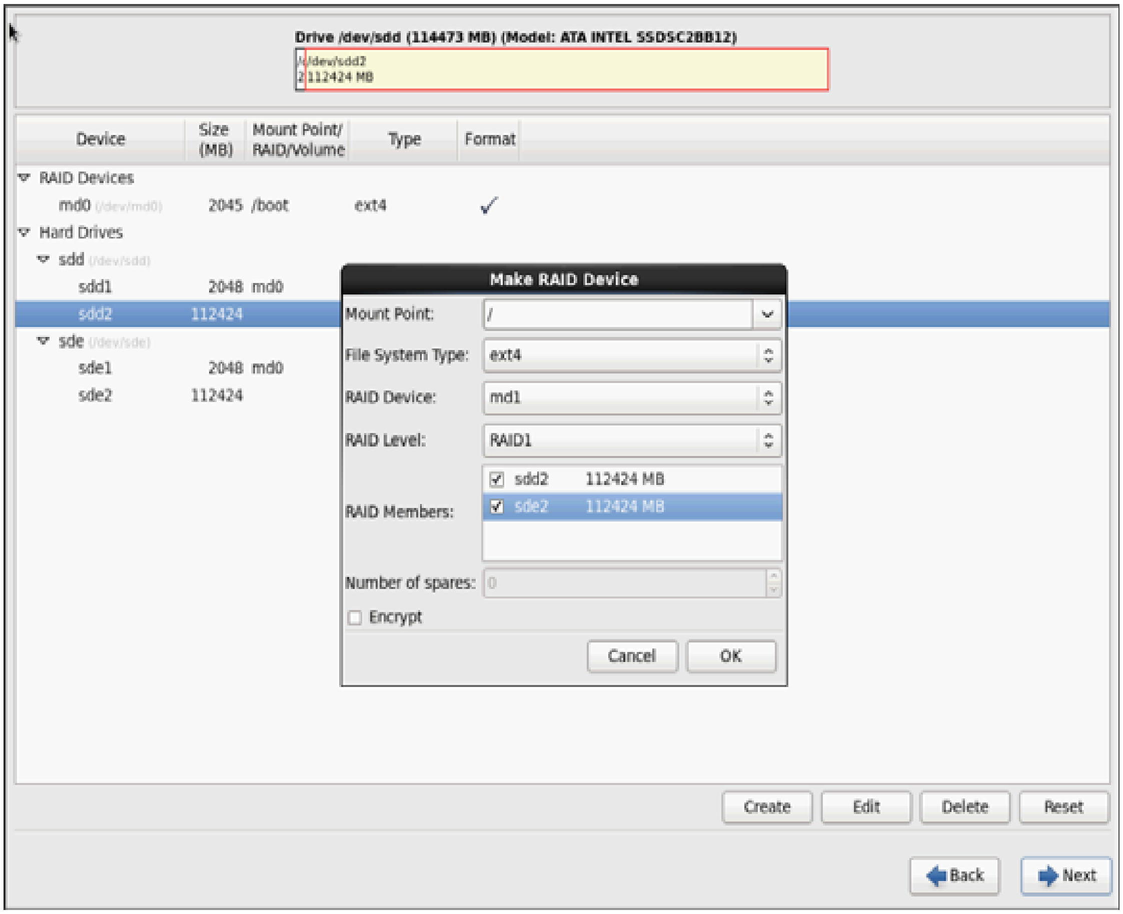
Create LVM Information

○ LVM Volume Group
Requires at least 1 free LVM formated partition

○ LVM Logical Volume
Create a logical volume on selected volume group

○ LVM Physical Volume
Create an LVM formated partition

Figure 157 RHEL Installation: Make RAID Device



Drive /dev/sdd (114473 MB) (Model: ATA INTEL SSDSC2BB12)

/dev/sdd2
112424 MB

Device	Size (MB)	Mount Point/ RAID/Volume	Type	Format
RAID Devices				
md0 (/dev/md0)	2045	/boot	ext4	✓
Hard Drives				
sdd (/dev/sdd)				
sdd1	2048	md0		
sdd2	112424			
sde (/dev/sde)				
sde1	2048	md0		
sde2	112424			

Make RAID Device

Mount Point: /

File System Type: ext4

RAID Device: md1

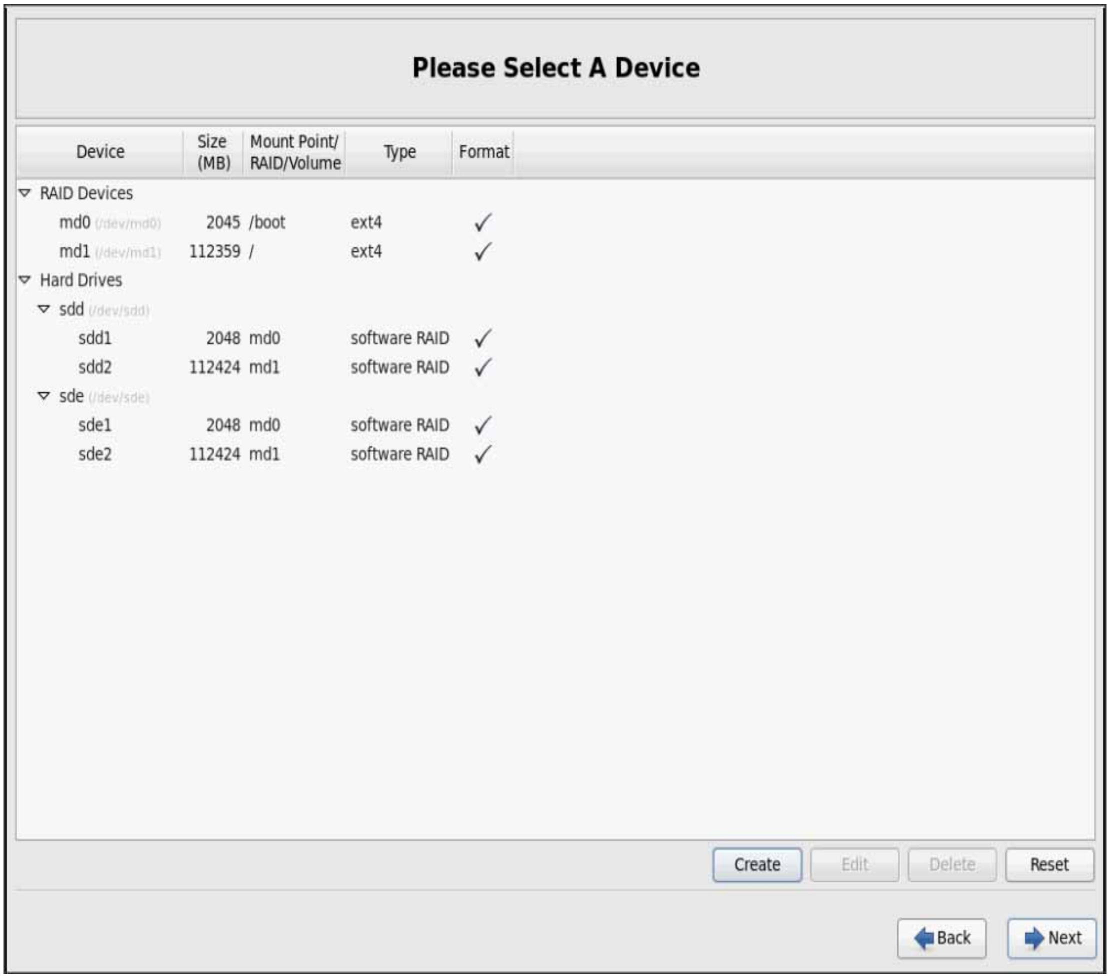
RAID Level: RAID1

RAID Members:
☑ sdd2 112424 MB
☑ sde2 112424 MB

Number of spares: 0

□ Encrypt

Figure 158 RHEL Installation: All the Selected Devices

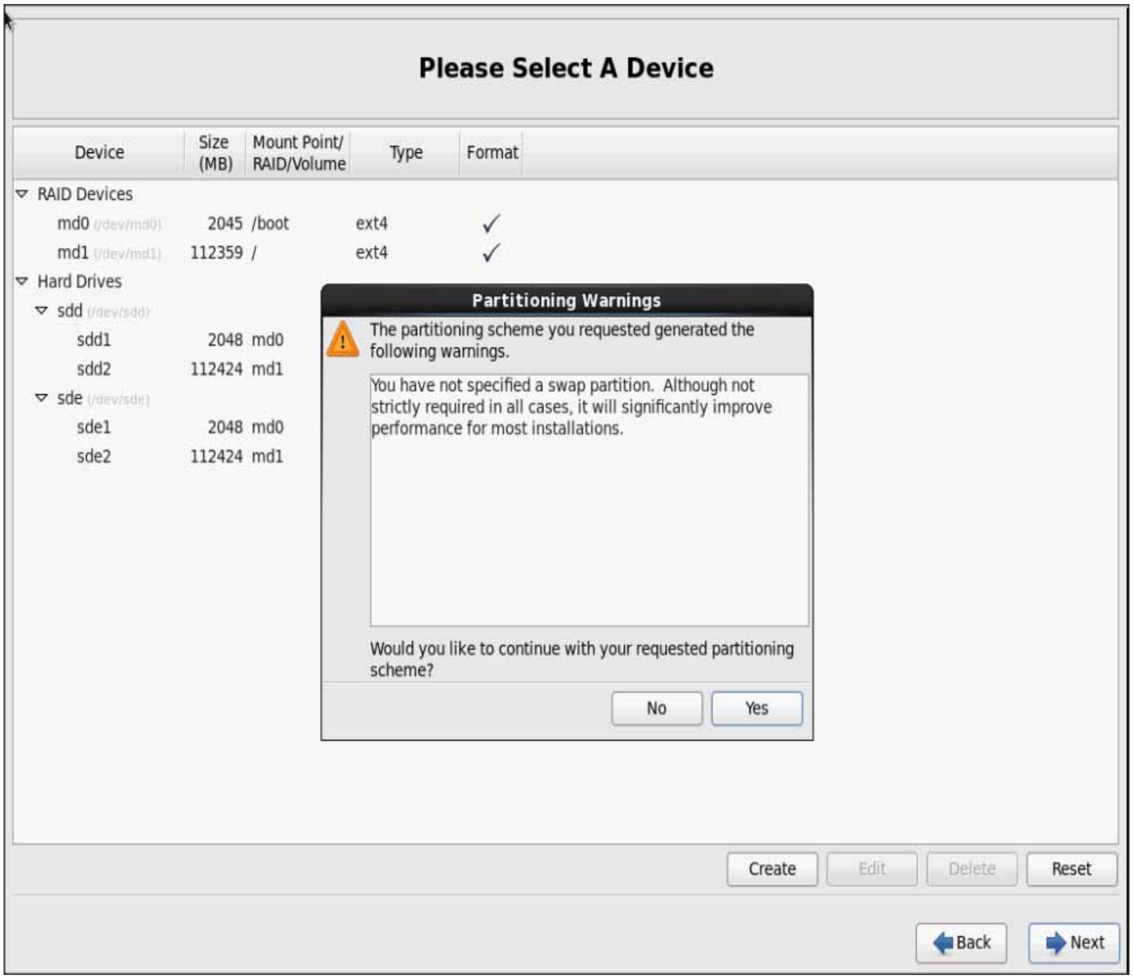


Please Select A Device

Device	Size (MB)	Mount Point/ RAID/Volume	Type	Format
▽ RAID Devices				
md0 (/dev/md0)	2045	/boot	ext4	✓
md1 (/dev/md1)	112359	/	ext4	✓
▽ Hard Drives				
▽ sdd (/dev/sdd)				
sdd1	2048	md0	software RAID	✓
sdd2	112424	md1	software RAID	✓
▽ sde (/dev/sde)				
sde1	2048	md0	software RAID	✓
sde2	112424	md1	software RAID	✓

27. Click on **Next**.

Figure 159 RHEL Installation: Warning before RAID Partitioning



Please Select A Device

Device	Size (MB)	Mount Point/ RAID/Volume	Type	Format
▽ RAID Devices				
md0 (/dev/md0)	2045	/boot	ext4	✓
md1 (/dev/md1)	112359	/	ext4	✓
▽ Hard Drives				
▽ sdd (/dev/sdd)				
sdd1	2048	md0		
sdd2	112424	md1		
▽ sde (/dev/sde)				
sde1	2048	md0		
sde2	112424	md1		

Partitioning Warnings

The partitioning scheme you requested generated the following warnings.

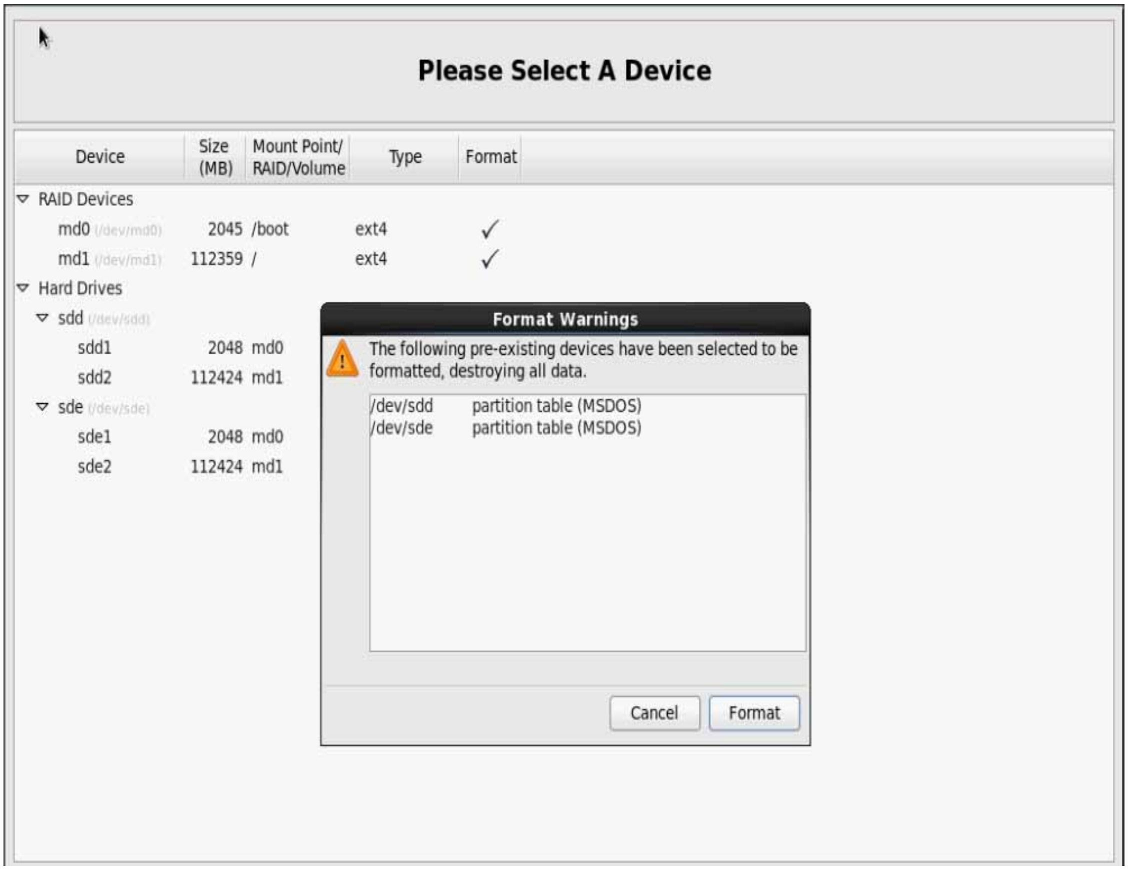
You have not specified a swap partition. Although not strictly required in all cases, it will significantly improve performance for most installations.

Would you like to continue with your requested partitioning scheme?

Note Swap partition can be created using the similar steps, however, since these systems are high in memory, this step is skipped (click **Yes**).

28. Click **Next**, and then click **Format**.

Figure 160 RHEL Installation: Destroy Old Devices



Please Select A Device

Device	Size (MB)	Mount Point/ RAID/Volume	Type	Format
▽ RAID Devices				
md0 (/dev/md0)	2045	/boot	ext4	✓
md1 (/dev/md1)	112359	/	ext4	✓
▽ Hard Drives				
▽ sdd (/dev/sdd)				
sdd1	2048	md0		
sdd2	112424	md1		
▽ sde (/dev/sde)				
sde1	2048	md0		
sde2	112424	md1		

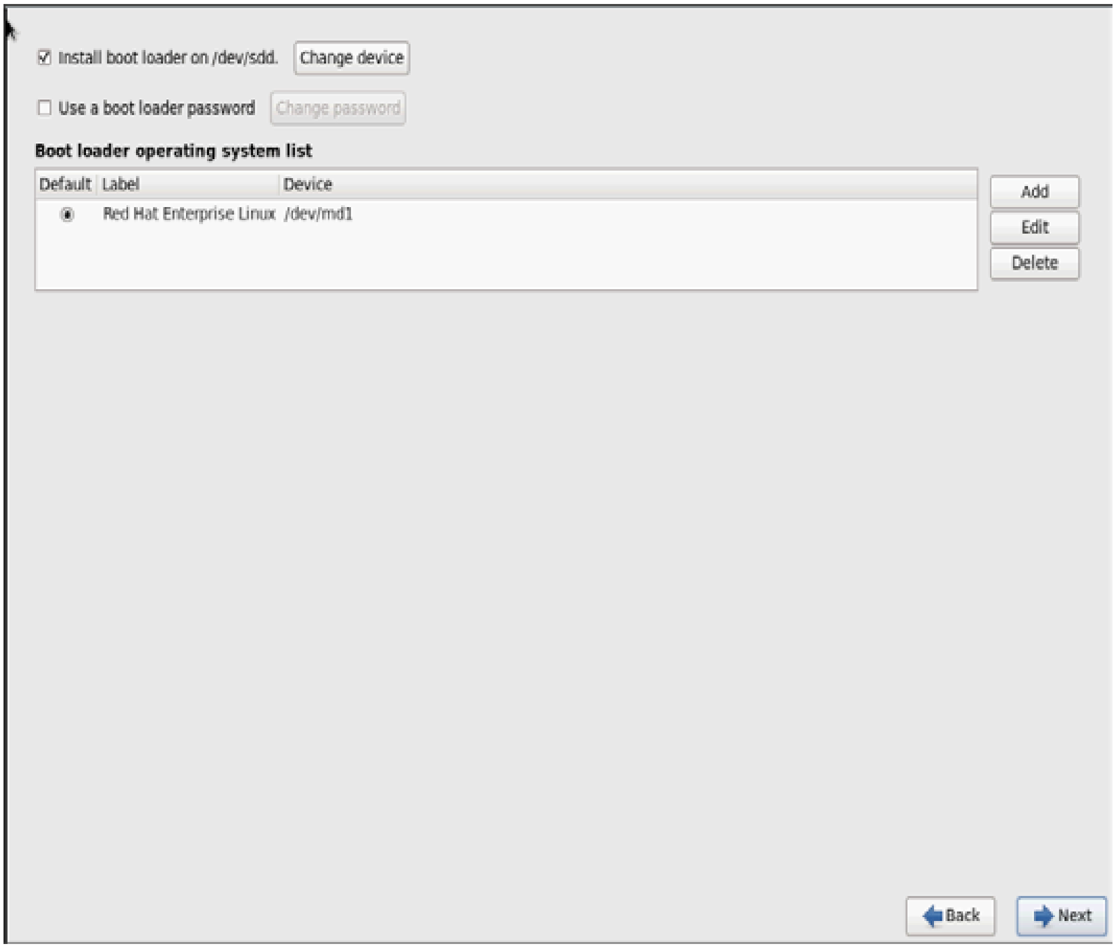
Format Warnings

The following pre-existing devices have been selected to be formatted, destroying all data.

```
/dev/sdd      partition table (MSDOS)
/dev/sde      partition table (MSDOS)
```

29. Select default settings and click **Next.**

Figure 161 RHEL Installation: Installing Boot Loader



☑ Install boot loader on /dev/sdd.

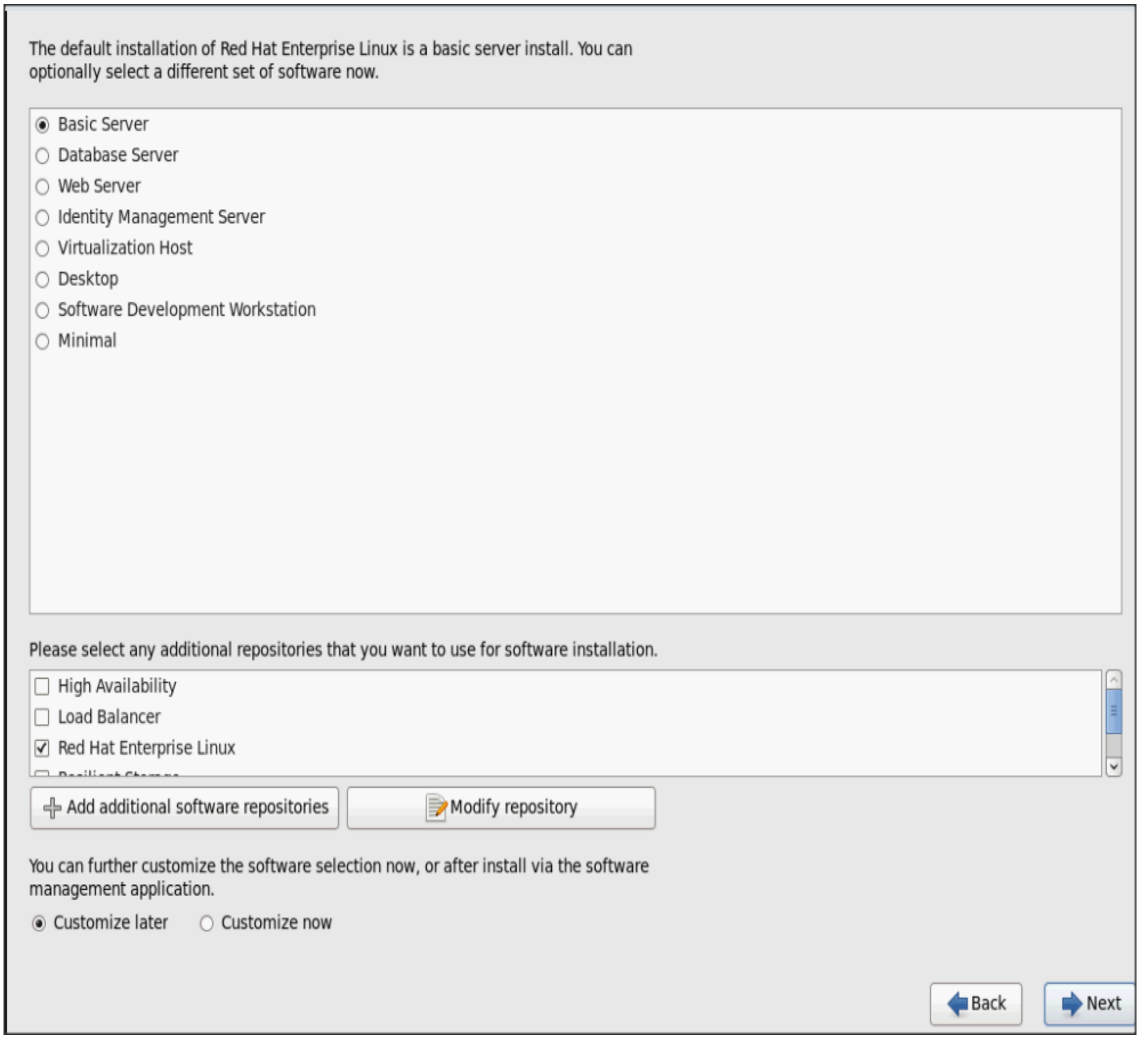
□ Use a boot loader password

Boot loader operating system list

Default	Label	Device
●	Red Hat Enterprise Linux	/dev/md1

30. Continue with RHEL Installation as shown below.

Figure 162 RHEL Installation: Keep the Default Installation Option



The default installation of Red Hat Enterprise Linux is a basic server install. You can optionally select a different set of software now.

● Basic Server
○ Database Server
○ Web Server
○ Identity Management Server
○ Virtualization Host
○ Desktop
○ Software Development Workstation
○ Minimal

Please select any additional repositories that you want to use for software installation.

☐ High Availability
☐ Load Balancer
☑ Red Hat Enterprise Linux
☐ Resilient Storage

You can further customize the software selection now, or after install via the software management application.

● Customize later ○ Customize now

31. Once the installation is complete reboot the system.

Repeat the steps 1 through 40 to install Red Hat Linux 6.5 on Servers 2 through 160.

Note The OS installation and configuration of the nodes that is mentioned above can be automated through PXE boot or third party tools.

Table 10 Host Names and IP Addresses

Servers	ETH 0	ETH 1	ETH 2
rhel 1	10.0.145.45	10.0.146.45	10.0.147.45
rhel 2	10.0.145.46	10.0.146.46	10.0.147.46
rhel 3	10.0.145.47	10.0.146.47	10.0.147.47

Table 10 Host Names and IP Addresses

rhel 4	10.0.145.48	10.0.146.48	10.0.147.48
rhel 5	10.0.145.49	10.0.146.49	10.0.147.49
rhel 6	10.0.145.50	10.0.146.50	10.0.147.50
rhel 7	10.0.145.51	10.0.146.51	10.0.147.51
rhel 8	10.0.145.52	10.0.146.52	10.0.147.52
rhel 9	10.0.145.53	10.0.146.53	10.0.147.53
rhel 10	10.0.145.54	10.0.146.54	10.0.147.54
rhel 11	10.0.145.55	10.0.146.55	10.0.147.55
rhel 12	10.0.145.56	10.0.146.56	10.0.147.56
rhel 13	10.0.145.57	10.0.146.57	10.0.147.57
rhel 14	10.0.145.58	10.0.146.58	10.0.147.58
rhel 15	10.0.145.59	10.0.146.59	10.0.147.59
rhel 16	10.0.145.60	10.0.146.60	10.0.147.60
…	…	…	…
rhel 160	10.0.145.204	10.0.146.204	10.0.147.204

Note **On Cloudera Security**: As mentioned above in the “Configuring VLANs” Section, when deploying Cloudera with Security only one VLAN on one vNIC is supported. Please refer to the note for more details

Post OS Install Configuration

Choose one of the nodes of the cluster as Admin Node for management such as CDH installation, parallel shell, creating a local Red Hat repo and others. This CVD uses rhel1 for this purpose.

Note rhel1 is admin node for the entire Hadoop cluster spawning across two different FI domains

Setting Up Password-less Login

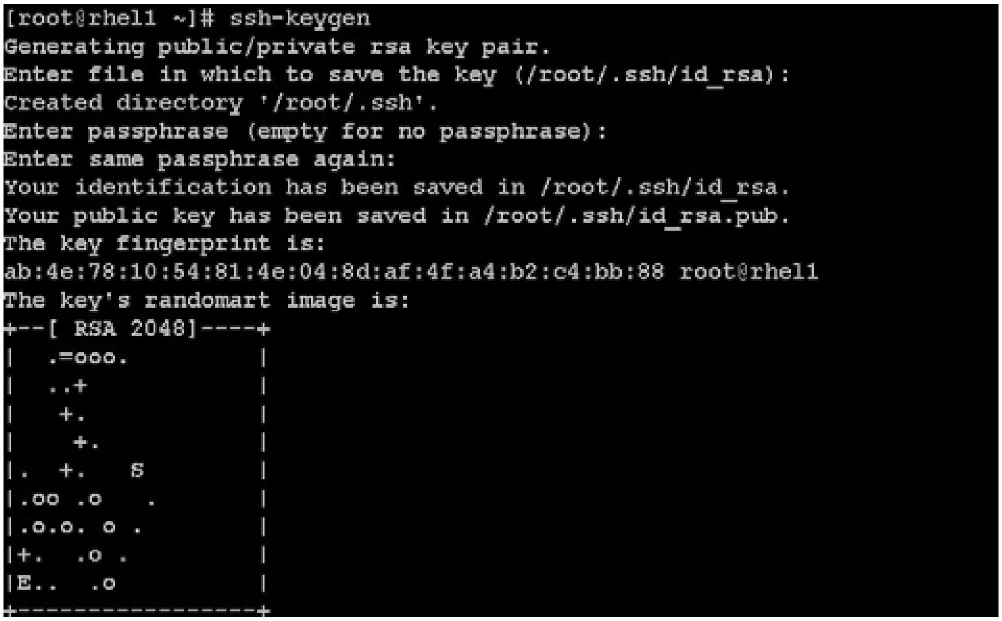
To manage all of the clusters nodes from the admin node we need to setup password-less login. It assists in automating common tasks with cluster-shell (clush, a cluster wide parallel shell), and shell-scripts without having to use passwords.

Once Red Hat Linux is installed across all the nodes in the cluster, follow these steps in order to enable password-less login across all the nodes.

1. Login to the Admin Node (rhel1)

```
ssh 10.0.145.45
```

2. Run the ssh-keygen command to create both public and private keys on the admin node.



```
[root@rhel1 ~]# ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/root/.ssh/id_rsa):
Created directory '/root/.ssh'.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /root/.ssh/id_rsa.
Your public key has been saved in /root/.ssh/id_rsa.pub.
The key fingerprint is:
ab:4e:78:10:54:81:4e:04:8d:af:4f:a4:b2:c4:bb:88 root@rhel1
The key's randomart image is:
+--[ RSA 2048]----+
|   .=ooo.        |
|   ..+           |
|    +.           |
|     +.          |
|.  +.   S        |
|.oo .o    .      |
|.o.o. o .        |
|+.   .o .        |
|E..   .o         |
+-----------------+
```

3. Then run the following command from the admin node to copy the public key id_rsa.pub to all the nodes of the cluster. ssh-copy-id appends the keys to the remote-host's .ssh/authorized_key.

```
for IP in {101..168}; do echo -n "$IP -> "; ssh-copy-id -i ~/.ssh/id_rsa.pub
10.29.160.$IP; done
```

Enter **yes** for **Are you sure you want to continue connecting (yes/no)?**

Enter the password of the remote host.

Configuring /etc/hosts

Setup /etc/hosts on the Admin node and other nodes as follows; this is a pre-configuration to setup DNS as shown in the further section.

Follow these steps to create the host file across all the nodes in the cluster:

1. Populate the host file with IP addresses and corresponding hostnames on the Admin node (rhel1) and other nodes as follows

On Admin Node (rhel1)

```
vi /etc/hosts
127.0.0.1 local host localhost.localdomain localhost4 localhost4.localdomain4
::1 localhost localhost.localdomain localhost6 localhost6.localdomain6

10.0.145.45 rhel1.mgmt
10.0.145.46 rhel2.mgmt
10.0.145.47 rhel3.mgmt
10.0.145.48 rhel4.mgmt
10.0.145.49 rhel5.mgmt
10.0.145.50 rhel6.mgmt
10.0.145.51 rhel7.mgmt
10.0.145.52 rhel8.mgmt
10.0.145.53 rhel9.mgmt
10.0.145.54 rhel10.mgmt
10.0.145.55 rhel11.mgmt
```

```
10.0.145.56 rhel12.mgmt
10.0.145.57 rhel13.mgmt
10.0.145.58 rhel14.mgmt
10.0.145.59 rhel15.mgmt
. . .
10.0.145.204 rhel160.mgmt


10.0.146.45 rhel1
10.0.146.46 rhel2
10.0.146.47 rhel3
10.0.146.48 rhel4
10.0.146.49 rhel5
10.0.146.50 rhel6
10.0.146.51 rhel7
10.0.146.52 rhel8
10.0.146.53 rhel9
10.0.146.54 rhel10
10.0.146.55 rhel11
10.0.146.56 rhel12
10.0.146.57 rhel13
10.0.146.58 rhel14
10.0.146.59 rhel15
. . .
10.0.146.204 rhel160
```

Setup ClusterShell

ClusterShell (or clush) is cluster wide shell to run commands on several hosts in parallel.

From the system connected to the Internet download Cluster shell (clush) and install it on rhel1. Cluster shell is available from EPEL (Extra Packages for Enterprise Linux) repository.

```
wget http://dl.fedoraproject.org/pub/epel//6/x86_64/clustershell-1.6-1.el6.noarch.rpm

scp clustershell-1.6-1.el6.noarch.rpm rhel1:/root/
```

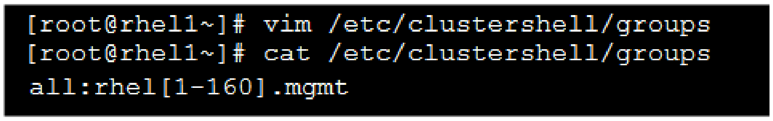
Login to rhel1 and install cluster shell

```
yum -y install clustershell-1.6-1.el6.noarch.rpm
```

```
Edit /etc/clustershell/groups file to include host-names for all the nodes of the cluster.
These set of hosts are taken when running clush with '-a' option
```

For 68 node cluster as in our CVD, set groups file as follows,

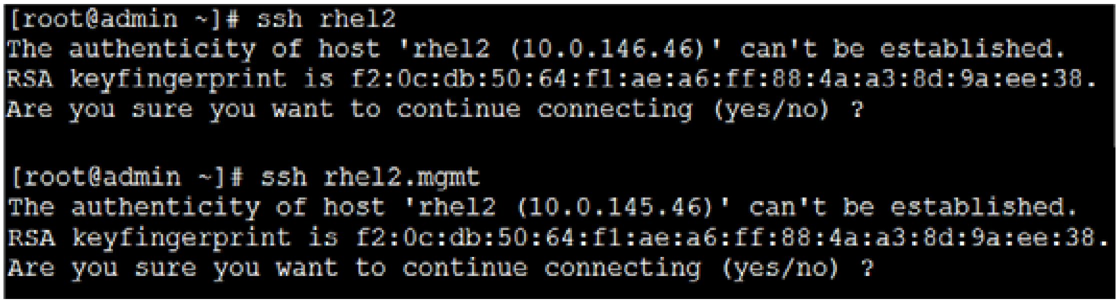
```
vi /etc/clustershell/groups
all: rhel[1-160]
```



```
[root@rhel1~]# vim /etc/clustershell/groups
[root@rhel1~]# cat /etc/clustershell/groups
all:rhel[1-160].mgmt
```

Note For more information and documentation on ClusterShell, visit https://github.com/cea-hpc/clustershell/wiki/UserAndProgrammingGuide

Note Clustershell will not work if not ssh to the machine earlier (as it requires to be in known_hosts file), for instance, as in the case below.



```
[root@admin ~]# ssh rhel2
The authenticity of host 'rhel2 (10.0.146.46)' can't be established.
RSA keyfingerprint is f2:0c:db:50:64:f1:ae:a6:ff:88:4a:a3:8d:9a:ee:38.
Are you sure you want to continue connecting (yes/no) ?

[root@admin ~]# ssh rhel2.mgmt
The authenticity of host 'rhel2 (10.0.145.46)' can't be established.
RSA keyfingerprint is f2:0c:db:50:64:f1:ae:a6:ff:88:4a:a3:8d:9a:ee:38.
Are you sure you want to continue connecting (yes/no) ?
```

Creating Red Hat Enterprise Linux (RHEL) 6.5 Local Repo

To create a repository using RHEL DVD or ISO on the admin node (in this deployment rhel1 is used for this purpose), create a directory with all the required RPMs, run the createrepo command and then publish the resulting repository.

1. Log on to rhel1. Create a directory that would contain the repository.

```
mkdir -p /var/www/html/rhelrepo
```

2. Copy the contents of the Red Hat DVD to **/var/www/html/rhelrepo** directory.

3. Alternatively, if you have access to a Red Hat ISO Image, Copy the ISO file to rhel1.

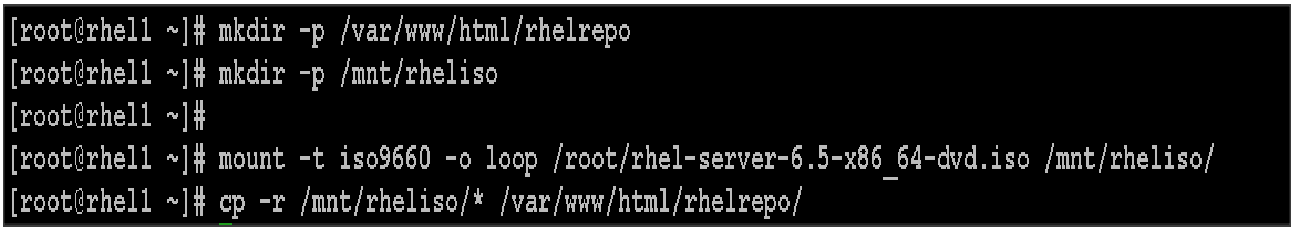
```
scp rhel-server-6.5-x86_64-dvd.iso rhel1:/root/
```

Here we assume you have the Red Hat ISO file located in your present working directory.

```
mkdir -p /mnt/rheliso
mount -t iso9660 -o loop /root/rhel-server-6.5-x86_64-dvd.iso /mnt/rheliso/
```

4. Next, copy the contents of the ISO to the **/var/www/html/rhelrepo** directory

```
cp -r /mnt/rheliso/* /var/www/html/rhelrepo
```



```
[root@rhel1 ~]# mkdir -p /var/www/html/rhelrepo
[root@rhel1 ~]# mkdir -p /mnt/rheliso
[root@rhel1 ~]#
[root@rhel1 ~]# mount -t iso9660 -o loop /root/rhel-server-6.5-x86_64-dvd.iso /mnt/rheliso/
[root@rhel1 ~]# cp -r /mnt/rheliso/* /var/www/html/rhelrepo/
```

5. Now on rhel1 create a.repo file to enable the use of the yum command.

```
vi /var/www/html/rhelrepo/rheliso.repo
[rhel6.5]
name=Red Hat Enterprise Linux 6.5
baseurl=http://10.29.160.101/rhelrepo
gpgcheck=0
enabled=1
```

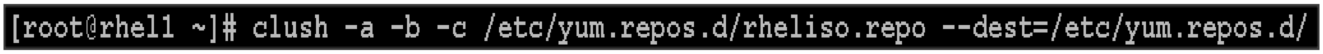
6. Now copy rheliso.repo file from **/var/www/html/rhelrepo to /etc/yum.repos.d** on rhel1

```
   cp /var/www/html/rhelrepo/rheliso.repo /etc/yum.repos.d/
```

Note Based on this repo file yum requires httpd to be running on rhel1 for other nodes to access the repository.

7. Copy the **rheliso.repo** to all the nodes of the cluster.

```
clush -a -b -c /etc/yum.repos.d/rheliso.repo --dest=/etc/yum.repos.d/
```



```
[root@rhel1 ~]# clush -a -b -c /etc/yum.repos.d/rheliso.repo --dest=/etc/yum.repos.d/
```

8. To make use of repository files on rhel1 without httpd, edit the baseurl of repo file **/etc/yum.repos.d/rheliso.repo** to point repository location in the file system.

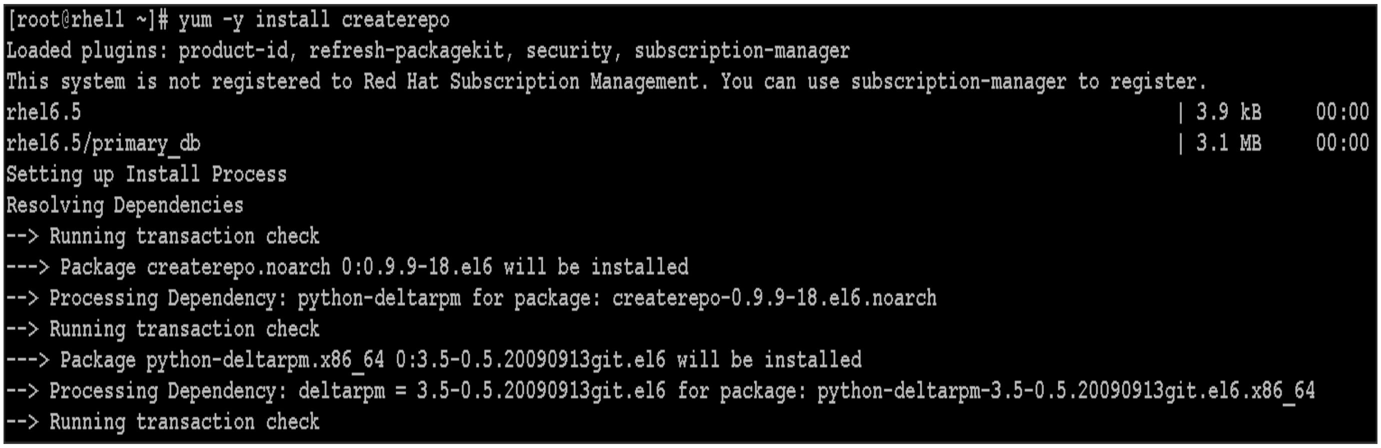
Note This step is needed to install software on Admin Node (rhel1) using the repo (such as httpd, createrepo, etc).

```
vi /etc/yum.repos.d/rheliso.repo
[rhel6.5]
name=Red Hat Enterprise Linux 6.5
baseurl=file:///var/www/html/rhelrepo
gpgcheck=0
enabled=1
```

9. Creating the Red Hat Repository Database.

Install the createrepo package on admin node (rhel1). Use it to regenerate the repository database(s) for the local copy of the RHEL DVD contents.

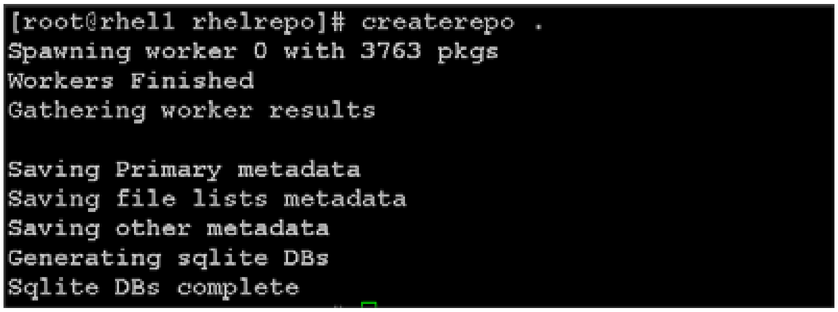
```
yum -y install createrepo
```



```
[root@rhel1 ~]# yum -y install createrepo
Loaded plugins: product-id, refresh-packagekit, security, subscription-manager
This system is not registered to Red Hat Subscription Management. You can use subscription-manager to register.
rhel6.5                                                                                  | 3.9 kB     00:00
rhel6.5/primary_db                                                                       | 3.1 MB     00:00
Setting up Install Process
Resolving Dependencies
--> Running transaction check
---> Package createrepo.noarch 0:0.9.9-18.el6 will be installed
--> Processing Dependency: python-deltarpm for package: createrepo-0.9.9-18.el6.noarch
--> Running transaction check
---> Package python-deltarpm.x86_64 0:3.5-0.5.20090913git.el6 will be installed
--> Processing Dependency: deltarpm = 3.5-0.5.20090913git.el6 for package: python-deltarpm-3.5-0.5.20090913git.el6.x86_64
--> Running transaction check
```

10. Run createrepo on the RHEL repository to create the repo database on admin node

```
cd /var/www/html/rhelrepo
createrepo .
```



```
[root@rhel1 rhelrepo]# createrepo .
Spawning worker 0 with 3763 pkgs
Workers Finished
Gathering worker results

Saving Primary metadata
Saving file lists metadata
Saving other metadata
Generating sqlite DBs
Sqlite DBs complete
```

11. Finally, purge the yum caches after httpd is installed (steps in section “Install Httpd”).

Configuring DNS

This section details setting up DNS using dnsmasq as an example based on the /etc/hosts configuration setup in the earlier section.

Follow these steps to create the host file across all the nodes in the cluster:

1. Disable Network manager on all nodes

```
clush -a -b service NetworkManager stop
clush -a -b chkconfig NetworkManager off
```

2. Update /etc/resolv.conf file to point to Admin Node

```
vi /etc/resolv.conf
nameserver 10.0.146.45
```

Note This step is needed if setting up dnsmasq on Admin node. Else this file should be updated with the correct nameserver.

3. Install and Start dnsmasq on Admin node

```
yum -y install dnsmasq
service dnsmasq start
chkconfig dnsmasq on
```

4. Deploy /etc/resolv.conf from the admin node (rhel1) to all the nodes via the following clush command:

```
clush -a -B -c /etc/resolv.conf
```

Note A clush copy without - –dest copies to the same directory location as the source-file directory.

5. Ensure DNS is working fine by running the following command on Admin node and any datanode

```
[root@rhel2 ~]# nslookup rhel1
    Server:             10.0.146.45
    Address:            10.0.146.45#53

   Name:   rhel1
Address: 10.0.146.45

  [root@rhel2 ~]# nslookup rhel1
Server:             10.0.146.45
Address:            10.0.146.45#53

  45.146.0.10.in-addr.arpa     name = rhel1.
  [root@rhel2 ~]# nslookup rhel1.mgmt
    Server:             10.0.146.45
    Address:            10.0.146.45#53

   Name:   rhel1.mgmt
Address: 10.0.145.45
```

Installing httpd

Setting up RHEL repo on the admin node requires httpd. This section describes the process of setting up one

1. Install httpd on the admin node to host repositories.

   The Red Hat repository is hosted using HTTP on the admin node, this machine is accessible by all the hosts in the cluster.

   ```
   yum –y install httpd
   ```

2. Add ServerName and make the necessary changes to the server configuration file.

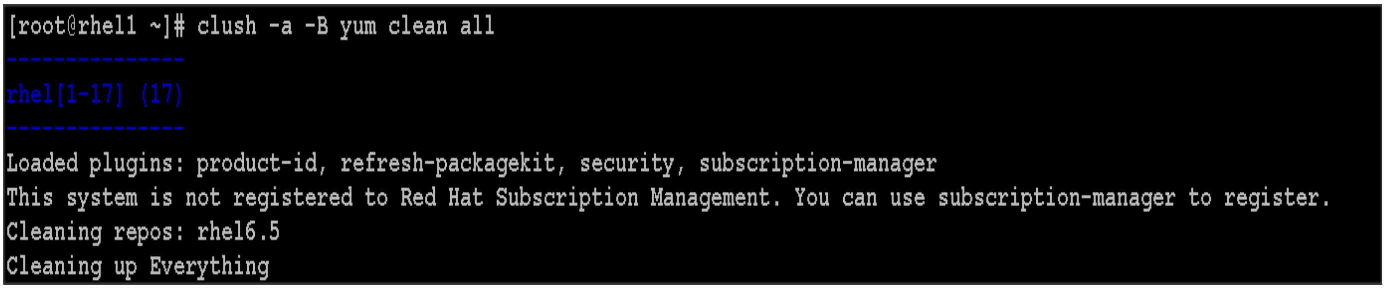
   ```
   vi /etc/httpd/conf/httpd.conf
   ServerName 10.0.145.45:80
   ```

3. Start httpd

   ```
   service httpd start
   chkconfig httpd on
   ```

4. Purge the yum caches after httpd is installed (step followed from section Setup Red Hat Repo)

   ```
   clush -a -B yum clean all
   clush –a –B yum repolist
   ```



```
[root@rhel1 ~]# clush -a -B yum clean all
---------------
rhel[1-17] (17)
---------------
Loaded plugins: product-id, refresh-packagekit, security, subscription-manager
This system is not registered to Red Hat Subscription Management. You can use subscription-manager to register.
Cleaning repos: rhel6.5
Cleaning up Everything
```

Note While suggested configuration is to disable SELinux as shown below, if for any reason SELinux needs to be enabled on the cluster, then ensure to run the following to make sure that the httpd is able to read the Yum repofiles `chcon -R -t httpd_sys_content_t /var/www/html/`

Upgrading Cisco Network driver for VIC1227

The latest Cisco Network driver is required for performance and updates. The latest drivers can be downloaded from the link below:

https://software.cisco.com/download/release.html?mdfid=283862063&flowid=25886&softwareid=283853158&release=1.5.7d&relind=AVAILABLE&rellifecycle=&reltype=latest

In the ISO image, the required driver `kmod-enic-2.1.1.66-rhel6u5.el6.x86_64.rpm` can be located at `\Linux\Network\Cisco\12x5x\RHEL\RHEL6.5`

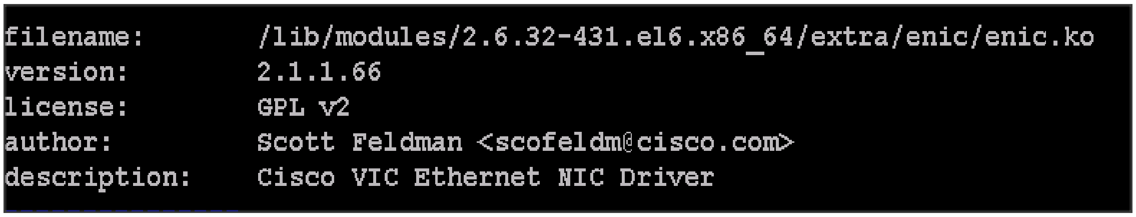
From a node connected to the Internet, download, extract and transfer `kmod-enic-2.1.1.66-rhel6u5.el6.x86_64.rpm` to rhel1 (admin node).

Install the rpm on all nodes of the cluster using the following clush commands. For this example the rpm is assumed to be in present working directory of rhel1.

```
[root@rhel1 ~]# clush -a -b -c kmod-enic-2.1.1.66-rhel6u5.el6.x86_64.rpm
[root@rhel1 ~]# clush -a -b "rpm -ivh kmod-enic-2.1.1.66-rhel6u5.el6.x86_64.rpm "
```

Ensure that the above installed version of kmod-enic driver is being used on all nodes by running the command “modinfo enic” on all nodes

```
[root@rhel1 ~]# clush -a -B "modinfo enic | head -5"
```

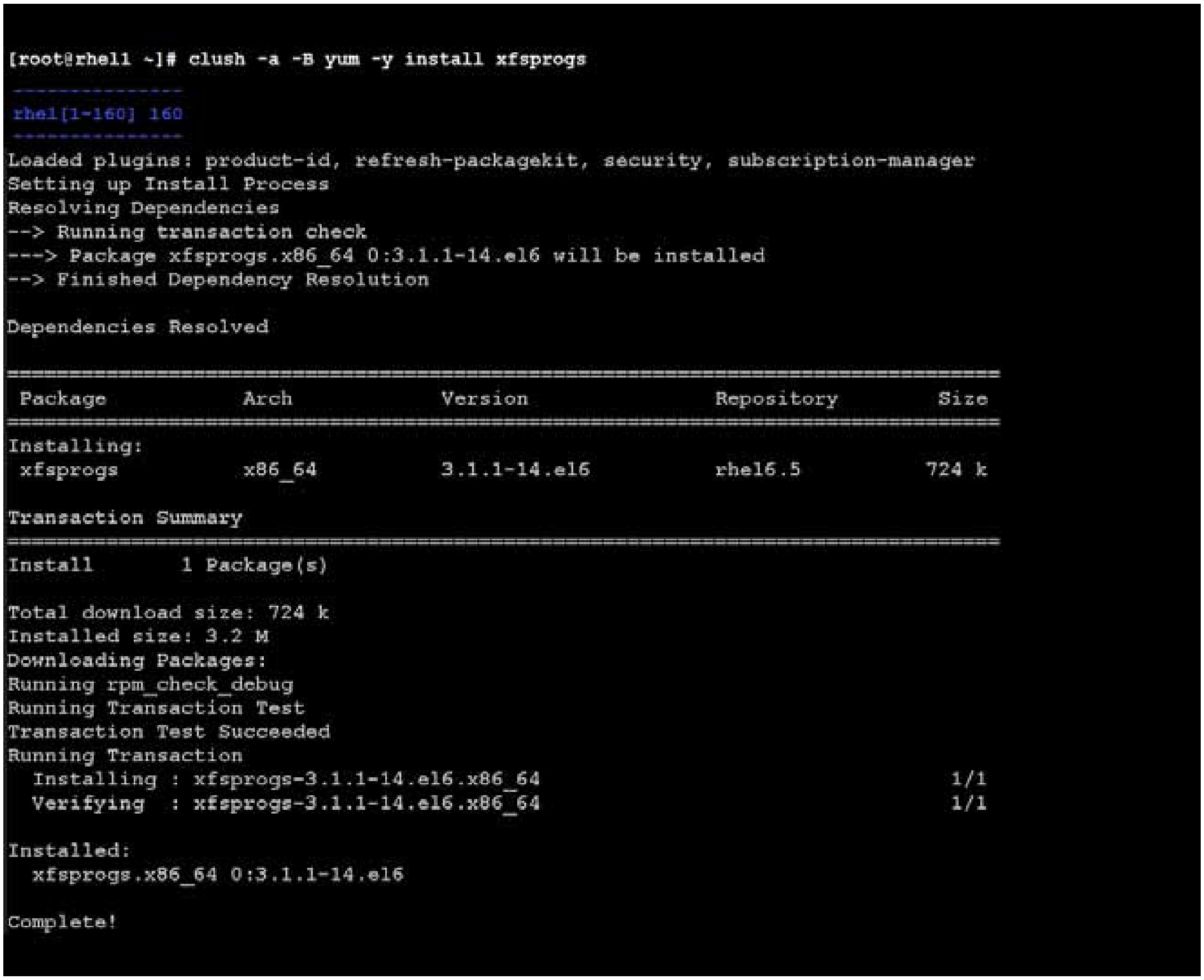


```
filename:       /lib/modules/2.6.32-431.el6.x86_64/extra/enic/enic.ko
version:        2.1.1.66
license:        GPL v2
author:         Scott Feldman <scofeldm@cisco.com>
description:    Cisco VIC Ethernet NIC Driver
```

Installing xfsprogs

From the admin node rhel1 run the command below to Install **xfsprogs** on all the nodes for xfs filesystem.

```
clush -a -B yum -y install xfsprogs
```



```
[root@rhel1 ~]# clush -a -B yum -y install xfsprogs
---------------
rhel[1-160] 160
---------------
Loaded plugins: product-id, refresh-packagekit, security, subscription-manager
Setting up Install Process
Resolving Dependencies
--> Running transaction check
---> Package xfsprogs.x86_64 0:3.1.1-14.el6 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================
 Package           Arch             Version                Repository       Size
================================================================================
Installing:
 xfsprogs          x86_64           3.1.1-14.el6           rhel6.5         724 k

Transaction Summary
================================================================================
Install       1 Package(s)

Total download size: 724 k
Installed size: 3.2 M
Downloading Packages:
Running rpm_check_debug
Running Transaction Test
Transaction Test Succeeded
Running Transaction
  Installing : xfsprogs-3.1.1-14.el6.x86_64                                  1/1
  Verifying  : xfsprogs-3.1.1-14.el6.x86_64                                  1/1

Installed:
  xfsprogs.x86_64 0:3.1.1-14.el6

Complete!
```

NTP Configuration

The Network Time Protocol (NTP) is used to synchronize the time of all the nodes within the cluster. The Network Time Protocol daemon (ntpd) sets and maintains the system time of day in synchronism with the timeserver located in the admin node (rhel1). Configuring NTP is critical for any Hadoop Cluster. If server clocks in the cluster drift out of sync, serious problems will occur with HBase and other services.

> Installing an internal NTP server keeps your cluster synchronized even when an outside NTP server is inaccessible.

Configure `/etc/ntp.conf` on the admin node with the following contents:

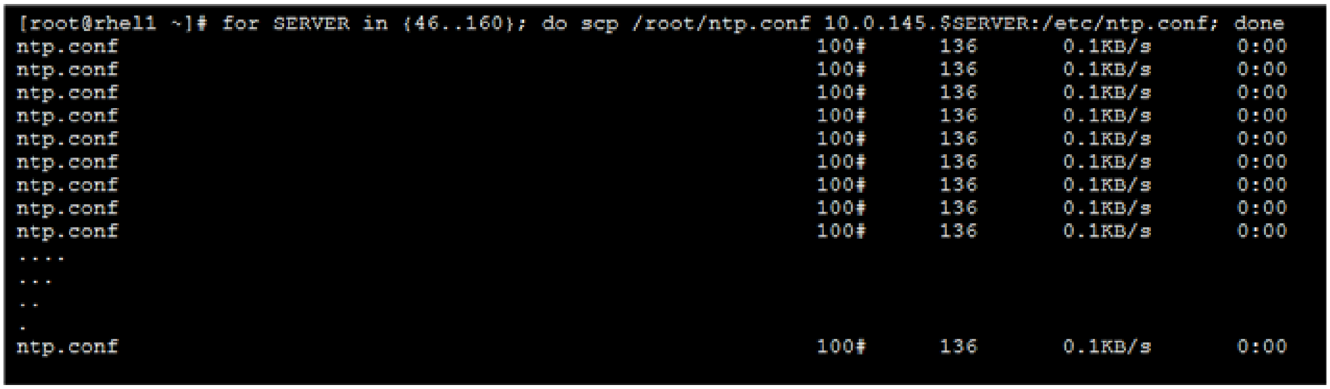
```
vi /etc/ntp.conf
driftfile /var/lib/ntp/drift
restrict 127.0.0.1
restrict -6 ::1
server 127.127.1.0
fudge 127.127.1.0 stratum 10
includefile /etc/ntp/crypto/pw
keys /etc/ntp/keys
```

Create `/root/ntp.conf` on the admin node and copy it to all nodes

```
vi /root/ntp.conf
server 10.29.160.101
driftfile /var/lib/ntp/drift
restrict 127.0.0.1
restrict -6 ::1
includefile /etc/ntp/crypto/pw
keys /etc/ntp/keys
```

Copy ntp.conf file from the admin node to /etc of all the data nodes (except rhel1) by executing the following command in the admin node (rhel1)

```
for SERVER in {46..204}; do scp /root/ntp.conf
10.0.145.$SERVER:/etc/ntp.conf; done
```



```
[root@rhel1 ~]# for SERVER in {46..160}; do scp /root/ntp.conf 10.0.145.$SERVER:/etc/ntp.conf; done
ntp.conf                                                      100%     136     0.1KB/s     0:00
ntp.conf                                                      100%     136     0.1KB/s     0:00
ntp.conf                                                      100%     136     0.1KB/s     0:00
ntp.conf                                                      100%     136     0.1KB/s     0:00
ntp.conf                                                      100%     136     0.1KB/s     0:00
ntp.conf                                                      100%     136     0.1KB/s     0:00
ntp.conf                                                      100%     136     0.1KB/s     0:00
ntp.conf                                                      100%     136     0.1KB/s     0:00
ntp.conf                                                      100%     136     0.1KB/s     0:00
....
...
..
.
ntp.conf                                                      100%     136     0.1KB/s     0:00
```

Note To run the above in clush use –w option: `clush -w rhel[2-160].mgmt -b -c /root/ntp.conf --dest=/etc`

Do not use **clush –a –b –c /root/ntp.conf --dest=/etc** command as it overwrites **/etc/ntp.conf** on the admin node.

Run thef following to syncronize the time and restart NTP daemon on all nodes

```
clush -a -B "yum install -y ntpdate"
clush -a -b "service ntpd stop"
clush -a -b "ntpdate rhel1"
clush -a -b "service ntpd start"
```

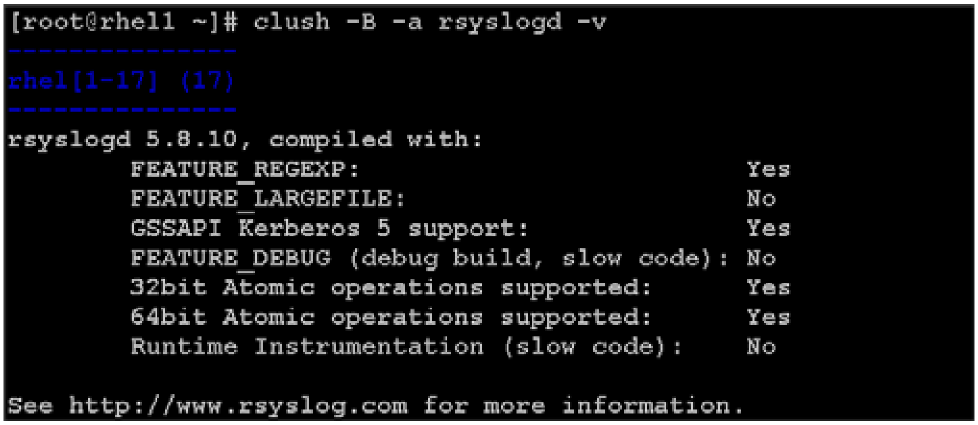
Ensure restart of NTP daemon across reboots

```
clush -a -b "chkconfig ntpd on"
```

Enabling Syslog

Syslog must be enabled on each node to preserve logs regarding killed processes or failed jobs. Modern versions such as syslog-ng and rsyslog are possible, making it more difficult to be sure that a syslog daemon is present. One of the following commands should suffice to confirm that the service is properly configured:

```
clush -B -a rsyslogd -v
```



```
[root@rhel1 ~]# clush -B -a rsyslogd -v
---------------
rhel[1-17] (17)
---------------
rsyslogd 5.8.10, compiled with:
        FEATURE_REGEXP:                         Yes
        FEATURE_LARGEFILE:                      No
        GSSAPI Kerberos 5 support:              Yes
        FEATURE_DEBUG (debug build, slow code): No
        32bit Atomic operations supported:      Yes
        64bit Atomic operations supported:      Yes
        Runtime Instrumentation (slow code):    No

See http://www.rsyslog.com for more information.
```

```
clush -B -a service rsyslog status
```

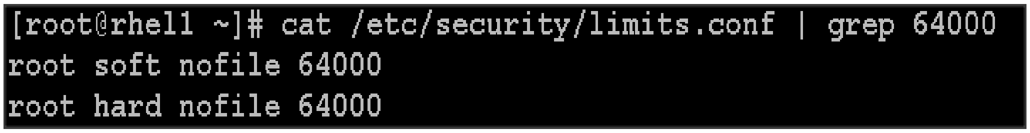
Setting ulimit

On each node, **ulimit -n** specifies the number of inodes that can be opened simultaneously. With the default value of 1024, the system appears to be out of disk space and shows no inodes available. This value should be set to 64000 on every node.

Higher values are unlikely to result in an appreciable performance gain.

For setting ulimit on Redhat, edit `/etc/security/limits.conf` on admin node rhel1 and add the following lines:

```
vim /etc/security/limits.conf
root soft nofile 64000
root hard nofile 64000
```



```
[root@rhel1 ~]# cat /etc/security/limits.conf | grep 64000
root soft nofile 64000
root hard nofile 64000
```

Copy the `/etc/security/limits.conf` file from admin node (rhel1) to all the nodes using the following command.

```
clush -a -b -c /etc/security/limits.conf --dest=/etc/security/
```

```
[root@rhel1 ~]# clush -a -b -c /etc/security/limits.conf --dest=/etc/security/
```

Verify the **ulimit** setting with the following steps:

Note Ulimit values are applied on a new shell, running the command on a node on an earlier instance of a shell will show old values

Run the following command at a command line. The command should report 64000.

```
clush -B -a ulimit -n
```

Disabling SELinux

SELinux must be disabled during the install procedure and cluster setup. SELinux can be enabled after installation and while the cluster is running.

SELinux can be disabled by editing `/etc/selinux/config` and changing the SELINUX line to SELINUX=disabled. The following command will disable SELINUX on all nodes.

```
clush -a -b "sed -i 's/SELINUX=enforcing/SELINUX=disabled/g' /etc/selinux/config "
clush –a –b "setenforce 0"
```

```
[root@rhel1 ~]# clush -a -b "sed -i 's/SELINUX=enforcing/SELINUX=disabled/g' /etc/selinux/config "
```

Note The above command may fail if SELinux is already disabled.

VM.Swapping

Lowering vm.swappiness reduces anonymous paging and minimizes OOM killer invocations.Run the following on all nodes. Variable vm.swappiness defines how often swap should be used. 0 is No Swapping, 60 default. With vm.swappiness set to 1, the kernel will try to reclaim from the page cache instead of application (anonymous) pages.

```
clush -a -b " echo 'vm.swappiness=1' >> /etc/sysctl.conf"
```

Load the settings from default sysctl file /etc/sysctl.conf

```
clush -a -b "sysctl -p"
```

Disable Transparent Huge Pages

Disabling Transparent Huge Pages (THP) reduces elevated CPU usage caused by THP. From the admin node, run the following commands

```
clush -a -b "echo never > /sys/kernel/mm/redhat_transparent_hugepage/enabled"

clush -a -b "echo never > /sys/kernel/mm/redhat_transparent_hugepage/defrag"
```

The above command needs to be run for every reboot, hence, copy this command to /etc/rc.local so they are executed automatically for every reboot.

On Admin node, run the following commands

```
rm –f /root/thp_disable
echo "echo never > /sys/kernel/mm/redhat_transparent_hugepage/enabled" >>
/root/thp_disable
echo "echo never > /sys/kernel/mm/redhat_transparent_hugepage/defrag " >>
/root/thp_disable
```

Copy file to each node

```
clush –a –b –c /root/thp_disable
```

Append the content of file thp_disable to /etc/rc.local

```
clush -a -b “cat /root/thp_disable >> /etc/rc.local”
```

Set TCP Retries

Adjusting the tcp_retries parameter for the system network enables faster detection of failed nodes. Given the advanced networking features of UCS, this is a safe and recommended change (failures observed at the operating system layer are most likely serious rather than transitory). On each node, set the number of TCP retries to 5 can help detect unreachable nodes with less latency.

1. Edit the file **/etc/sysctl.conf** and on admin node rhel1 and add the following lines:

```
net.ipv4.tcp_retries2=5
```

Copy the **/etc/sysctl.conf** file from admin node (rhel1) to all the nodes using the following command.

```
clush -a -b -c /etc/sysctl.conf --dest=/etc/
```

2. Load the settings from default sysctl file **/etc/sysctl.conf** by running the below command.

```
clush -B -a sysctl -p
```

Disabling the Linux Firewall

The default Linux firewall settings are far too restrictive for any Hadoop deployment. Since the UCS Big Data deployment will be in its own isolated network, there’s no need to leave the IP tables service running.

```
clush -a -b "service iptables stop"
clush -a -b "chkconfig iptables off"
```

```
[root@rhel1 ~]# clush -a -b "service iptables stop"
[root@rhel1 ~]# clush -a -b "chkconfig iptables off"
```

Disable IPv6 Defaults

Disable IPv6 as the addresses used are IPv4.

```
clush -a -b “echo 'net.ipv6.conf.all.disable_ipv6 = 1' >> /etc/sysctl.conf”
clush -a -b “echo 'net.ipv6.conf.default.disable_ipv6 = 1' >> /etc/sysctl.conf”
clush -a -b “echo 'net.ipv6.conf.lo.disable_ipv6 = 1' >> /etc/sysctl.conf”
```

Load the settings from default sysctl file /etc/sysctl.conf

```
clush -a -b “sysctl -p”
```

Disable IPv6 Defaults

Disable IPv6 as the addresses used are IPv4.

```
clush -a -b “echo \'net.ipv6.conf.all.disable_ipv6 = 1\' >> /etc/sysctl.conf”
clush -a -b “echo \'net.ipv6.conf.default.disable_ipv6 = 1\' >> /etc/sysctl.conf”
clush -a -b “echo \'net.ipv6.conf.lo.disable_ipv6 = 1\' >> /etc/sysctl.conf”
```

Load the settings from default sysctl file /etc/sysctl.conf

```
clush -a -b “sysctl -p”
```

Configuring Data Drives on Name Node

This section describes steps to configure non-OS disk drives as RAID1 using StorCli command as described below. All the drives are going to be part of a single RAID1 volume. This volume can be used for Staging any client data to be loaded to HDFS. This volume won’t be used for HDFS data.

From the website download storcli: http://www.lsi.com/downloads/Public/RAID%20Controllers/RAID%20Controllers%20Common%20Files/1.14.12_StorCLI.zip

Extract the zip file and copy storcli-1.14.12-1.noarch.rpm from the linux directory.

1. Download storcli and its dependencies and transfer to Admin node.

   ```
   scp storcli-1.14.12-1.noarch.rpm rhel1:/root/
   ```

2. Copy storcli rpm to all the nodes using the following commands:

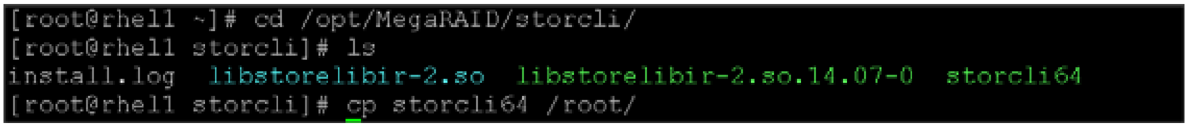
   ```
   clush -a -b -c /root/storcli-1.14.12-1.noarch.rpm --dest=/root/
   ```

3. Run the below command to install storcli on all the nodes

   ```
   clush -a -b rpm -ivh storcli-1.14.12-1.noarch.rpm
   ```

4. Run the below command to copy storcli64 to root directory.

   ```
   cd /opt/MegaRAID/storcli/
   cp storcli64 /root/
   ```



```
[root@rhel1 ~]# cd /opt/MegaRAID/storcli/
[root@rhel1 storcli]# ls
install.log  libstorelibir-2.so  libstorelibir-2.so.14.07-0  storcli64
[root@rhel1 storcli]# cp storcli64 /root/
```

5. Copy storcli64 to all the nodes using the following commands:

   ```
   clush -a -b -c /root/storcli64 --dest=/root/
   ```

6. Run the following script as root user on NameNode and Secondary NameNode to create the virtual drives.

```
vi /root/raid1.sh
./storcli64 -cfgldadd
r1[$1:1,$1:2,$1:3,$1:4,$1:5,$1:6,$1:7,$1:8,$1:9,$1:10,$1:11,$1:12,$1:13,$1:14,$1:15,$1
:16,$1:17,$1:18,$1:19,$1:20,$1:21,$1:22,$1:23,$1:24] wb ra nocachedbadbbu strpsz1024
-a0
The above script requires enclosure ID as a parameter. Run the following command to
get enclousure id.
./storcli64 pdlist -a0 | grep Enc | grep -v 252 | awk '{print $4}' | sort | uniq -c |
awk '{print $2}'
chmod 755 raid1.sh
```

Run MegaCli script as follows

```
./raid1.sh <EnclosureID> obtained by running the command above
```

WB: Write back

RA: Read Ahead

NoCachedBadBBU: Do not write cache when the BBU is bad.

Strpsz1024: Strip Size of 1024K

Note The command above will not override any existing configuration. To clear and reconfigure existing configurations refer to Embedded MegaRAID Software Users Guide available at www.lsi.com

Configuring Data Drives on Data Nodes

This section describes steps to configure non-OS disk drives as individual RAID0 volumes using StorCli command as described below. These volumes are going to be used for HDFS Data.

Issue the following command from the admin node to create the virtual drives with individual RAID 0 configurations on all the datanodes.

```
clush -w rhel[3-64] -B ./storcli64 -cfgeachdskraid0 WB RA direct NoCachedBadBBU
strpsz1024 -a0
```

WB: Write back

RA: Read Ahead

NoCachedBadBBU: Do not write cache when the BBU is bad.

Strpsz1024: Strip Size of 1024K

Note The command above will not override existing configurations. To clear and reconfigure existing configurations refer to Embedded MegaRAID Software Users Guide available at www.lsi.com

Configuring the Filesystem for NameNodes and DataNodes

The following script will format and mount the available volumes on each node whether it is namenode, Data node or Archival node. OS boot partition is going to be skipped. All drives are going to be mounted based on their UUID as /data/disk1, /data/disk2, and so on.

1. On the Admin node, create a file containing the following script.

To create partition tables and file systems on the local disks supplied to each of the nodes, run the following script as the root user on each node.

Note The script assumes there are no partitions already existing on the data volumes. If there are partitions, then they have to be deleted first before running this script. This process is documented in the "Note" section at the end of the section

```
vi /root/driveconf.sh
#!/bin/bash
#disks_count=`lsblk -id | grep sd | wc -l`
#if [ $disks_count -eq 24 ]; then
# echo "Found 24 disks"
#else
# echo "Found $disks_count disks. Expecting 24. Exiting.."
# exit 1
#fi
[[ "-x" == "${1}" ]] && set -x && set -v && shift 1
count=1
for X in /sys/class/scsi_host/host?/scan
do
echo '- - -' > ${X}
done
for X in /dev/sd?
do
echo $X
if [[ -b ${X} && `/sbin/parted -s ${X} print quit|/bin/grep -c boot` -ne 0
]]
then
echo "$X bootable - skipping."
continue
else
Y=${X##*/}1
echo "Setting up Drive => ${X}"
/sbin/parted -s ${X} mklabel gpt quit
/sbin/parted -s ${X} mkpart 1 6144s 100% quit
/sbin/mkfs.xfs -f -q -l size=65536b,lazy-count=1,su=256k -d sunit=1024,swidth=6144 -r
extsize=256k -L ${Y} ${X}1
(( $? )) && continue
#Identify UUID
UUID=`blkid ${X}1 | cut -d " " -f3 | cut -d "=" -f2 | sed 's/"//g'`
/bin/mkdir  -p  /data/disk${count}
(( $? )) && continue
echo "UUID of ${X}1 = ${UUID}, mounting ${X}1 as UUID on /data/disk${count}"
/bin/mount  -t xfs  -o allocsize=128m,noatime,nobarrier,nodiratime -U ${UUID}
/data/disk${count}
(( $? )) && continue
echo "UUID=${UUID} /data/disk${count} xfs allocsize=128m,noatime,nobarrier,nodiratime
0 0" >> /etc/fstab
((count++))
fi
done
```

2. Run the following command to copy driveconf.sh to all the nodes

```
chmod 755 /root/driveconf.sh
clush –a -B –c /root/driveconf.sh
```

3. Run the following command from the admin node to run the script across all data nodes

```
clush –a –B /root/driveconf.sh
```

4. Run the following from the admin node to list the partitions and mount points

```
clush –a -B df –h
clush –a -B mount
clush –a -B cat /etc/fstab
```

Note In-case there is need to delete any partitions, it can be done so using the following. Run command ‘mount’ to identify which drive is mounted to which device /dev/sd<?> umount the drive for which partition is to be deleted and run fdisk to delete as shown below.

Care to be taken **not to delete OS partition** as this will wipe out OS

```
mount
umount /data/disk1 # <-- disk1 shown as example
(echo d;  echo w;) | sudo fdisk /dev/sd<?>
```

Cluster Verification

The section describes the steps to create the script cluster_verification.sh that helps to verify CPU, memory, NIC, storage adapter settings across the cluster on all nodes. This script also checks additional prerequisites such as NTP status, SELinux status, ulimit settings, JAVA_HOME settings and JDK version, IP address and hostname resolution, Linux version and firewall settings.

Create script cluster_verification.sh as follows on the Admin node (rhel1).

```
vi cluster_verification.sh
#!/bin/bash
shopt -s expand_aliases
# Setting Color codes
green='\e[0;32m'
red='\e[0;31m'
NC='\e[0m' # No Color
echo -e "${green} === Cisco UCS Integrated Infrastructure for Big Data \ Cluster 
Verification === ${NC}"
echo ""
echo ""
echo -e "${green} ==== System Information  ==== ${NC}"
echo ""
echo ""
echo -e "${green}System ${NC}"
clush -a -B " `which dmidecode` |grep -A2 '^System Information'"
echo ""
echo ""
echo -e "${green}BIOS ${NC}"
clush -a -B " `which dmidecode` | grep -A3 '^BIOS I'"
echo ""
echo ""
echo -e "${green}Memory ${NC}"
clush -a -B "cat /proc/meminfo | grep -i ^memt | uniq"
echo ""
echo ""
echo -e "${green}Number of Dimms ${NC}"
clush -a -B "echo -n 'DIMM slots: ';  `which dmidecode` |grep -c \
'^[[:space:]]*Locator:'"
clush -a -B "echo -n 'DIMM count is: ';  `which dmidecode` | grep \ "Size"| grep -c 
"MB""
clush -a -B " `which dmidecode` | awk '/Memory Device$/,/^$/ {print}' |\ grep -e 
'^Mem' -e Size: -e Speed: -e Part | sort -u | grep -v -e 'NO \ DIMM' -e 'No Module 
Installed' -e Unknown"
echo ""
echo ""
# probe for cpu info #
echo -e "${green}CPU ${NC}"
clush -a -B "grep '^model name' /proc/cpuinfo | sort -u"
```

```
echo ""
clush -a -B "`which lscpu` | grep -v -e op-mode -e ^Vendor -e family -e\ Model: -e
Stepping: -e BogoMIPS -e Virtual -e ^Byte -e '^NUMA node(s)'"
echo ""
echo ""
# probe for nic info #
echo -e "${green}NIC ${NC}"
clush -a -B "`which ifconfig` | egrep '(^e|^p)' | awk '{print \$1}' | \ xargs -l
`which ethtool` | grep -e ^Settings -e Speed"
echo ""
clush -a -B "`which lspci` | grep -i ether"
echo ""
echo ""
# probe for disk info #
echo -e "${green}Storage ${NC}"
clush -a -B "echo 'Storage Controller: '; `which lspci` | grep -i -e \ raid -e storage
-e lsi"
echo ""
clush -a -B "dmesg | grep -i raid | grep -i scsi"
echo ""
clush -a -B "lsblk -id | awk '{print \$1,\$4}'|sort | nl"
echo ""
echo ""
echo -e "${green} ================ Software  ======================= ${NC}"
echo ""
echo ""
echo -e "${green}Linux Release ${NC}"
clush -a -B "cat /etc/*release | uniq"
echo ""
echo ""
echo -e "${green}Linux Version ${NC}"
clush -a -B "uname -srvm | fmt"
echo ""
echo ""
echo -e "${green}Date ${NC}"
clush -a -B date
echo ""
echo ""
echo -e "${green}NTP Status ${NC}"
clush -a -B "ntpstat 2>&1 | head -1"
echo ""
echo ""
echo -e "${green}SELINUX ${NC}"
clush -a -B "echo -n 'SElinux status: '; grep ^SELINUX= \ /etc/selinux/config 2>&1"
echo ""
echo ""
echo -e "${green}IPTables ${NC}"
clush -a -B "`which chkconfig` --list iptables 2>&1"
echo ""
clush -a -B " `which service` iptables status 2>&1 | head -10"
echo ""
echo ""
echo -e "${green}Transparent Huge Pages ${NC}"
clush -a -B " cat /sys/kernel/mm/*transparent_hugepage/enabled"
echo ""
echo ""
echo -e "${green}CPU Speed${NC}"
clush -a -B "echo -n 'CPUspeed Service: ';  `which service` cpuspeed \ status 2>&1"
clush -a -B "echo -n 'CPUspeed Service: '; `which chkconfig` --list \ cpuspeed 2>&1"
echo ""
echo ""
echo -e "${green}Java Version${NC}"
clush -a -B 'java -version 2>&1; echo JAVA_HOME is ${JAVA_HOME:-Not \ Defined!}'
echo ""
echo ""
echo -e "${green}Hostname Lookup${NC}"
clush -a -B " ip addr show"
echo ""
echo ""
echo -e "${green}Open File Limit${NC}"
clush -a -B 'echo -n "Open file limit(should be >32K): "; ulimit -n'
```

Change permissions to executable

```
chmod 755 cluster_verification.sh
```

Run the Cluster Verification tool from the admin node. This can be run before starting CDH to identify any discrepancies in Post OS Configuration between the servers or during troubleshooting of any cluster / Hadoop issues.

```
./cluster_verification.sh
```

Installing Cloudera

Cloudera's Distribution including Apache Hadoop (CDH) is an enterprise grade, hardened Hadoop distribution. CDH offers Apache Hadoop and several related projects into a single tested and certified product. It offers the latest innovations from the open source community with the testing and quality you expect from enterprise quality software.

Pre-Requisites for CDH Installation

This section details the pre-requisites for CDH Installation such as setting up of CDH Repo.

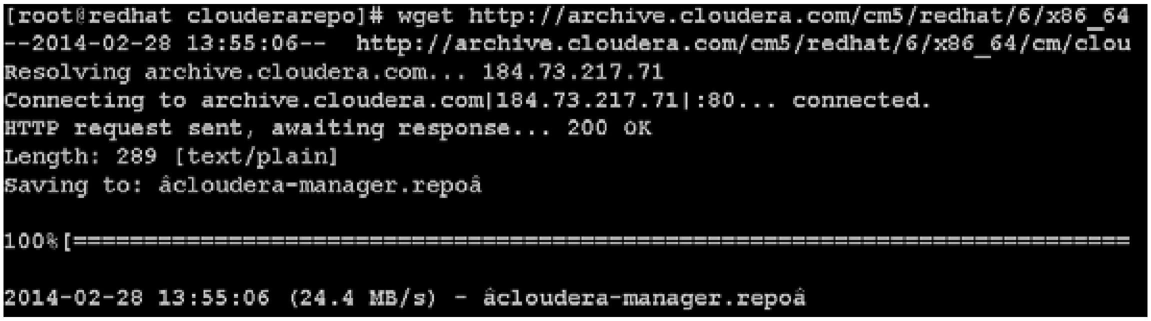
Cloudera Repo

From a host connected to the Internet, download the Cloudera's repositories as shown below and transfer it to the admin node.

```
mkdir -p /tmp/clouderarepo/
```

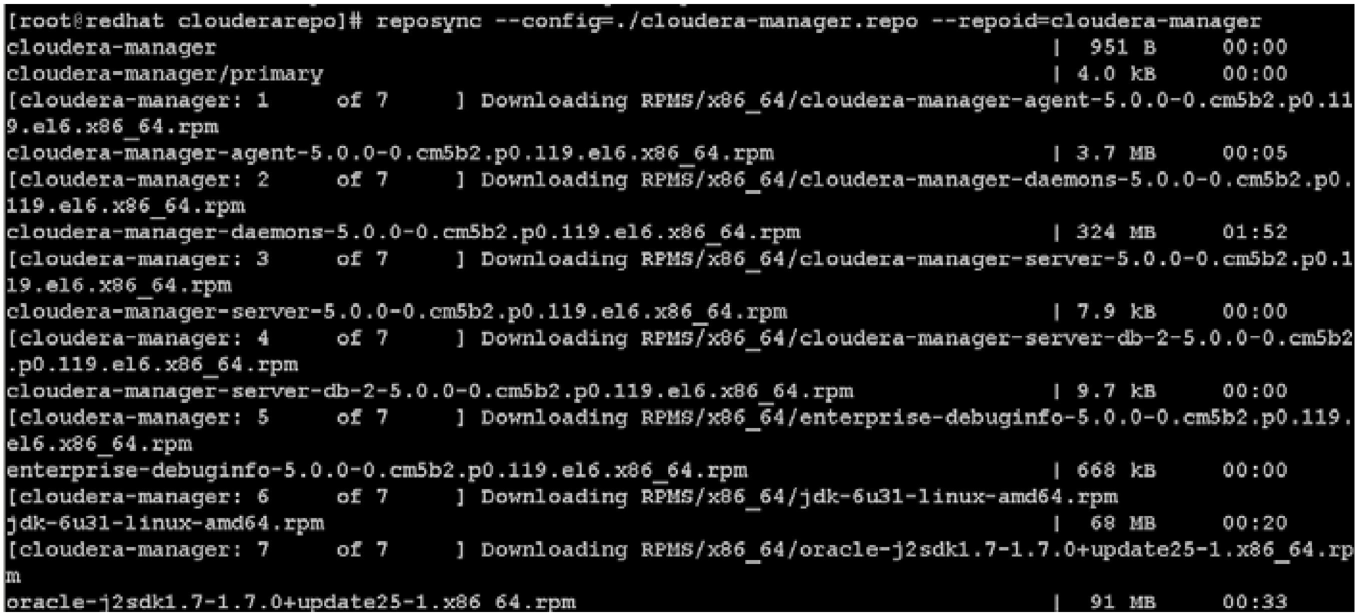
1. Download Cloudera Manager Repo

```
cd /tmp/clouderarepo/
wget http://archive.cloudera.com/cm5/redhat/6/x86_64/cm/cloudera-manager.repo
```



```
[root@redhat clouderarepo]# wget http://archive.cloudera.com/cm5/redhat/6/x86_64
--2014-02-28 13:55:06--  http://archive.cloudera.com/cm5/redhat/6/x86_64/cm/clou
Resolving archive.cloudera.com... 184.73.217.71
Connecting to archive.cloudera.com|184.73.217.71|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 289 [text/plain]
Saving to: âcloudera-manager.repoâ

100%[========================================================================

2014-02-28 13:55:06 (24.4 MB/s) - âcloudera-manager.repoâ
```

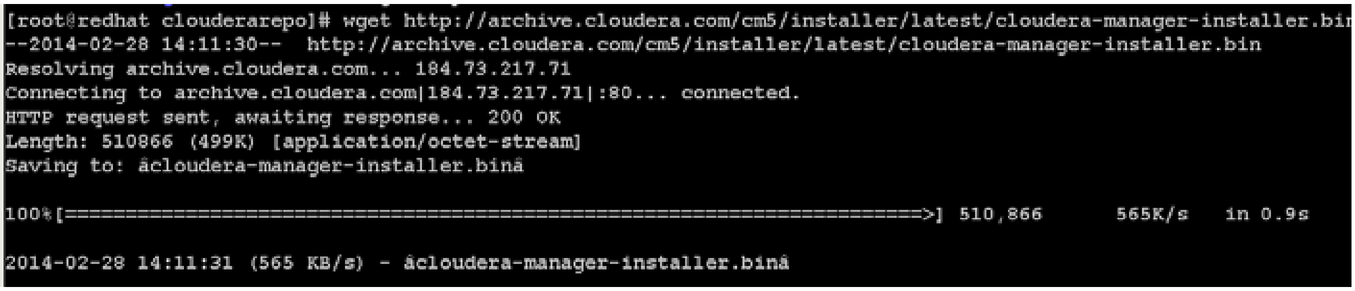
```
reposync --config=./cloudera-manager.repo --repoid=cloudera-manager
```



```
[root@redhat clouderarepo]# reposync --config=./cloudera-manager.repo --repoid=cloudera-manager
cloudera-manager                                                             |  951 B     00:00
cloudera-manager/primary                                                     | 4.0 kB     00:00
[cloudera-manager: 1     of 7     ] Downloading RPMS/x86_64/cloudera-manager-agent-5.0.0-0.cm5b2.p0.11
9.el6.x86_64.rpm
cloudera-manager-agent-5.0.0-0.cm5b2.p0.119.el6.x86_64.rpm                   | 3.7 MB     00:05
[cloudera-manager: 2     of 7     ] Downloading RPMS/x86_64/cloudera-manager-daemons-5.0.0-0.cm5b2.p0.
119.el6.x86_64.rpm
cloudera-manager-daemons-5.0.0-0.cm5b2.p0.119.el6.x86_64.rpm                 | 324 MB     01:52
[cloudera-manager: 3     of 7     ] Downloading RPMS/x86_64/cloudera-manager-server-5.0.0-0.cm5b2.p0.1
19.el6.x86_64.rpm
cloudera-manager-server-5.0.0-0.cm5b2.p0.119.el6.x86_64.rpm                  | 7.9 kB     00:00
[cloudera-manager: 4     of 7     ] Downloading RPMS/x86_64/cloudera-manager-server-db-2-5.0.0-0.cm5b2
.p0.119.el6.x86_64.rpm
cloudera-manager-server-db-2-5.0.0-0.cm5b2.p0.119.el6.x86_64.rpm             | 9.7 kB     00:00
[cloudera-manager: 5     of 7     ] Downloading RPMS/x86_64/enterprise-debuginfo-5.0.0-0.cm5b2.p0.119.
el6.x86_64.rpm
enterprise-debuginfo-5.0.0-0.cm5b2.p0.119.el6.x86_64.rpm                     | 668 kB     00:00
[cloudera-manager: 6     of 7     ] Downloading RPMS/x86_64/jdk-6u31-linux-amd64.rpm
jdk-6u31-linux-amd64.rpm                                                     |  68 MB     00:20
[cloudera-manager: 7     of 7     ] Downloading RPMS/x86_64/oracle-j2sdk1.7-1.7.0+update25-1.x86_64.rp
m
oracle-j2sdk1.7-1.7.0+update25-1.x86_64.rpm                                  |  91 MB     00:33
```

2. Download Cloudera Manager Installer.

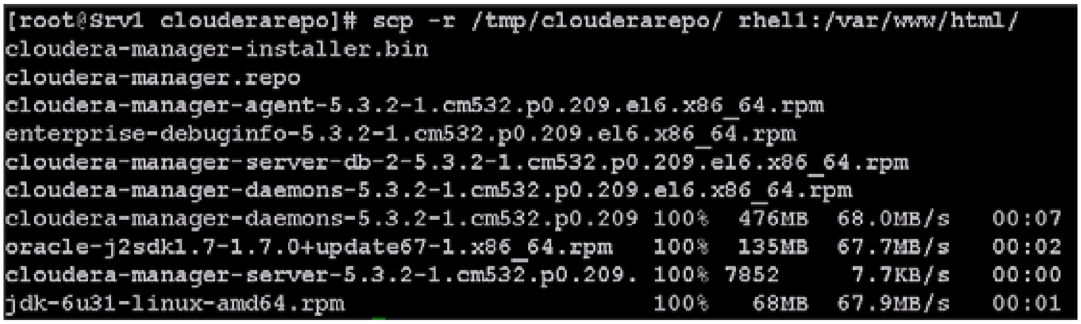
   ```
   cd /tmp/clouderarepo/
   wget http://archive.cloudera.com/cm5/installer/latest/cloudera-manager-installer.bin
   ```



```
[root@redhat clouderarepo]# wget http://archive.cloudera.com/cm5/installer/latest/cloudera-manager-installer.bi
--2014-02-28 14:11:30--  http://archive.cloudera.com/cm5/installer/latest/cloudera-manager-installer.bin
Resolving archive.cloudera.com... 184.73.217.71
Connecting to archive.cloudera.com|184.73.217.71|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 510866 (499K) [application/octet-stream]
Saving to: âcloudera-manager-installer.binâ

100%[======================================================================>] 510,866      565K/s   in 0.9s

2014-02-28 14:11:31 (565 KB/s) - âcloudera-manager-installer.binâ
```

3. Copy the repository directory to the admin (rhel1) node.

   ```
   Scp -r /tmp/clouderarepo/ rhel1:/var/www/html
   ```

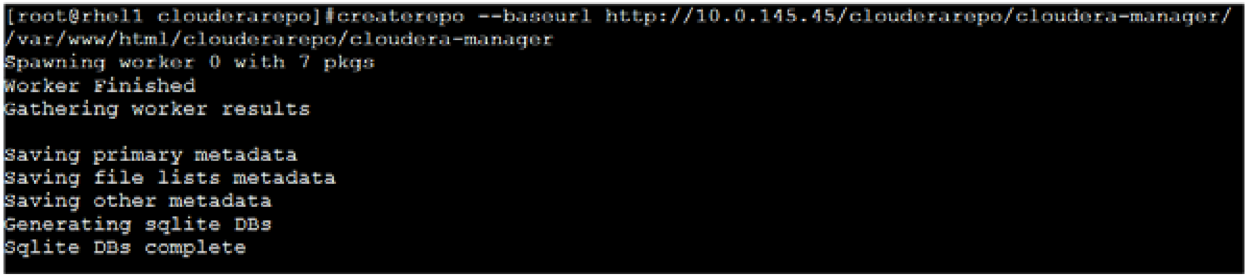


```
[root@Srv1 clouderarepo]# scp -r /tmp/clouderarepo/ rhel1:/var/www/html/
cloudera-manager-installer.bin
cloudera-manager.repo
cloudera-manager-agent-5.3.2-1.cm532.p0.209.el6.x86_64.rpm
enterprise-debuginfo-5.3.2-1.cm532.p0.209.el6.x86_64.rpm
cloudera-manager-server-db-2-5.3.2-1.cm532.p0.209.el6.x86_64.rpm
cloudera-manager-daemons-5.3.2-1.cm532.p0.209.el6.x86_64.rpm
cloudera-manager-daemons-5.3.2-1.cm532.p0.209 100%  476MB  68.0MB/s   00:07
oracle-j2sdk1.7-1.7.0+update67-1.x86_64.rpm   100%  135MB  67.7MB/s   00:02
cloudera-manager-server-5.3.2-1.cm532.p0.209. 100% 7852      7.7KB/s   00:00
jdk-6u31-linux-amd64.rpm                      100%   68MB  67.9MB/s   00:01
```

4. On admin node (rhel1) run create repo command.

   ```
   cd /var/www/html/clouderarepo/
   ```

```
createrepo --baseurl http://10.0.145.45/clouderarepo/cloudera-manager/
/var/www/html/clouderarepo/cloudera-manager
```



```
[root@rhel1 clouderarepo]#createrepo --baseurl http://10.0.145.45/clouderarepo/cloudera-manager/
/var/www/html/clouderarepo/cloudera-manager
Spawning worker 0 with 7 pkgs
Worker Finished
Gathering worker results

Saving primary metadata
Saving file lists metadata
Saving other metadata
Generating sqlite DBs
Sqlite DBs complete
```

Note Visit http://10.0.145.45/clouderarepo to verify the files.

5. Create the Cloudera Manager repo file with following contents:

```
vim /var/www/html/clouderarepo/cloudera-manager/cloudera-manager.repo
[cloudera-manager]
name=Cloudera Manager
baseurl=http://10.0.145.45/clouderarepo/cloudera-manager/
gpgcheck = 0
```

Copy the file cloudera-manager.repo into /etc/yum.repos.d/ on the admin node to enable it to find the packages that are locally hosted.

```
cp /var/www/html/clouderarepo/cloudera-manager/cloudera-manager.repo /etc/yum.repos.d/
```

From the admin node copy the repo files to /etc/yum.repos.d/ of all the nodes of the cluster.

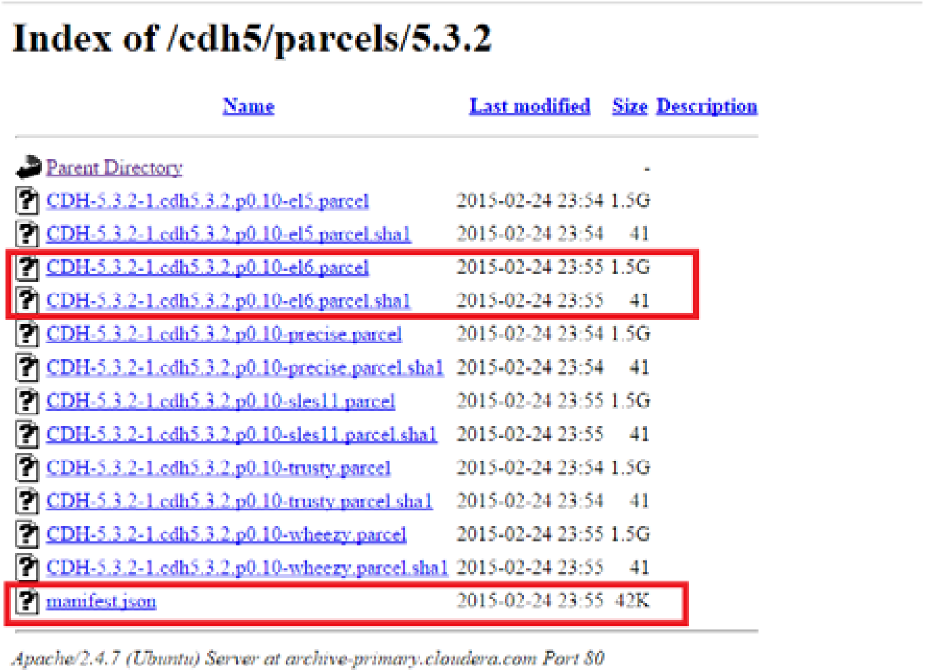
```
clush -a -B -c /etc/yum.repos.d/cloudera-manager.repo
```

Setup the Local Parcels for CDH 5.3.2

From a host that’s connected the internet, download the appropriate CDH 5.3.2 parcels that are meant for RHEL6.5 from the URL: http://archive.cloudera.com/cdh5/parcels/ and place them in the directory “/var/www/html/CDH5.3parcels” of the Admin node.

The following screenshot shows the files relevant for RHEL6.5. They are,

- CDH-5.3.2-1.cdh5.3.2.p0.10-el6.parcel
- CDH-5.3.2-1.cdh5.3.2.p0.10-el6.parcel.sha1
- manifest.json.



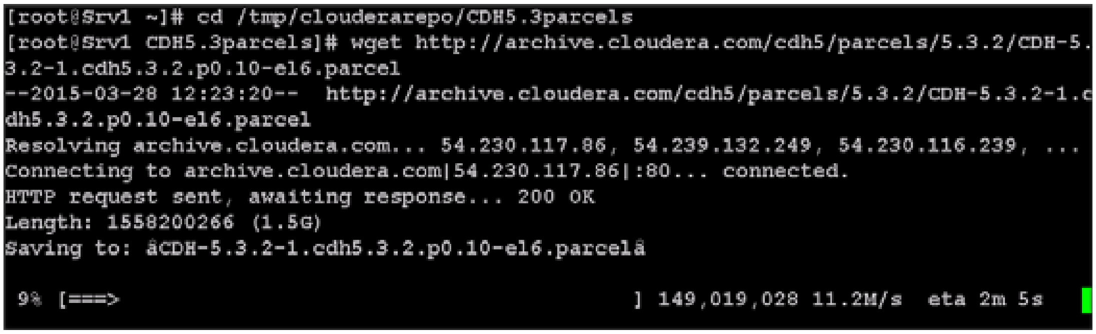
Index of /cdh5/parcels/5.3.2

Name	Last modified	Size	Description
Parent Directory		-	
CDH-5.3.2-1.cdh5.3.2.p0.10-el5.parcel	2015-02-24 23:54	1.5G	
CDH-5.3.2-1.cdh5.3.2.p0.10-el5.parcel.sha1	2015-02-24 23:54	41	
CDH-5.3.2-1.cdh5.3.2.p0.10-el6.parcel	2015-02-24 23:55	1.5G	
CDH-5.3.2-1.cdh5.3.2.p0.10-el6.parcel.sha1	2015-02-24 23:55	41	
CDH-5.3.2-1.cdh5.3.2.p0.10-precise.parcel	2015-02-24 23:54	1.5G	
CDH-5.3.2-1.cdh5.3.2.p0.10-precise.parcel.sha1	2015-02-24 23:54	41	
CDH-5.3.2-1.cdh5.3.2.p0.10-sles11.parcel	2015-02-24 23:55	1.5G	
CDH-5.3.2-1.cdh5.3.2.p0.10-sles11.parcel.sha1	2015-02-24 23:55	41	
CDH-5.3.2-1.cdh5.3.2.p0.10-trusty.parcel	2015-02-24 23:54	1.5G	
CDH-5.3.2-1.cdh5.3.2.p0.10-trusty.parcel.sha1	2015-02-24 23:54	41	
CDH-5.3.2-1.cdh5.3.2.p0.10-wheezy.parcel	2015-02-24 23:55	1.5G	
CDH-5.3.2-1.cdh5.3.2.p0.10-wheezy.parcel.sha1	2015-02-24 23:55	41	
manifest.json	2015-02-24 23:55	42K	

Apache/2.4.7 (Ubuntu) Server at archive-primary.cloudera.com Port 80

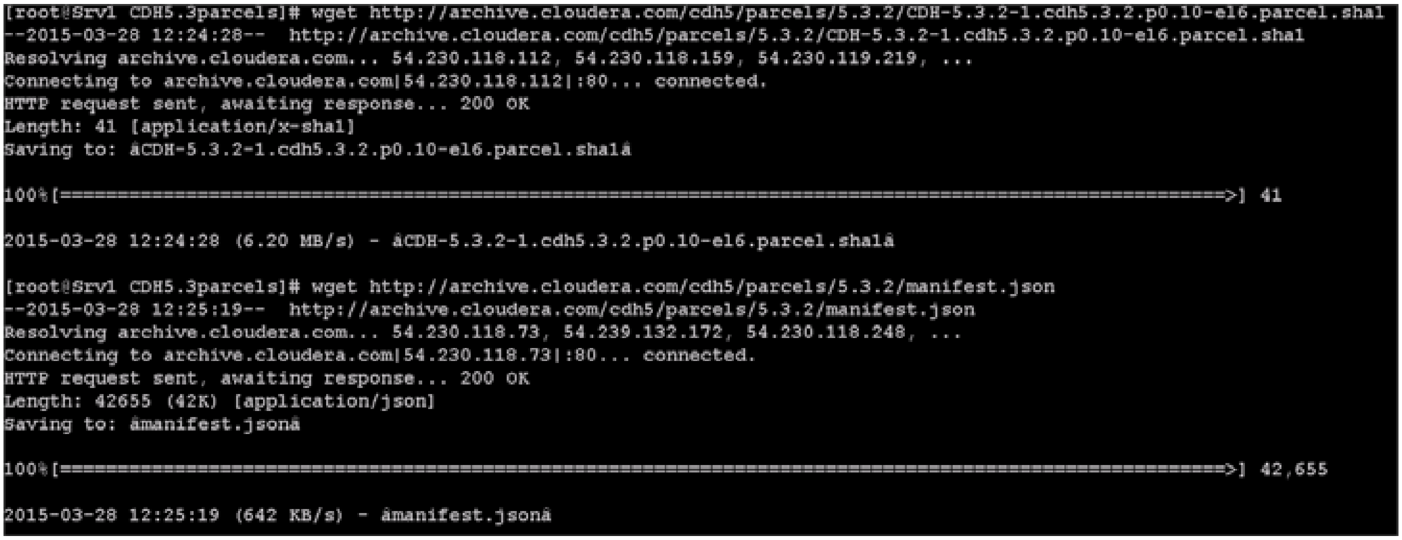
1. mkdir -p /tmp/clouderarepo/CDH5.3parcels
2. cd /tmp/clouderarepo/CDH5.3parcels
3. Download Parcels

```
wget
http://archive.cloudera.com/cdh5/parcels/5.3.2/CDH-5.3.2-1.cdh5.3.2.p0.10-el6.parcel
```



```
[root@Srv1 ~]# cd /tmp/clouderarepo/CDH5.3parcels
[root@Srv1 CDH5.3parcels]# wget http://archive.cloudera.com/cdh5/parcels/5.3.2/CDH-5.
3.2-1.cdh5.3.2.p0.10-el6.parcel
--2015-03-28 12:23:20--  http://archive.cloudera.com/cdh5/parcels/5.3.2/CDH-5.3.2-1.c
dh5.3.2.p0.10-el6.parcel
Resolving archive.cloudera.com... 54.230.117.86, 54.239.132.249, 54.230.116.239, ...
Connecting to archive.cloudera.com|54.230.117.86|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 1558200266 (1.5G)
Saving to: âCDH-5.3.2-1.cdh5.3.2.p0.10-el6.parcelâ

 9% [===>                                       ] 149,019,028 11.2M/s  eta 2m 5s
```

```
wget
http://archive.cloudera.com/cdh5/parcels/5.3.2/CDH-5.3.2-1.cdh5.3.2.p0.10-el6.parcel.s
ha1
wget http://archive.cloudera.com/cdh5/parcels/5.3.2/manifest.json
```



```
[root@Srv1 CDH5.3parcels]# wget http://archive.cloudera.com/cdh5/parcels/5.3.2/CDH-5.3.2-1.cdh5.3.2.p0.10-el6.parcel.sha1
--2015-03-28 12:24:28--  http://archive.cloudera.com/cdh5/parcels/5.3.2/CDH-5.3.2-1.cdh5.3.2.p0.10-el6.parcel.sha1
Resolving archive.cloudera.com... 54.230.118.112, 54.230.118.159, 54.230.119.219, ...
Connecting to archive.cloudera.com|54.230.118.112|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 41 [application/x-sha1]
Saving to: âCDH-5.3.2-1.cdh5.3.2.p0.10-el6.parcel.sha1â

100%[==========================================================================================>] 41

2015-03-28 12:24:28 (6.20 MB/s) - âCDH-5.3.2-1.cdh5.3.2.p0.10-el6.parcel.sha1â

[root@Srv1 CDH5.3parcels]# wget http://archive.cloudera.com/cdh5/parcels/5.3.2/manifest.json
--2015-03-28 12:25:19--  http://archive.cloudera.com/cdh5/parcels/5.3.2/manifest.json
Resolving archive.cloudera.com... 54.230.118.73, 54.239.132.172, 54.230.118.248, ...
Connecting to archive.cloudera.com|54.230.118.73|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 42655 (42K) [application/json]
Saving to: âmanifest.jsonâ

100%[==========================================================================================>] 42,655

2015-03-28 12:25:19 (642 KB/s) - âmanifest.jsonâ
```

4. Now edit the manifest.json file and remove the scripts that are not meant for RHEL6.5. Below is that script which you can copy and paste.

Note Make sure the script starts and end with initial additional braces.

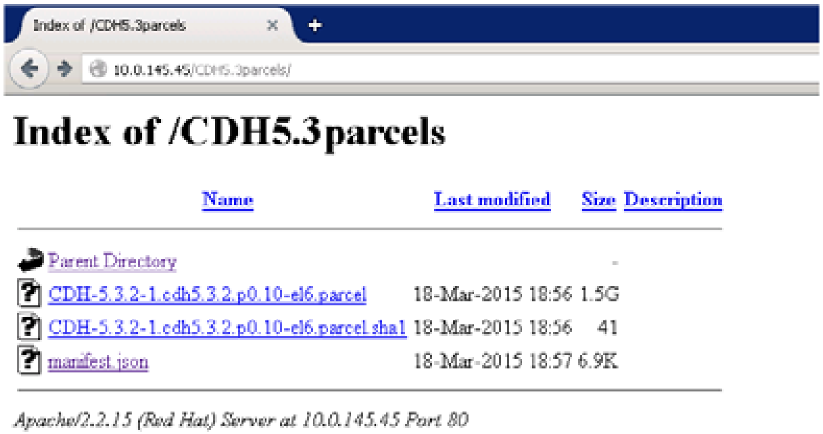
```
{
    "lastUpdated": 14248220420000,
    "parcels": [
        {
            "parcelName": "CDH-5.3.2-1.cdh5.3.2.p0.10-el6.parcel",
            "components": [
                {
                    "pkg_version": "0.7.0+cdh5.3.2+0",
                    "pkg_release": "1.cdh5.3.2.p0.17",
                    "name": "bigtop-tomcat",
                    "version": "6.0.41-cdh5.3.2"
                },
                {
                    "pkg_version": "0.11.0+cdh5.3.2+18",
                    "pkg_release": "1.cdh5.3.2.p0.17",
                    "name": "crunch",
                    "version": "0.11.0-cdh5.3.2"
                },
                {
                    "pkg_version": "1.5.0+cdh5.3.2+84",
                    "pkg_release": "1.cdh5.3.2.p0.17",
                    "name": "flume-ng",
                    "version": "1.5.0-cdh5.3.2"
                },
                {
                    "pkg_version": "2.5.0+cdh5.3.2+813",
                    "pkg_release": "1.cdh5.3.2.p0.17",
                    "name": "hadoop-0.20-mapreduce",
                    "version": "2.5.0-cdh5.3.2"
                },
                {
                    "pkg_version": "2.5.0+cdh5.3.2+813",
                    "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "hadoop",
            "version": "2.5.0-cdh5.3.2"
        },
        {
            "pkg_version": "2.5.0+cdh5.3.2+813",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "hadoop-hdfs",
            "version": "2.5.0-cdh5.3.2"
        },
        {
            "pkg_version": "2.5.0+cdh5.3.2+813",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "hadoop-httpfs",
            "version": "2.5.0-cdh5.3.2"
        },
        {
            "pkg_version": "2.5.0+cdh5.3.2+813",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "hadoop-kms",
            "version": "2.5.0-cdh5.3.2"
        },
        {
            "pkg_version": "2.5.0+cdh5.3.2+813",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "hadoop-mapreduce",
            "version": "2.5.0-cdh5.3.2"
        },
        {
            "pkg_version": "2.5.0+cdh5.3.2+813",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "hadoop-yarn",
            "version": "2.5.0-cdh5.3.2"
        },
        {
            "pkg_version": "0.98.6+cdh5.3.2+83",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "hbase",
            "version": "0.98.6-cdh5.3.2"
        },
        {
            "pkg_version": "1.5+cdh5.3.2+25",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "hbase-solr",
            "version": "1.5-cdh5.3.2"
        },
        {
            "pkg_version": "0.13.1+cdh5.3.2+330",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "hive",
            "version": "0.13.1-cdh5.3.2"
        },
        {
            "pkg_version": "0.13.1+cdh5.3.2+330",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "hive-hcatalog",
            "version": "0.13.1-cdh5.3.2"
        },
        {
            "pkg_version": "3.7.0+cdh5.3.2+163",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "hue",
            "version": "3.7.0-cdh5.3.2"
        },
        {
            "pkg_version": "2.1.2+cdh5.3.2+0",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "impala",
            "version": "2.1.2-cdh5.3.2"
        },
        {
            "pkg_version": "0.15.0+cdh5.3.2+193",
            "pkg_release": "1.cdh5.3.2.p0.18",
            "name": "kite",
            "version": "0.15.0-cdh5.3.2"
        },
        {
            "pkg_version": "1.0.0+cdh5.3.2+0",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "llama",
            "version": "1.0.0-cdh5.3.2"
        },
        {
            "pkg_version": "0.9+cdh5.3.2+19",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "mahout",
            "version": "0.9-cdh5.3.2"
        },
        {
            "pkg_version": "4.0.0+cdh5.3.2+339",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "oozie",
            "version": "4.0.0-cdh5.3.2"
        },
        {
            "pkg_version": "1.5.0+cdh5.3.2+62",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "parquet",
            "version": "1.5.0-cdh5.3.2"
        },
        {
            "pkg_version": "0.12.0+cdh5.3.2+51",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "pig",
            "version": "0.12.0-cdh5.3.2"
        },
        {
            "pkg_version": "1.4.0+cdh5.3.2+128",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "sentry",
            "version": "1.4.0-cdh5.3.2"
        },
        {
            "pkg_version": "4.4.0+cdh5.3.2+326",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "solr",
            "version": "4.4.0-cdh5.3.2"
        },
        {
            "pkg_version": "1.2.0+cdh5.3.2+369",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "spark",
            "version": "1.2.0-cdh5.3.2"
        },
        {
            "pkg_version": "1.99.4+cdh5.3.2+21",
            "pkg_release": "1.cdh5.3.2.p0.17",
            "name": "sqoop2",
            "version": "1.99.4-cdh5.3.2"
```

```
                },
                {
                    "pkg_version": "1.4.5+cdh5.3.2+64",
                    "pkg_release": "1.cdh5.3.2.p0.17",
                    "name": "sqoop",
                    "version": "1.4.5-cdh5.3.2"
                },
                {
                    "pkg_version": "0.9.0+cdh5.3.2+13",
                    "pkg_release": "1.cdh5.3.2.p0.17",
                    "name": "whirr",
                    "version": "0.9.0-cdh5.3.2"
                },
                {
                    "pkg_version": "3.4.5+cdh5.3.2+83",
                    "pkg_release": "1.cdh5.3.2.p0.17",
                    "name": "zookeeper",
                    "version": "3.4.5-cdh5.3.2"
                }
            ],
            "replaces": "IMPALA, SOLR, SPARK",
            "hash": "a1722a9c033d33ca4ed4558eaf6c10c803b06a16"
        }
    ]
}
```

5. scp /tmp/clouderarepo/CDH5.3parcels to the /var/www/html directory of Admin node (rhel1).

```
scp -r /tmp/clouderarepo/CDH5.3parcels/ rhel1:/var/www/html/
```

6. Verify that these files are accessible by visiting the URL http://10.0.145.45/CDH5.3parcels/ in admin node.



Index of /CDH5.3parcels

10.0.145.45/CDH5.3parcels/

Index of /CDH5.3parcels

Name	Last modified	Size	Description
Parent Directory		-	
CDH-5.3.2-1.cdh5.3.2.p0.10-el6.parcel	18-Mar-2015 18:56	1.5G	
CDH-5.3.2-1.cdh5.3.2.p0.10-el6.parcel.sha1	18-Mar-2015 18:56	41	
manifest.json	18-Mar-2015 18:57	6.9K	

Apache/2.2.15 (Red Hat) Server at 10.0.145.45 Port 80

Setting MySQL Database for Cloudera manager

To use a MySQL database, follow these procedures:

1. Installing the MySQL Server
2. Configuring and Starting the MySQL Server
3. Installing the MySQL JDBC Driver

4. Creating Databases for Activity Monitor, Reports Manager, Hive Metastore Server, Sentry Server, Cloudera Navigator Audit Server, and Cloudera Navigator Metadata Server

Following steps provide details of the above procedure for setting MySQL database for Cloudera Manager:

1. Installing the mysql server

   In the admin node where Cloudera manager will be installed, use the following command to install mysql server.

```
[root@rhel1 ]# yum -y install mysql-server
```

2. Configuring and starting the MySQL Server

   a. Stop the MySQL server if it is running.

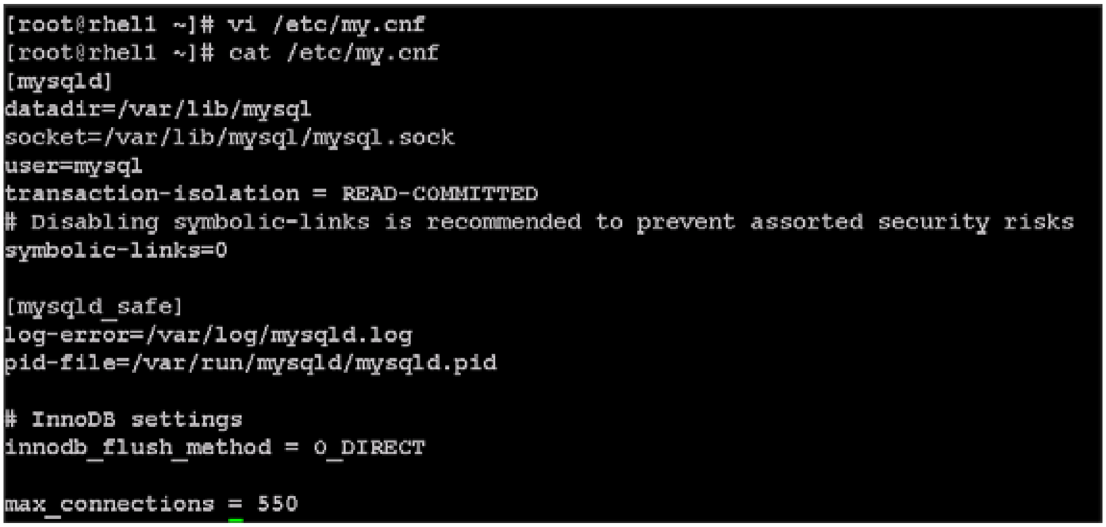
```
[root@rhel1 ]# service mysqld stop
```

   b. Move old InnoDB log if exists.

```
Move files /var/lib/mysql/ib_logfile0 and /var/lib/mysql/ib_logfile1 out of
/var/lib/mysql/ to a backup location.

mv /var/lib/mysql/ib_logfile0 /root/ib_logfile0.bkp

mv /var/lib/mysql/ib_logfile1 /root/ib_logfile1.bkp
```

   c. Determine the location of the option file, my.cnf and edit/add following lines

```
vim /etc/my.cnf
[mysqld]
transaction-isolation = READ-COMMITTED

# InnoDB settings
innodb_flush_method = O_DIRECT

max_connections = 550
```



```
[root@rhel1 ~]# vi /etc/my.cnf
[root@rhel1 ~]# cat /etc/my.cnf
[mysqld]
datadir=/var/lib/mysql
socket=/var/lib/mysql/mysql.sock
user=mysql
transaction-isolation = READ-COMMITTED
# Disabling symbolic-links is recommended to prevent assorted security risks
symbolic-links=0

[mysqld_safe]
log-error=/var/log/mysqld.log
pid-file=/var/run/mysqld/mysqld.pid

# InnoDB settings
innodb_flush_method = O_DIRECT

max_connections = 550
```

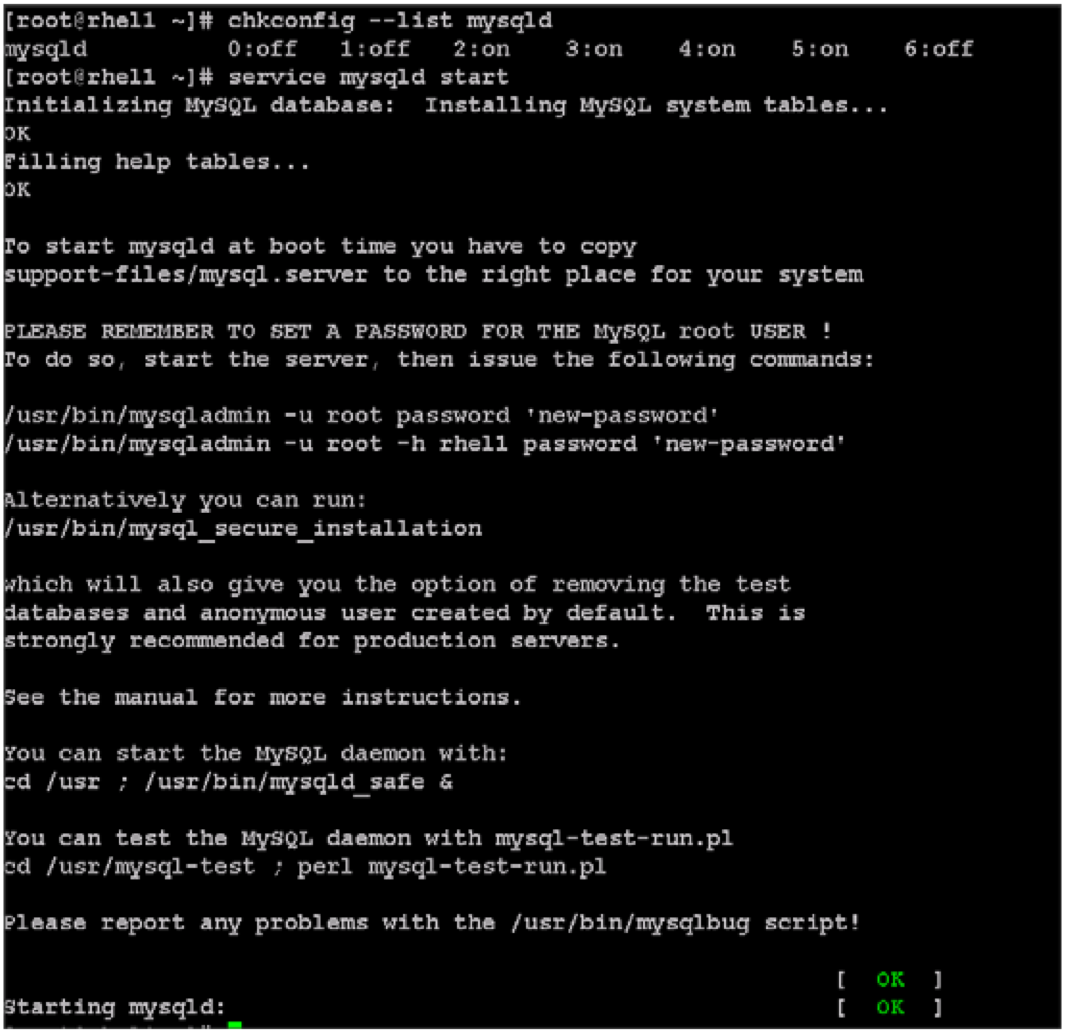
Note max_connections need to be increased based on number of nodes and applications. Please follow the recommendations as mention in Cloudera document: http://www.cloudera.com/content/cloudera/en/documentation/core/v5-3-x/topics/cm_ig_mysql.html

d. Ensure MySQL Server starts at boot

```
chkconfig mysqld on

[root@rhel1 ]# chkconfig --list mysqld
mysqld          0:off   1:off   2:on    3:on    4:on    5:on    6:off
```

e. Start the MySQL Server

```
service mysqld start
```



```
[root@rhel1 ~]# chkconfig --list mysqld
mysqld          0:off   1:off   2:on    3:on    4:on    5:on    6:off
[root@rhel1 ~]# service mysqld start
Initializing MySQL database:  Installing MySQL system tables...
OK
Filling help tables...
OK

To start mysqld at boot time you have to copy
support-files/mysql.server to the right place for your system

PLEASE REMEMBER TO SET A PASSWORD FOR THE MySQL root USER !
To do so, start the server, then issue the following commands:

/usr/bin/mysqladmin -u root password 'new-password'
/usr/bin/mysqladmin -u root -h rhel1 password 'new-password'

Alternatively you can run:
/usr/bin/mysql_secure_installation

which will also give you the option of removing the test
databases and anonymous user created by default.  This is
strongly recommended for production servers.

See the manual for more instructions.

You can start the MySQL daemon with:
cd /usr ; /usr/bin/mysqld_safe &

You can test the MySQL daemon with mysql-test-run.pl
cd /usr/mysql-test ; perl mysql-test-run.pl

Please report any problems with the /usr/bin/mysqlbug script!

                                                           [  OK  ]
Starting mysqld:                                           [  OK  ]
```

f. set the MySQL root password

In the admin node (rhel1) run the mysql_secure_installation to set MySQL root password. The file is located at /usr/bin directory.

```
[root@rhel1 ]# cd /usr/bin/
[root@rhel1 bin]# mysql_secure_installation

************************OUTPUT**************************
[root@rhel1 bin]# mysql_secure_installation

NOTE: RUNNING ALL PARTS OF THIS SCRIPT IS RECOMMENDED FOR ALL MySQL
      SERVERS IN PRODUCTION USE!  PLEASE READ EACH STEP CAREFULLY!

In order to log into MySQL to secure it, we'll need the current
password for the root user.  If you've just installed MySQL, and
you haven't set the root password yet, the password will be blank,
so you should just press enter here.

Enter current password for root (enter for none):
OK, successfully used password, moving on...

Setting the root password ensures that nobody can log into the MySQL
root user without the proper authorization.

Set root password? [Y/n] y
New password:
Re-enter new password:
Password updated successfully!
Reloading privilege tables..
 ... Success!


By default, a MySQL installation has an anonymous user, allowing anyone
to log into MySQL without having to have a user account created for
them.  This is intended only for testing, and to make the installation
go a bit smoother.  You should remove them before moving into a
production environment.

Remove anonymous users? [Y/n] y
 ... Success!

Normally, root should only be allowed to connect from 'localhost'.  This
ensures that someone cannot guess at the root password from the network.

Disallow root login remotely? [Y/n] n
 ... skipping.

By default, MySQL comes with a database named 'test' that anyone can
access.  This is also intended only for testing, and should be removed
before moving into a production environment.

Remove test database and access to it? [Y/n] Y
 - Dropping test database...
 ... Success!
 - Removing privileges on test database...
 ... Success!

Reloading the privilege tables will ensure that all changes made so far
will take effect immediately.

Reload privilege tables now? [Y/n] Y
 ... Success!

Cleaning up...


All done!  If you've completed all of the above steps, your MySQL
```

```
installation should now be secure.

Thanks for using MySQL!

*************************end********************************
```

3. Installing the MySQL JDBC Driver

   Install the JDBC driver on the Cloudera Manager Server host, as well as hosts which run the Activity Monitor, Reports Manager, Hive Metastore Server, Sentry Server, Cloudera Navigator Audit Server, and Cloudera Navigator Metadata Server roles.

   a. From the host connected to the internet, download the MySQL JDBC driver from: http://www.mysql.com/downloads/connector/j/5.1.html.

   Note select the platform independent from the drop down list and download mysql-connector-java-5.1.34.tar.gz file

   b. Copy the downloaded file to the admin (rhel1) node, log in to the admin node and extract the file.

   ```
   scp mysql-connector-java-5.1.34.tar.gz rhel1:/root/
   ```

   c. Login to the admin (rhel1) node and extract the file.

   ```
   tar xzvf mysql-connector-java-5.1.34.tar.gz
   ```

   d. Create /usr/share/java/ directory in the admin node.

   ```
   mkdir -p /usr/share/java/
   ```

   e. Go the mysql-connector-java-5.1.34 directory and copy the mysql-connector-java-5.1.35-bin.jar and rename it to the folder created above as shown in the command below:

   ```
   cd mysql-connector-java-5.1.34
   cp mysql-connector-java-5.1.34/mysql-connector-java-5.1.34-bin.jar
   /usr/share/java/mysql-connector-java.jar
   ```

4. Creating Databases for Activity Monitor, Reports Manager and Hive Metastore Server.

   a. In the admin node (rhel1) Log into MySQL as the root user:

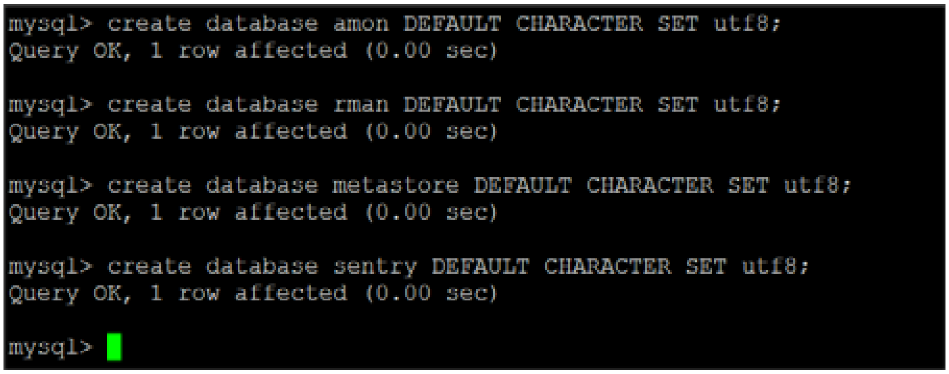
   ```
   mysql -u root -p
   ```

   Enter the password that was supplied in step 2.f above

   ```
   Enter password:
   ```

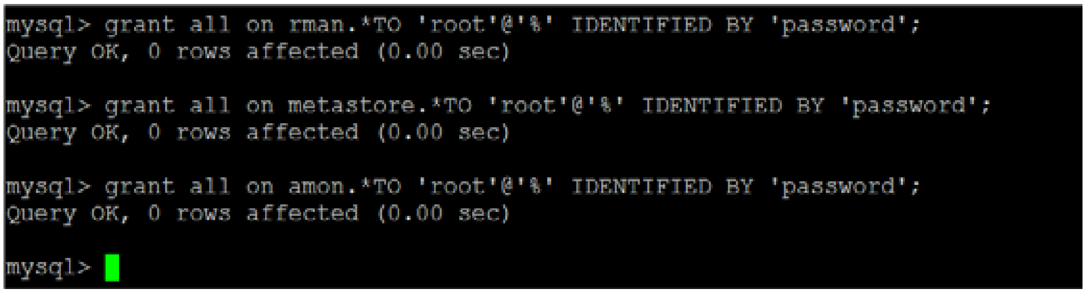
   b. Create databases for the Activity Monitor, Reports Manager and Hive Metastore Server using the command below:

   ```
   Mysql> create database amon DEFAULT CHARACTER SET utf8;
   Mysql> create database rman DEFAULT CHARACTER SET utf8;
   Mysql> create database metastore DEFAULT CHARACTER SET utf8;
   ```



```
mysql> create database amon DEFAULT CHARACTER SET utf8;
Query OK, 1 row affected (0.00 sec)

mysql> create database rman DEFAULT CHARACTER SET utf8;
Query OK, 1 row affected (0.00 sec)

mysql> create database metastore DEFAULT CHARACTER SET utf8;
Query OK, 1 row affected (0.00 sec)

mysql> create database sentry DEFAULT CHARACTER SET utf8;
Query OK, 1 row affected (0.00 sec)

mysql>
```

```
mysql> grant all on rman.*TO 'root'@'%' IDENTIFIED BY 'password';
mysql> grant all on metastore.*TO 'root'@'%' IDENTIFIED BY 'password';
mysql> grant all on amon.*TO 'root'@'%' IDENTIFIED BY 'password';
```



```
mysql> grant all on rman.*TO 'root'@'%' IDENTIFIED BY 'password';
Query OK, 0 rows affected (0.00 sec)

mysql> grant all on metastore.*TO 'root'@'%' IDENTIFIED BY 'password';
Query OK, 0 rows affected (0.00 sec)

mysql> grant all on amon.*TO 'root'@'%' IDENTIFIED BY 'password';
Query OK, 0 rows affected (0.00 sec)

mysql>
```

Cloudera Installation

The following section describes installation of Cloudera Manager first and then using Cloudera Manager to install CDH 5.3

Installing Cloudera Manager

Cloudera Manager, an end to end management application, is used to install and configure CDH. During CDH Installation, Cloudera Manager's Wizard will help to install Hadoop services on all nodes using the following procedure:

- Discovery of the cluster nodes
- Configure the Cloudera parcel or package repositories
- Install Hadoop, Cloudera Manager Agent (CMA) and Impala on all the cluster nodes.
- Install the Oracle JDK if it is not already installed across all the cluster nodes.
- Assign various services to nodes.
- Start the Hadoop services.

Follow the steps below to install Cloudera Manager.

Update the repo files to point to local repository.

```
rm -f /var/www/html/clouderarepo/*.repo
cp /etc/yum.repos.d/c*.repo /var/www/html/clouderarepo/
```

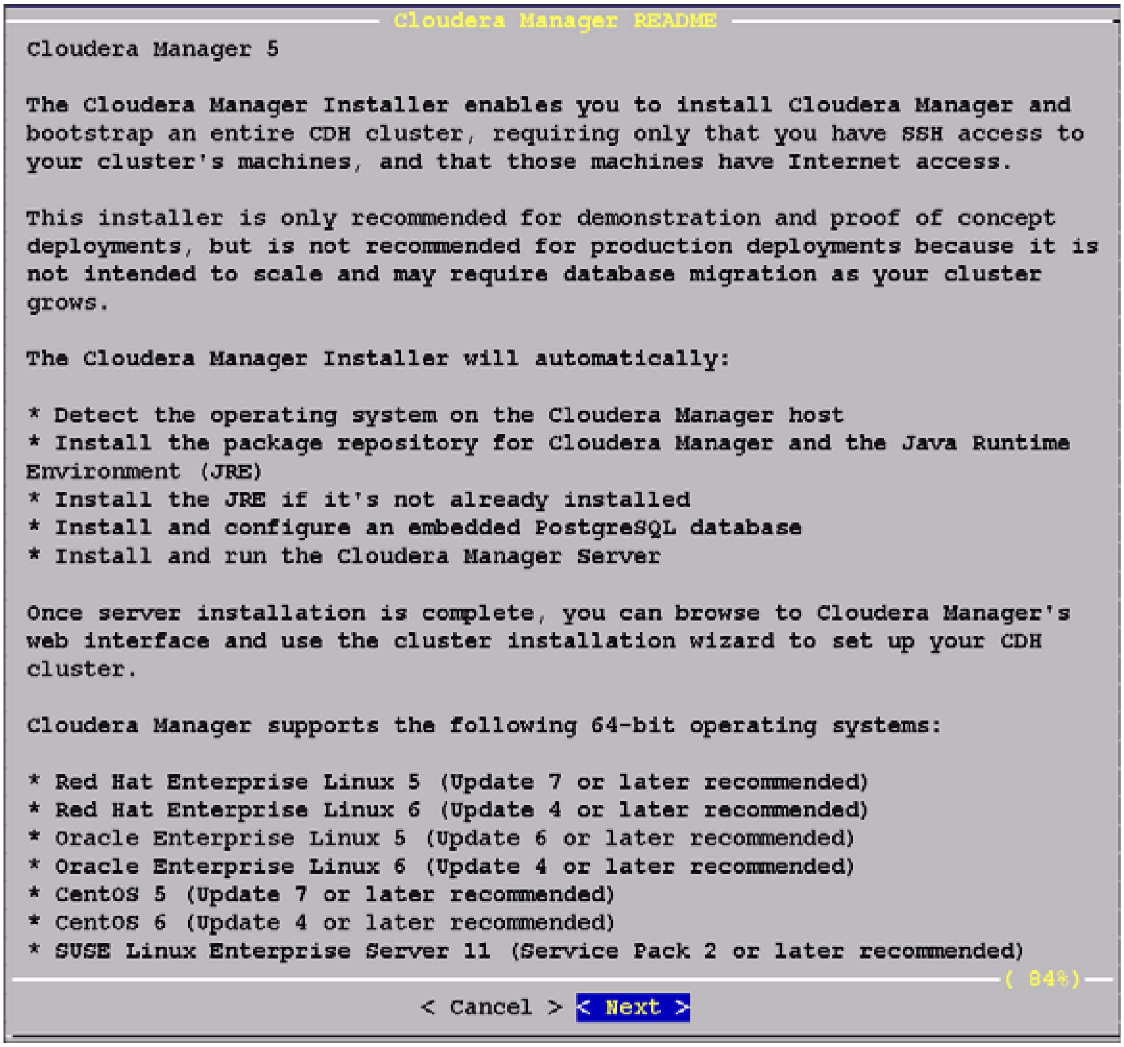
1. Change the permission of Cloudera Manager Installer on the admin node.

```
cd /var/www/html/clouderarepo
chmod +x cloudera-manager-installer.bin
```

2. Execute the following command in the admin node (rhel1) to start Cloudera Manager Installer.

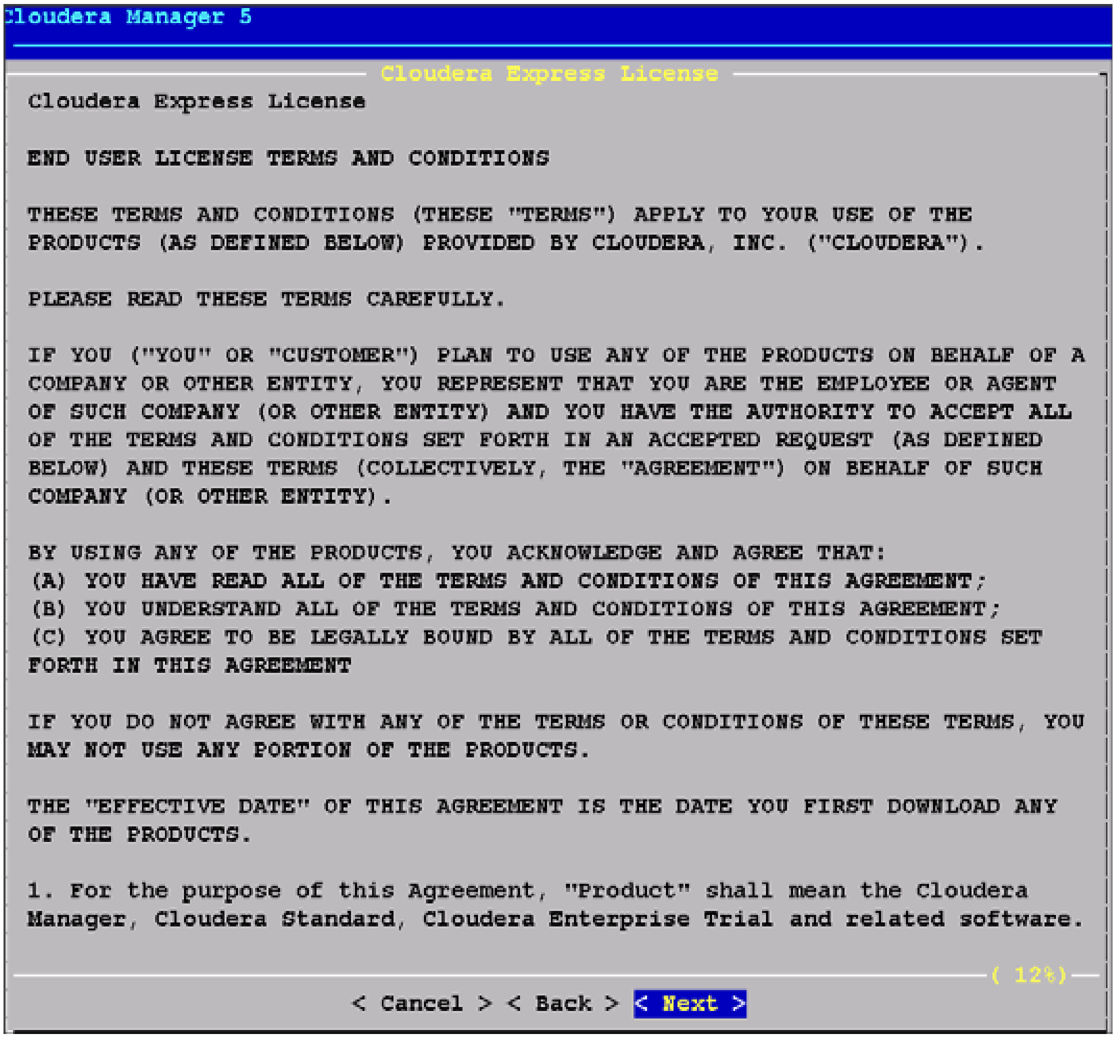
```
cd /var/www/html/clouderarepo/
./cloudera-manager-installer.bin --skip_repo_package=1
```

3. This displays the Cloudera Manager Read Me file. Click **Next**.



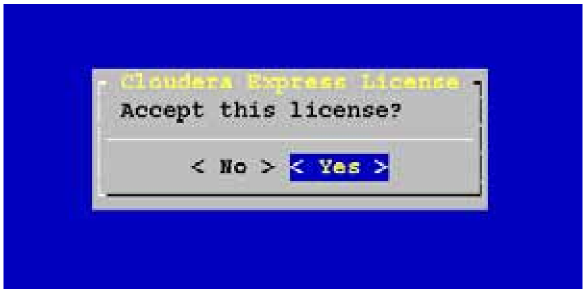
```
Cloudera Manager 5

The Cloudera Manager Installer enables you to install Cloudera Manager and
bootstrap an entire CDH cluster, requiring only that you have SSH access to
your cluster's machines, and that those machines have Internet access.

This installer is only recommended for demonstration and proof of concept
deployments, but is not recommended for production deployments because it is
not intended to scale and may require database migration as your cluster
grows.

The Cloudera Manager Installer will automatically:

* Detect the operating system on the Cloudera Manager host
* Install the package repository for Cloudera Manager and the Java Runtime
Environment (JRE)
* Install the JRE if it's not already installed
* Install and configure an embedded PostgreSQL database
* Install and run the Cloudera Manager Server

Once server installation is complete, you can browse to Cloudera Manager's
web interface and use the cluster installation wizard to set up your CDH
cluster.

Cloudera Manager supports the following 64-bit operating systems:

* Red Hat Enterprise Linux 5 (Update 7 or later recommended)
* Red Hat Enterprise Linux 6 (Update 4 or later recommended)
* Oracle Enterprise Linux 5 (Update 6 or later recommended)
* Oracle Enterprise Linux 6 (Update 4 or later recommended)
* CentOS 5 (Update 7 or later recommended)
* CentOS 6 (Update 4 or later recommended)
* SUSE Linux Enterprise Server 11 (Service Pack 2 or later recommended)
```

4. Click **Next** in the End User License agreement page.



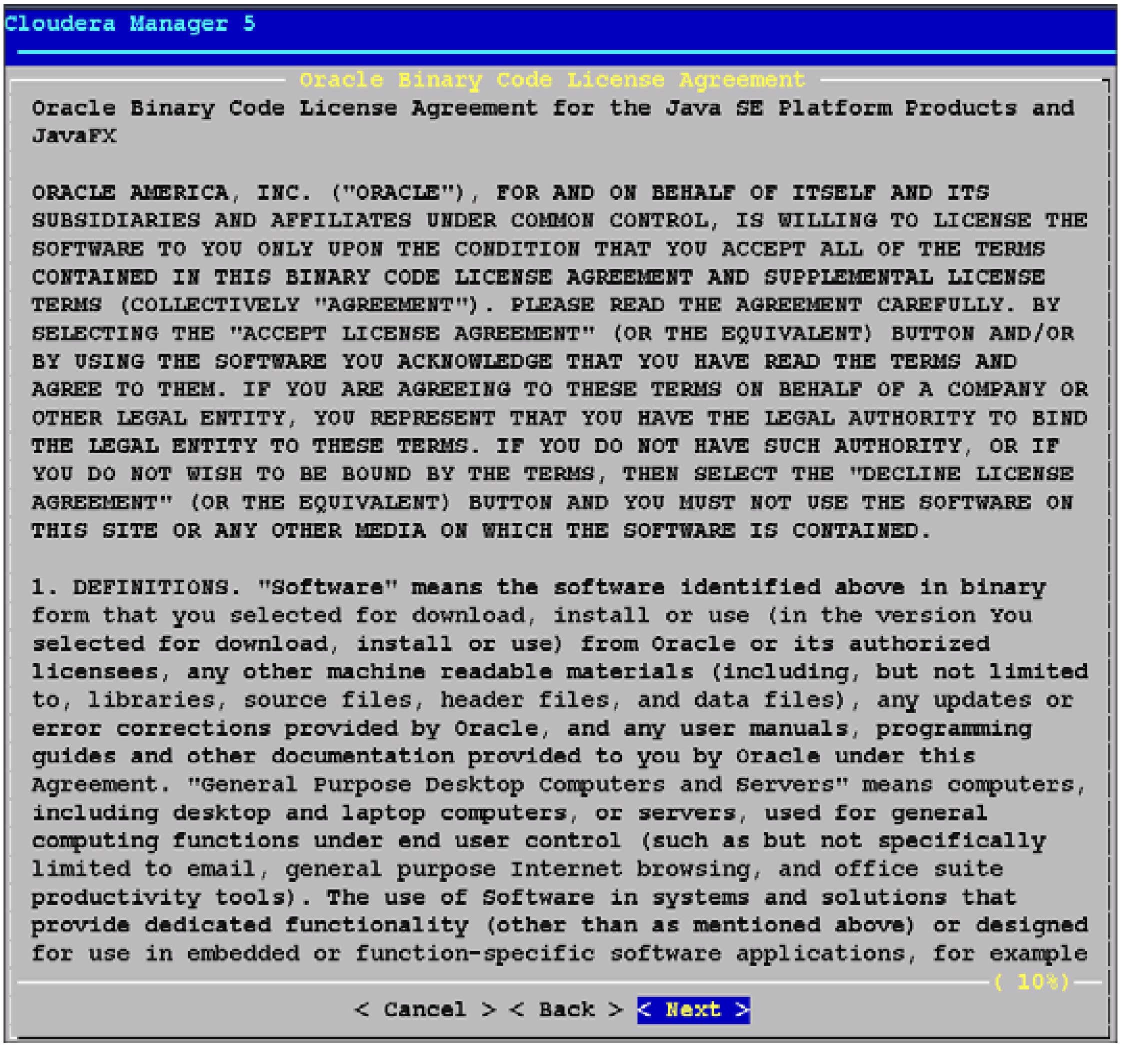
```
Cloudera Manager 5

Cloudera Express License

END USER LICENSE TERMS AND CONDITIONS

THESE TERMS AND CONDITIONS (THESE "TERMS") APPLY TO YOUR USE OF THE
PRODUCTS (AS DEFINED BELOW) PROVIDED BY CLOUDERA, INC. ("CLOUDERA").

PLEASE READ THESE TERMS CAREFULLY.

IF YOU ("YOU" OR "CUSTOMER") PLAN TO USE ANY OF THE PRODUCTS ON BEHALF OF A
COMPANY OR OTHER ENTITY, YOU REPRESENT THAT YOU ARE THE EMPLOYEE OR AGENT
OF SUCH COMPANY (OR OTHER ENTITY) AND YOU HAVE THE AUTHORITY TO ACCEPT ALL
OF THE TERMS AND CONDITIONS SET FORTH IN AN ACCEPTED REQUEST (AS DEFINED
BELOW) AND THESE TERMS (COLLECTIVELY, THE "AGREEMENT") ON BEHALF OF SUCH
COMPANY (OR OTHER ENTITY).

BY USING ANY OF THE PRODUCTS, YOU ACKNOWLEDGE AND AGREE THAT:
(A) YOU HAVE READ ALL OF THE TERMS AND CONDITIONS OF THIS AGREEMENT;
(B) YOU UNDERSTAND ALL OF THE TERMS AND CONDITIONS OF THIS AGREEMENT;
(C) YOU AGREE TO BE LEGALLY BOUND BY ALL OF THE TERMS AND CONDITIONS SET
FORTH IN THIS AGREEMENT

IF YOU DO NOT AGREE WITH ANY OF THE TERMS OR CONDITIONS OF THESE TERMS, YOU
MAY NOT USE ANY PORTION OF THE PRODUCTS.

THE "EFFECTIVE DATE" OF THIS AGREEMENT IS THE DATE YOU FIRST DOWNLOAD ANY
OF THE PRODUCTS.

1. For the purpose of this Agreement, "Product" shall mean the Cloudera
Manager, Cloudera Standard, Cloudera Enterprise Trial and related software.
```

5. Click **Yes** in the license agreement confirmation page.



```
Accept this license?
```

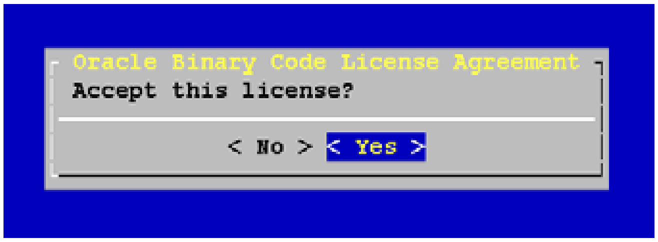
6. Click **Next** in Oracle Binary Code License Agreement and Yes in the Oracle Binary Code License Agreement for the Java SE Platform Products page.


Cloudera Manager 5
Oracle Binary Code License Agreement
(10%)
< Cancel > < Back > < Next >

Oracle Binary Code License Agreement for the Java SE Platform Products and JavaFX

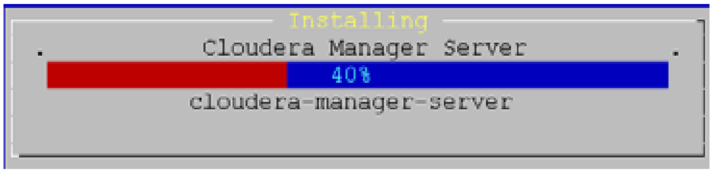
ORACLE AMERICA, INC. ("ORACLE"), FOR AND ON BEHALF OF ITSELF AND ITS SUBSIDIARIES AND AFFILIATES UNDER COMMON CONTROL, IS WILLING TO LICENSE THE SOFTWARE TO YOU ONLY UPON THE CONDITION THAT YOU ACCEPT ALL OF THE TERMS CONTAINED IN THIS BINARY CODE LICENSE AGREEMENT AND SUPPLEMENTAL LICENSE TERMS (COLLECTIVELY "AGREEMENT"). PLEASE READ THE AGREEMENT CAREFULLY. BY SELECTING THE "ACCEPT LICENSE AGREEMENT" (OR THE EQUIVALENT) BUTTON AND/OR BY USING THE SOFTWARE YOU ACKNOWLEDGE THAT YOU HAVE READ THE TERMS AND AGREE TO THEM. IF YOU ARE AGREEING TO THESE TERMS ON BEHALF OF A COMPANY OR OTHER LEGAL ENTITY, YOU REPRESENT THAT YOU HAVE THE LEGAL AUTHORITY TO BIND THE LEGAL ENTITY TO THESE TERMS. IF YOU DO NOT HAVE SUCH AUTHORITY, OR IF YOU DO NOT WISH TO BE BOUND BY THE TERMS, THEN SELECT THE "DECLINE LICENSE AGREEMENT" (OR THE EQUIVALENT) BUTTON AND YOU MUST NOT USE THE SOFTWARE ON THIS SITE OR ANY OTHER MEDIA ON WHICH THE SOFTWARE IS CONTAINED.

1. DEFINITIONS. "Software" means the software identified above in binary form that you selected for download, install or use (in the version You selected for download, install or use) from Oracle or its authorized licensees, any other machine readable materials (including, but not limited to, libraries, source files, header files, and data files), any updates or error corrections provided by Oracle, and any user manuals, programming guides and other documentation provided to you by Oracle under this Agreement. "General Purpose Desktop Computers and Servers" means computers, including desktop and laptop computers, or servers, used for general computing functions under end user control (such as but not specifically limited to email, general purpose Internet browsing, and office suite productivity tools). The use of Software in systems and solutions that provide dedicated functionality (other than as mentioned above) or designed for use in embedded or function-specific software applications, for example



Accept this license?

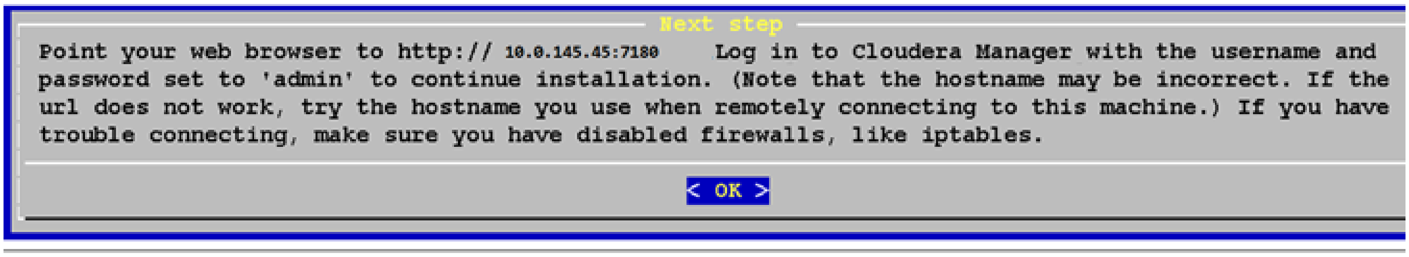
7. Wait for the installer to install the packages needed for Cloudera Manager.



Cloudera Manager Server

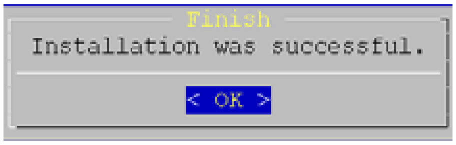
cloudera-manager-server

8. Save the url displayed http://10.0.145.45:7180. You will need this url to access Cloudera Manager. If you are unable to connect to the server, check to see if iptables and SELinux are disabled.



```
Point your web browser to http:// 10.0.145.45:7180    Log in to Cloudera Manager with the username and
password set to 'admin' to continue installation. (Note that the hostname may be incorrect. If the
url does not work, try the hostname you use when remotely connecting to this machine.) If you have
trouble connecting, make sure you have disabled firewalls, like iptables.
```

9. Click **OK**.



```
Installation was successful.
```

10. Once the installation of Cloudera Manager is complete. Install CDH5 using the Cloudera Manager web interface.

Setting up the Cloudera Manager Server Database

The Cloudera Manager Server database stores information about service and host configurations.

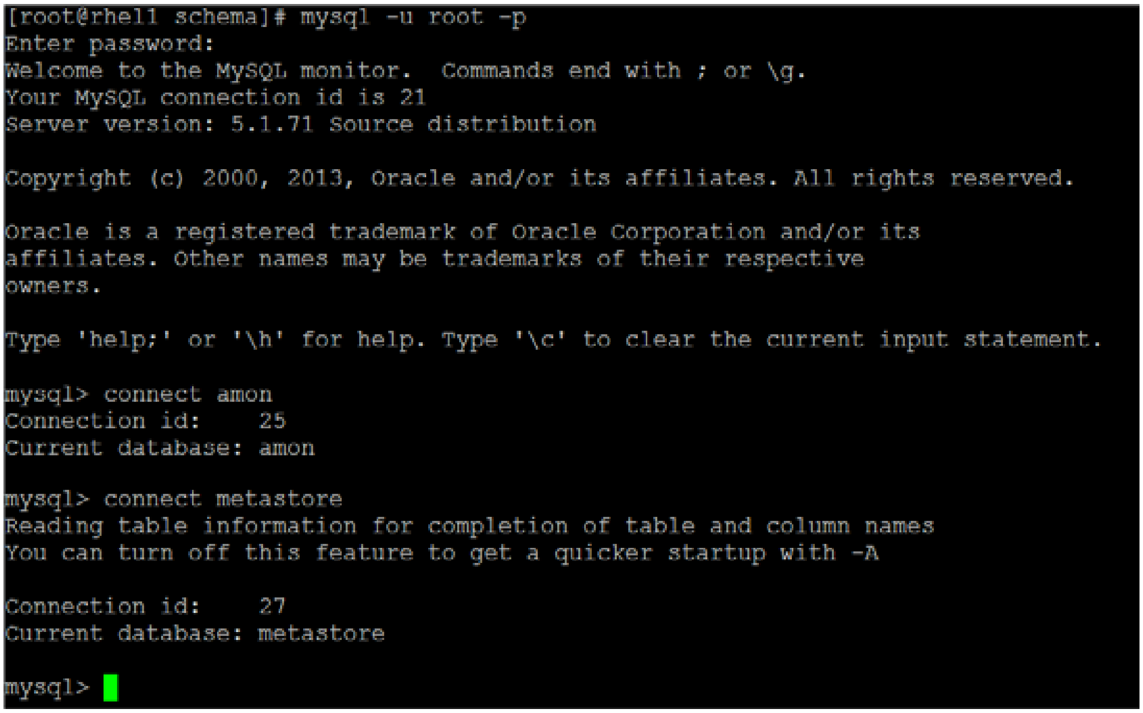
Preparing a Cloudera Manager Server External Database

1. Run the scm_prepare_database.sh script on the host where the Cloudera Manager Server package is installed:

```
[root@rhel1 ~]# cd /usr/share/cmf/schema
[root@rhel1 schema]# ./scm_prepare_database.sh mysql amon root <password>
[root@rhel1 schema]# ./scm_prepare_database.sh mysql rman root <password>
[root@rhel1 schema]# ./scm_prepare_database.sh mysql metastore root <password>
```

2. Verify the database connectivity using the following command.

```
[root@rhel1 ~]# mysql -u root -p
Mysql> connect amon
Mysql> connect rman
Mysql> connect metastore
```



```
[root@rhel1 schema]# mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 21
Server version: 5.1.71 Source distribution

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> connect amon
Connection id:    25
Current database: amon

mysql> connect metastore
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Connection id:    27
Current database: metastore

mysql> 
```

The MySQL External database setup is complete.

Installing Cloudera Enterprise Data Hub Edition (CDH5)

Role Assignment

This is one of the critical consideration for the installation. Inspect and customize the role assignments of all the nodes based on your requirements.

Table 11 Service Assignment

Service Name	Host
NameNode	rhel1, rhel3 (HA)
HistoryServer	rhel1
ResouceManager	rhel2, rhel3 (HA)
Hue Server	rhel2
HiveMetastore Server	rhel1
HiveServer2	rhel2
HBase Master	rhel2
Oozie Server	rhel1
Zookeeper	rhel1, rhel2, rhel3

Table 11 Service Assignment

JournalNodes	rhel1, rhel2, rhel3
DataNode	rhel4 to rhel160
NodeManager	rhel4 to rhel160
RegionServer	rhel4 to rhel160
Sqoop Server	rhel1
Impala Catalog Server Daemon	rhel2
Solr Server	rhel1
Spark Server	rhel1
Spark Worker	rhel4 to rhel160

Scaling the Cluster

The role assignment recommendation above is for clusters larger than 64 servers and in High Availability (HA). For smaller cluster running without HA the recommendation is to dedicate one server for name node and a second server for secondary name node and YARN Resource Manager. For larger clusters larger than 64 nodes the recommendation is to dedicate one server each for name node, YARN Resource Manager and one more for running both NameNode (HA) and ResourceManager(HA) as in the table (no Secondary Namenode when in HA).

HDFS High Availability (HA)

The HDFS HA feature provides the option of running two NameNodes in the same cluster, in an Active/Passive configuration. These are referred to as the Active NameNode and the Standby NameNode. Unlike the Secondary NameNode, the Standby NameNode is hot standby, allowing a fast failover to a new NameNode in the case that a machine crashes, or a graceful administrator-initiated failover for the purpose of planned maintenance. There cannot be more than two NameNodes.

For more information, see:
http://www.cloudera.com/content/cloudera/en/documentation/core/v5-3-x/topics/cdh_hag_hdfs_ha_intro.html

Note Setting up HDFS HA is done after Cloudera Install.

Map-Reduce HA (YARN/MRv2)

The YARN ResourceManager (RM) is responsible for tracking the resources in a cluster and scheduling applications (for example, MapReduce jobs). Before CDH 5, the RM was a single point of failure in a YARN cluster. The RM high availability (HA) feature adds redundancy in the form of an Active/Standby RM pair to remove this single point of failure. Furthermore, upon failover from the Standby RM to the Active, the applications can resume from their last check-pointed state; for example, completed map tasks in a MapReduce job are not re-run on a subsequent attempt. This allows events such the following to be handled without any significant performance effect on running applications.

- Unplanned events such as machine crashes.
- Planned maintenance events such as software or hardware upgrades on the machine running the ResourceManager.

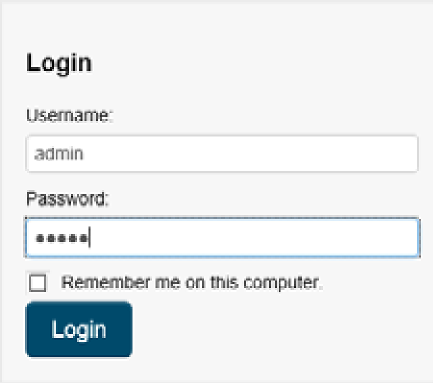
For more information, see: http://www.cloudera.com/content/cloudera/en/documentation/core/v5-3-x/topics/cdh_hag_rm_ha_config.html

Note Setting up YARN HA is done after Cloudera Install.

To install Cloudera Enterprise Data Hub, follow these steps:

1. Access the Cloudera Manager using the URL displayed by the Installer, http:// 10.0.145.45:7180.
2. Login to the Cloudera Manager. Enter "admin" for both the Username and Password fields.

Figure 163 Login to Cloudera Manager



Login

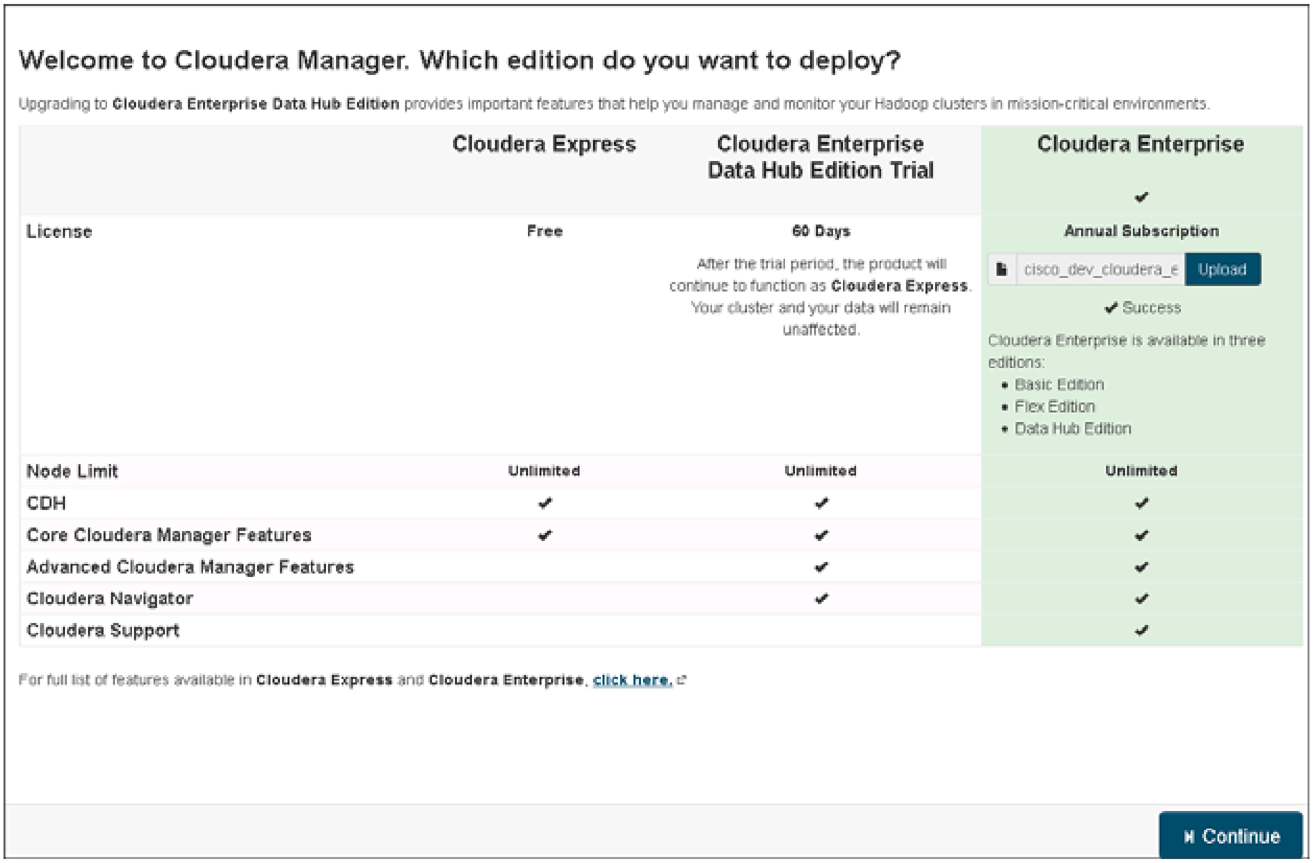
Username: admin

Password: •••••

□ Remember me on this computer

3. If you do not have a Cloudera license, click Cloudera Enterprise Data Hub Trial Edition. If you do have a Cloudera license, Click “Upload License” and select your license.
4. Based on requirement Choose appropriate Cloudera Editions for Installation.

Figure 164 Installing Cloudera Enterprise



Welcome to Cloudera Manager. Which edition do you want to deploy?

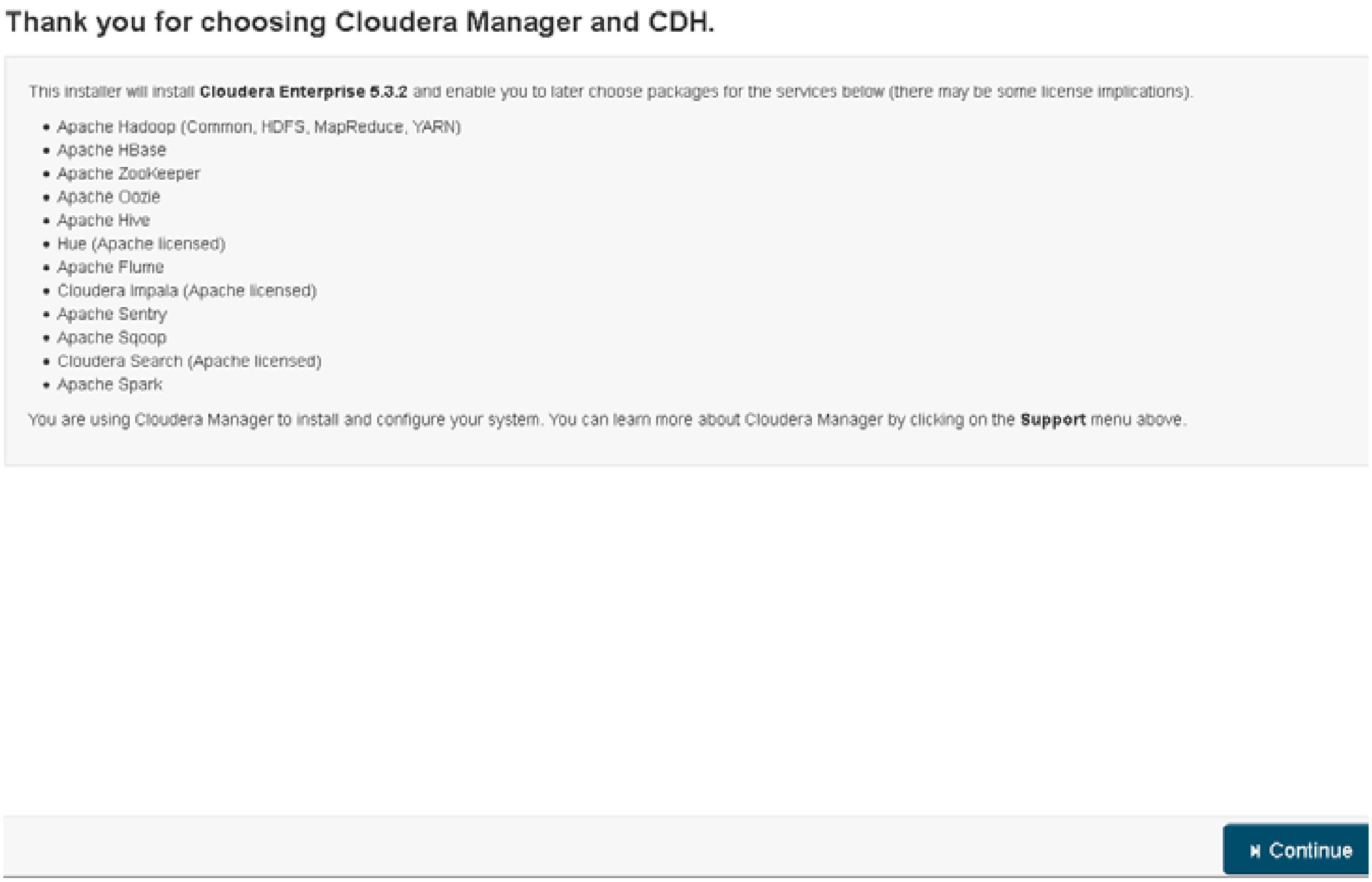
Upgrading to **Cloudera Enterprise Data Hub Edition** provides important features that help you manage and monitor your Hadoop clusters in mission-critical environments.

	Cloudera Express	Cloudera Enterprise Data Hub Edition Trial	Cloudera Enterprise ✔
License	**Free**	**60 Days** After the trial period, the product will continue to function as **Cloudera Express**. Your cluster and your data will remain unaffected.	**Annual Subscription** cisco_dev_cloudera_e Upload ✔ Success Cloudera Enterprise is available in three editions: • Basic Edition • Flex Edition • Data Hub Edition
Node Limit	**Unlimited**	**Unlimited**	**Unlimited**
CDH	✔	✔	✔
Core Cloudera Manager Features	✔	✔	✔
Advanced Cloudera Manager Features		✔	✔
Cloudera Navigator		✔	✔
Cloudera Support			✔

For full list of features available in **Cloudera Express** and **Cloudera Enterprise**, **click here.**

5. Click **Continue** in the confirmation page.

Figure 165 Confirmation Page



Thank you for choosing Cloudera Manager and CDH.

This installer will install **Cloudera Enterprise 5.3.2** and enable you to later choose packages for the services below (there may be some license implications).

- Apache Hadoop (Common, HDFS, MapReduce, YARN)
- Apache HBase
- Apache ZooKeeper
- Apache Oozie
- Apache Hive
- Hue (Apache licensed)
- Apache Flume
- Cloudera Impala (Apache licensed)
- Apache Sentry
- Apache Sqoop
- Cloudera Search (Apache licensed)
- Apache Spark

You are using Cloudera Manager to install and configure your system. You can learn more about Cloudera Manager by clicking on the **Support** menu above.

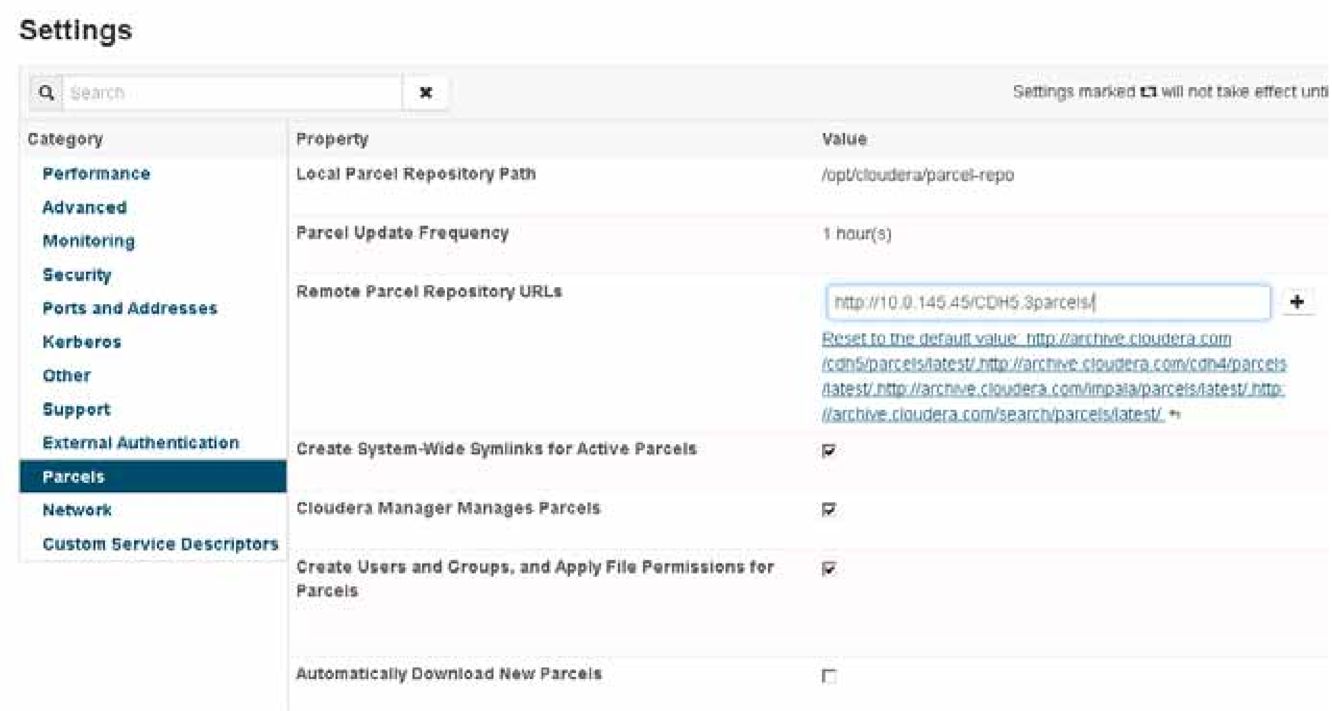
Edit the Cloudera Enterprise Parcel Settings to Use the CDH 5.3.2 Parcels

1. At this point, open another tab in the same browser window and visit the URL:

http://10.0.145.45:7180/cmf/parcel/status for modifying the parcel settings.

2. Click **Edit Settings** on this page:
3. Click – to remove all the remote repository URLs, and add the URL to the location where we kept the CDH 5.3.2 parcels i.e. http://10.0.145.45/CDH5.3parcels/

Figure 166 *Edit Cloudera Enterprise Parcel Settings*



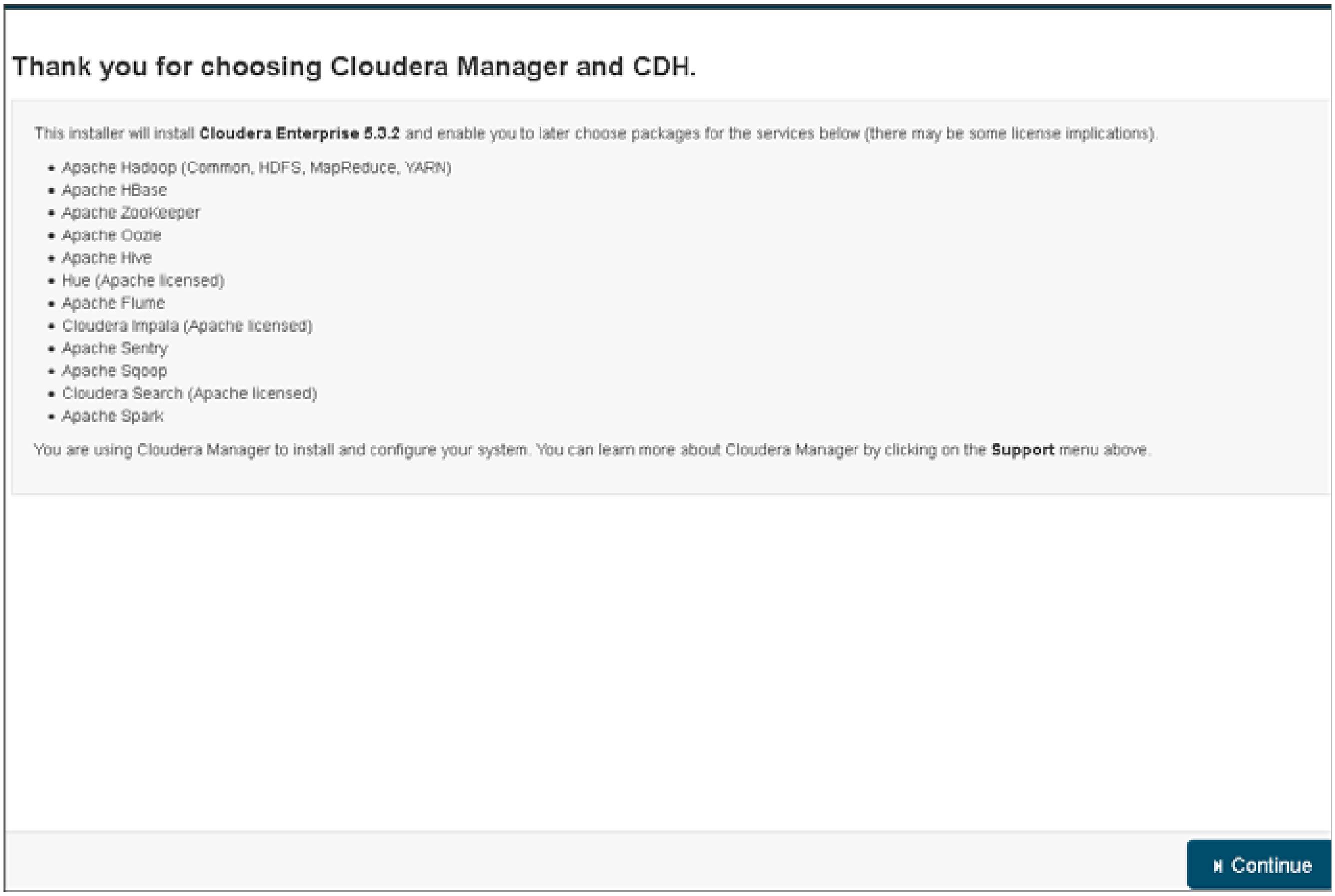
Property	Value
Local Parcel Repository Path	/opt/cloudera/parcel-repo
Parcel Update Frequency	1 hour(s)
Remote Parcel Repository URLs	http://10.0.145.45/CDH5.3parcels/ Reset to the default value: http://archive.cloudera.com/cdh5/parcels/latest/,http://archive.cloudera.com/cdh4/parcels/latest/,http://archive.cloudera.com/impala/parcels/latest/,http://archive.cloudera.com/search/parcels/latest/
Create System-Wide Symlinks for Active Parcels	☑
Cloudera Manager Manages Parcels	☑
Create Users and Groups, and Apply File Permissions for Parcels	☑
Automatically Download New Parcels	□

4. Click **Save Changes** to finish the configuration.

   Now navigate back to the Cloudera installation home page i.e. http://10.0.145.45:7180

5. Click **Continue** in the confirmation page.

Figure 167 Cloudera Confirmation Page



Thank you for choosing Cloudera Manager and CDH.

This installer will install **Cloudera Enterprise 5.3.2** and enable you to later choose packages for the services below (there may be some license implications).

- Apache Hadoop (Common, HDFS, MapReduce, YARN)
- Apache HBase
- Apache ZooKeeper
- Apache Oozie
- Apache Hive
- Hue (Apache licensed)
- Apache Flume
- Cloudera Impala (Apache licensed)
- Apache Sentry
- Apache Sqoop
- Cloudera Search (Apache licensed)
- Apache Spark

You are using Cloudera Manager to install and configure your system. You can learn more about Cloudera Manager by clicking on the **Support** menu above.

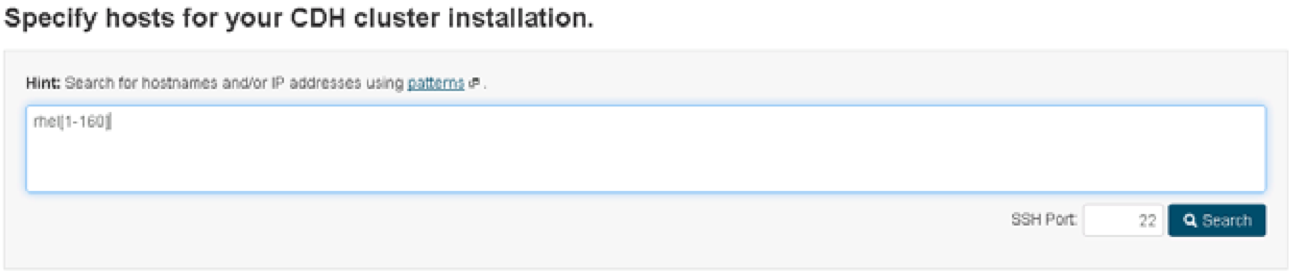
6. Specify the hosts that are part of the cluster using their IP addresses or hostname. The figure below shows use of a pattern to specify IP addresses range.

```
10.0.146.[45-204] or rhel[1-160]
```

Note Here, eth1 IP is provided as this is provided with better QoS policy than management VLAN.

7. After the IP addresses or hostnames are entered, click **Search**.

Figure 168 Searching for Cluster Nodes



Specify hosts for your CDH cluster installation.

Hint: Search for hostnames and/or IP addresses using patterns.

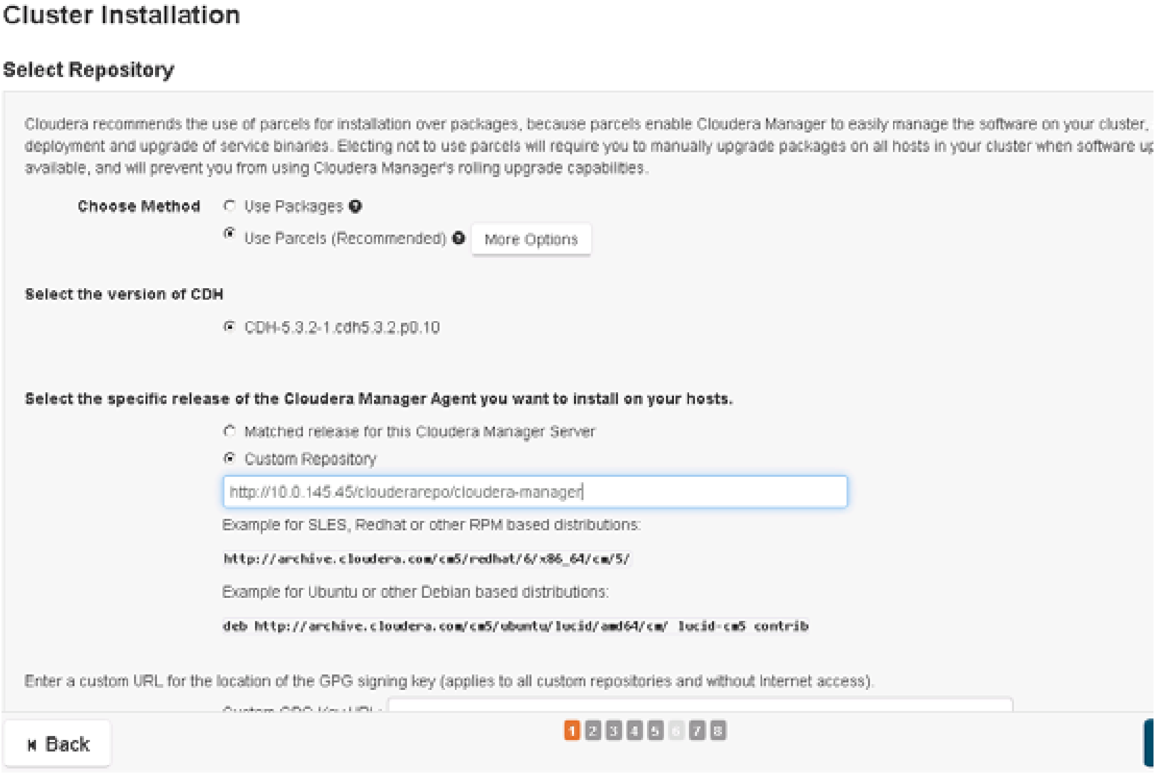
rhel[1-160]

SSH Port: 22

8. Cloudera Manager will "discover" the nodes in the cluster. Verify that all desired nodes have been found and selected for installation.
9. For the method of installation, select the **Use Parcels (Recommended)** radio button.
10. For the CDH version, select the **CDH5** radio button.
11. For the specific release of Cloudera Manager, select the **Custom Repository** radio button.
12. Enter the URL for the repository within the admin node.

http://10.0.145.45/clouderarepo/cloudera-manager and click **Continue**.

Figure 169 Cluster Installation: Selecting Repository



Cluster Installation

Select Repository

Cloudera recommends the use of parcels for installation over packages, because parcels enable Cloudera Manager to easily manage the software on your cluster, deployment and upgrade of service binaries. Electing not to use parcels will require you to manually upgrade packages on all hosts in your cluster when software up available, and will prevent you from using Cloudera Manager's rolling upgrade capabilities.

Choose Method ○ Use Packages
● Use Parcels (Recommended)

Select the version of CDH

● CDH-5.3.2-1.cdh5.3.2.p0.10

Select the specific release of the Cloudera Manager Agent you want to install on your hosts.

○ Matched release for this Cloudera Manager Server
● Custom Repository

http://10.0.145.45/clouderarepo/cloudera-manager

Example for SLES, Redhat or other RPM based distributions:

```
http://archive.cloudera.com/cm5/redhat/6/x86_64/cm/5/
```

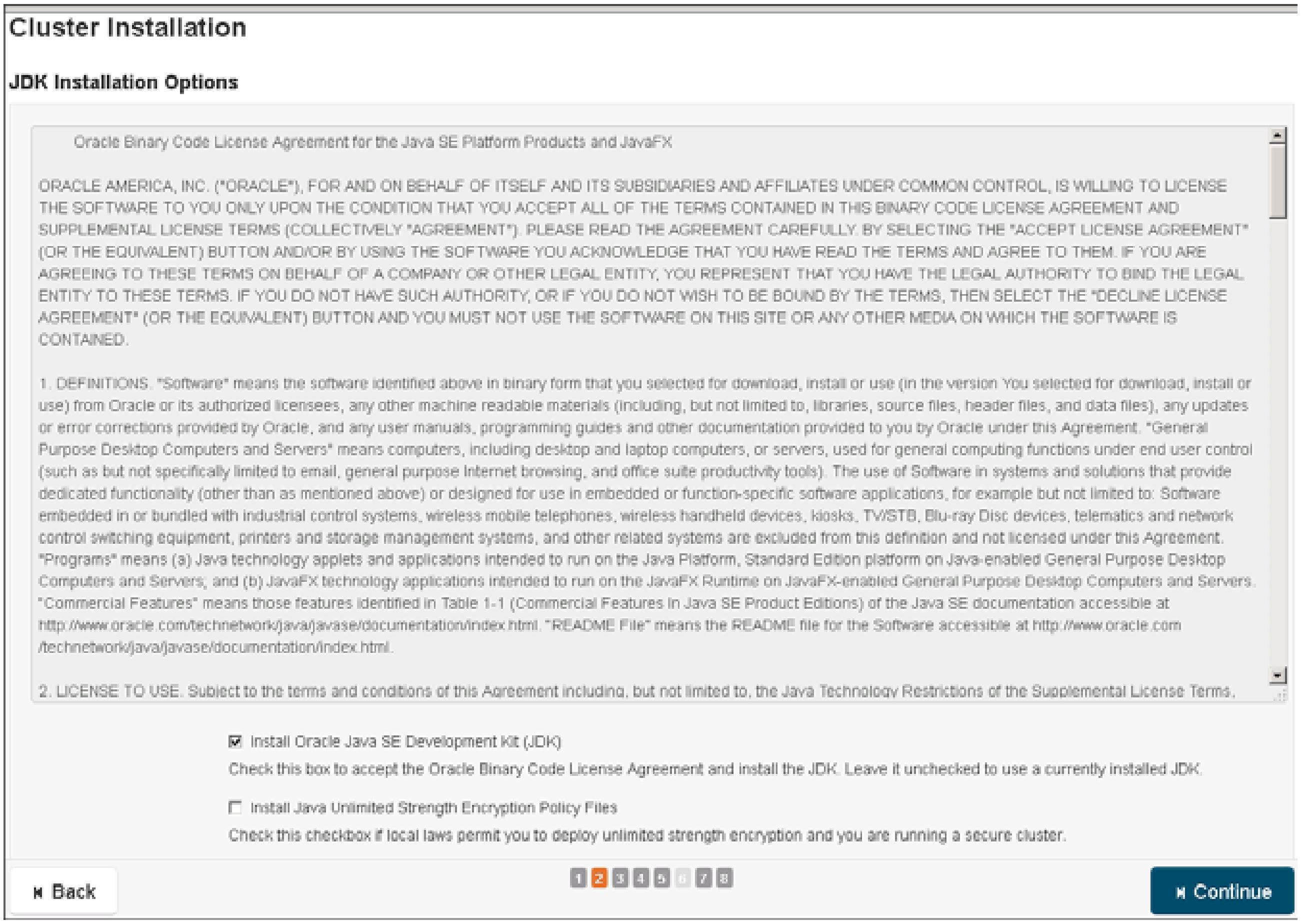
Example for Ubuntu or other Debian based distributions:

```
deb http://archive.cloudera.com/cm5/ubuntu/lucid/amd64/cm/ lucid-cm5 contrib
```

Enter a custom URL for the location of the GPG signing key (applies to all custom repositories and without Internet access).

13. Check “install Oracle java SE Development kit (JDK)” and click **Continue**.

Figure 170 Cluster Installation: JDK Installation



Cluster Installation

JDK Installation Options

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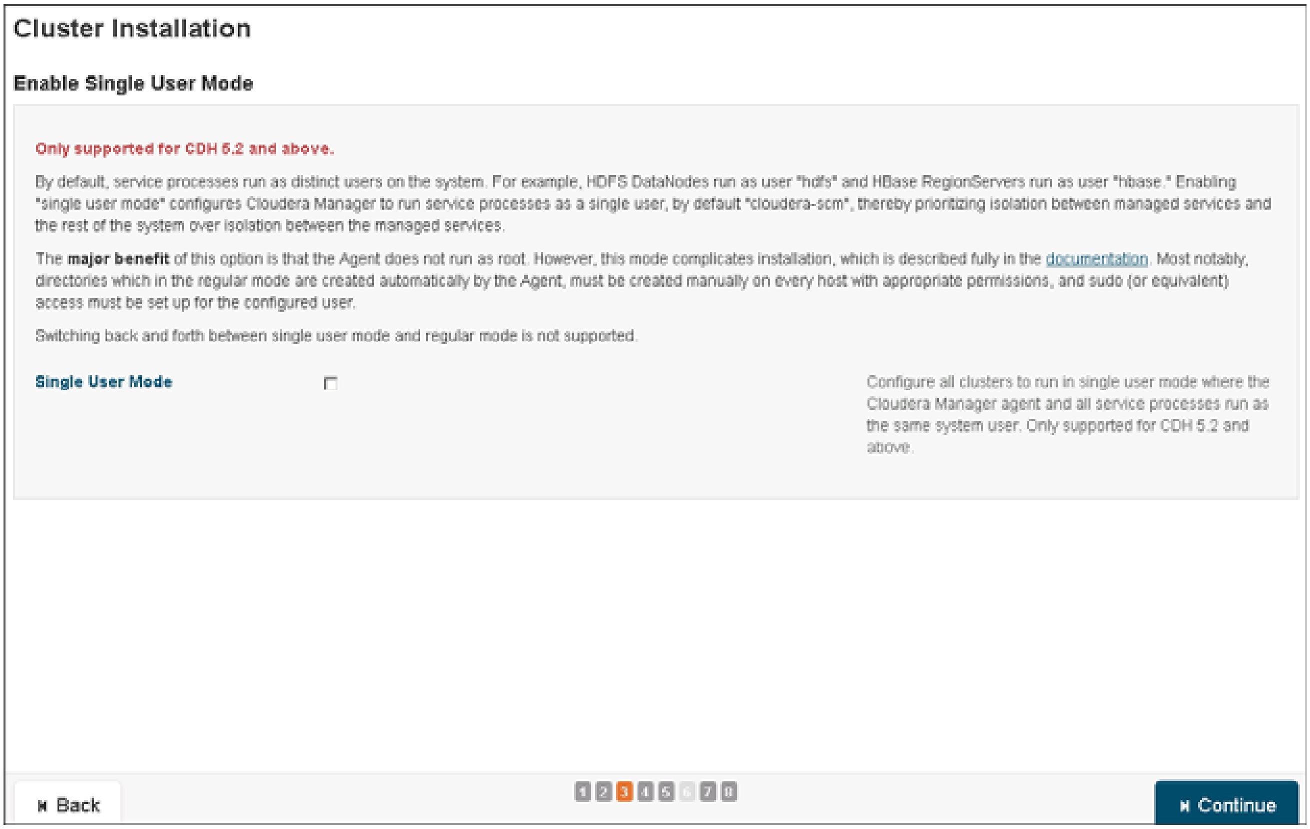
Check this checkbox if local laws permit you to deploy unlimited strength encryption and you are running a secure cluster.

14. Click **Continue** again.



Cluster Installation

Enable Single User Mode

Only supported for CDH 5.2 and above.

By default, service processes run as distinct users on the system. For example, HDFS DataNodes run as user "hdfs" and HBase RegionServers run as user "hbase." Enabling "single user mode" configures Cloudera Manager to run service processes as a single user, by default "cloudera-scm", thereby prioritizing isolation between managed services and the rest of the system over isolation between the managed services.

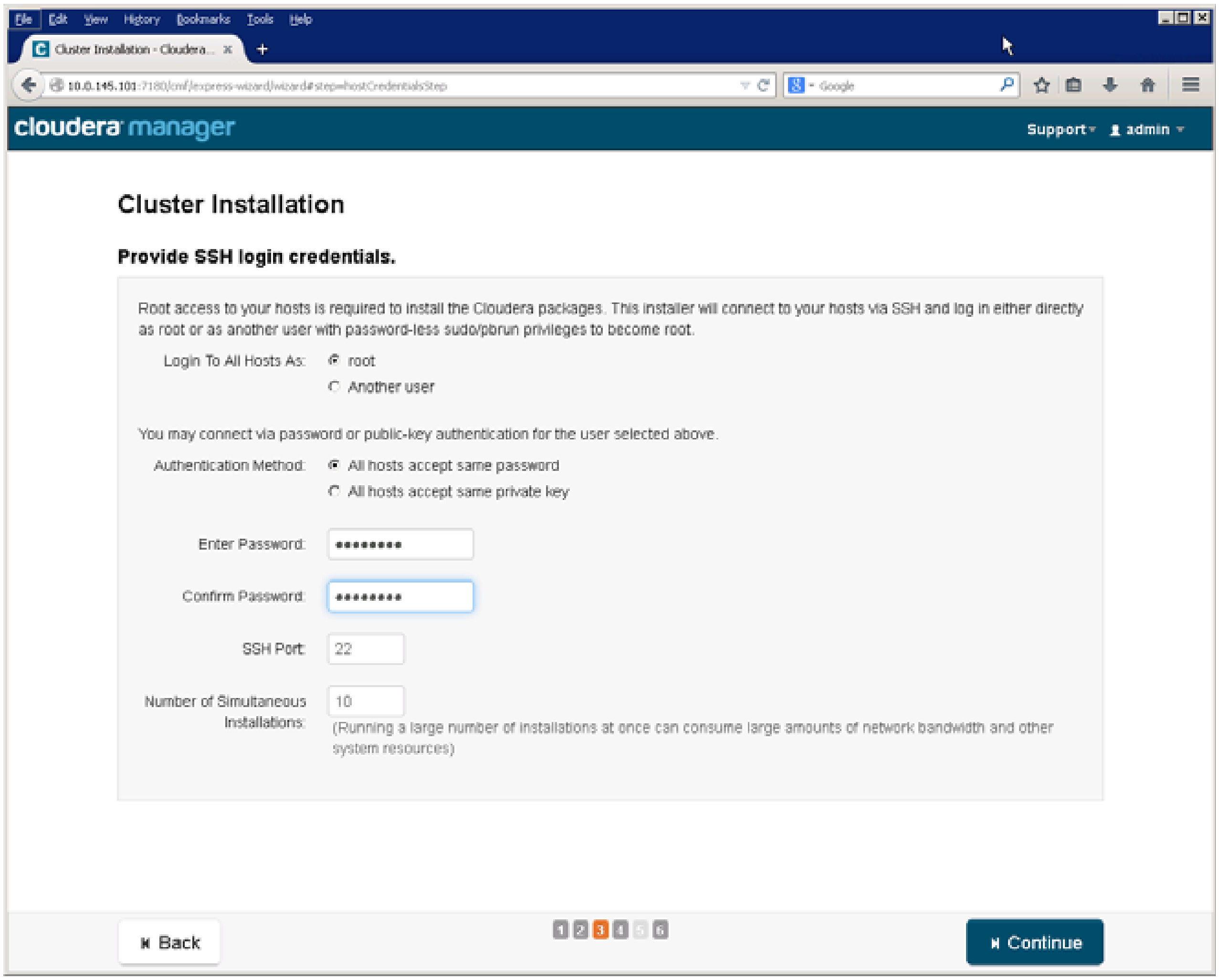
The **major benefit** of this option is that the Agent does not run as root. However, this mode complicates installation, which is described fully in the documentation. Most notably, directories which in the regular mode are created automatically by the Agent, must be created manually on every host with appropriate permissions, and sudo (or equivalent) access must be set up for the configured user.

Switching back and forth between single user mode and regular mode is not supported.

Single User Mode □ Configure all clusters to run in single user mode where the Cloudera Manager agent and all service processes run as the same system user. Only supported for CDH 5.2 and above.

15. Provide SSH login credentials for the cluster and click **Continue**.

Figure 171 Login Credentials to Start CDH Installation



File Edit View History Bookmarks Tools Help
Cluster Installation - Cloudera...
10.0.145.101:7180/cmf/express-wizard/wizard#step=hostCredentialsStep
Google
cloudera manager
Support
admin

Cluster Installation

Provide SSH login credentials.

Root access to your hosts is required to install the Cloudera packages. This installer will connect to your hosts via SSH and log in either directly as root or as another user with password-less sudo/pbrun privileges to become root.

Login To All Hosts As: ● root
○ Another user

You may connect via password or public-key authentication for the user selected above.

Authentication Method: ● All hosts accept same password
○ All hosts accept same private key

Enter Password: •••••••••

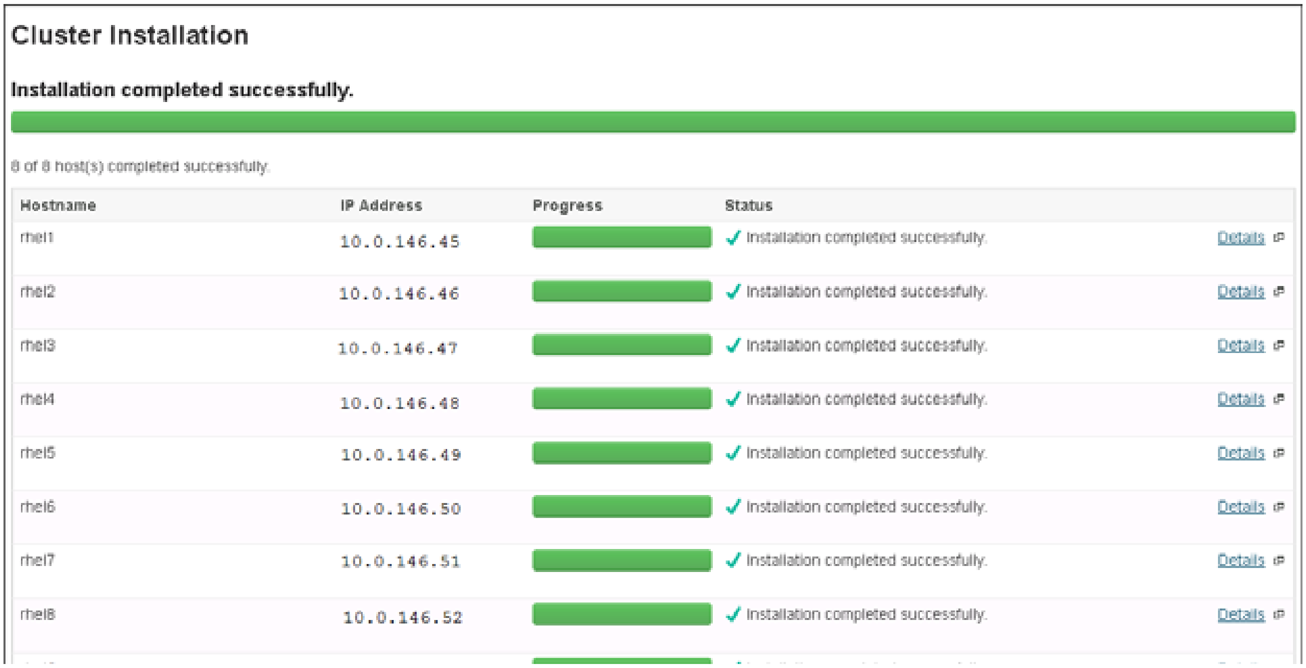
Confirm Password: •••••••••

SSH Port: 22

Number of Simultaneous Installations: 10
(Running a large number of installations at once can consume large amounts of network bandwidth and other system resources)

16. After the installation is successful click **Continue** to begin the parcel installation.

Figure 172 Cluster Installation: Completed



Cluster Installation

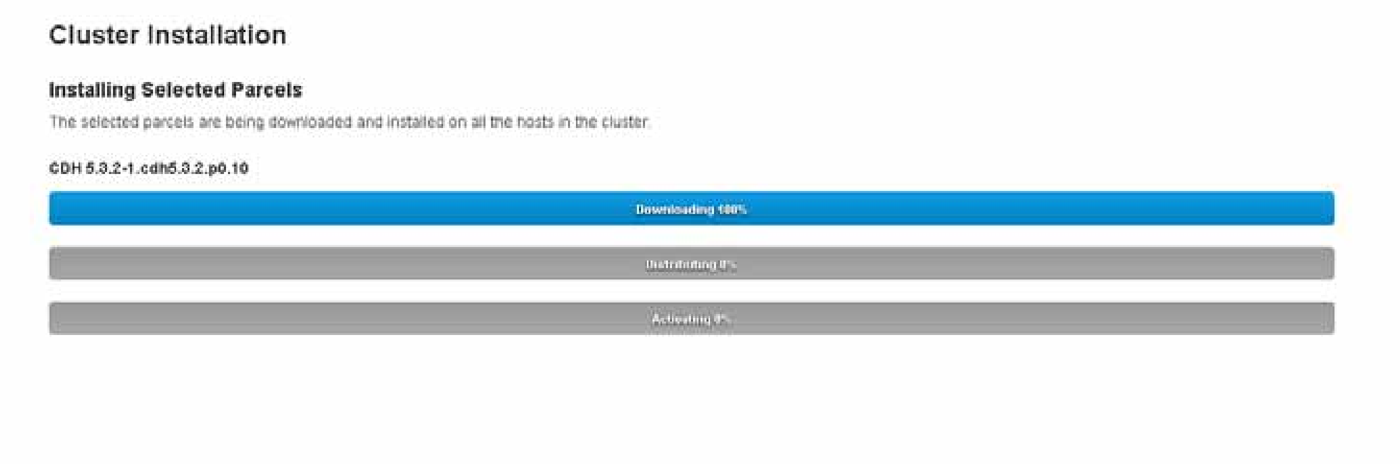
Installation completed successfully.

8 of 8 host(s) completed successfully.

Hostname	IP Address	Progress	Status	
rhel1	10.0.146.45	🟩	✓ Installation completed successfully.	Details
rhel2	10.0.146.46	🟩	✓ Installation completed successfully.	Details
rhel3	10.0.146.47	🟩	✓ Installation completed successfully.	Details
rhel4	10.0.146.48	🟩	✓ Installation completed successfully.	Details
rhel5	10.0.146.49	🟩	✓ Installation completed successfully.	Details
rhel6	10.0.146.50	🟩	✓ Installation completed successfully.	Details
rhel7	10.0.146.51	🟩	✓ Installation completed successfully.	Details
rhel8	10.0.146.52	🟩	✓ Installation completed successfully.	Details

17. Installation using parcels begins.

Figure 173 Cluster Installation: Installation Selected Parcels



Cluster Installation

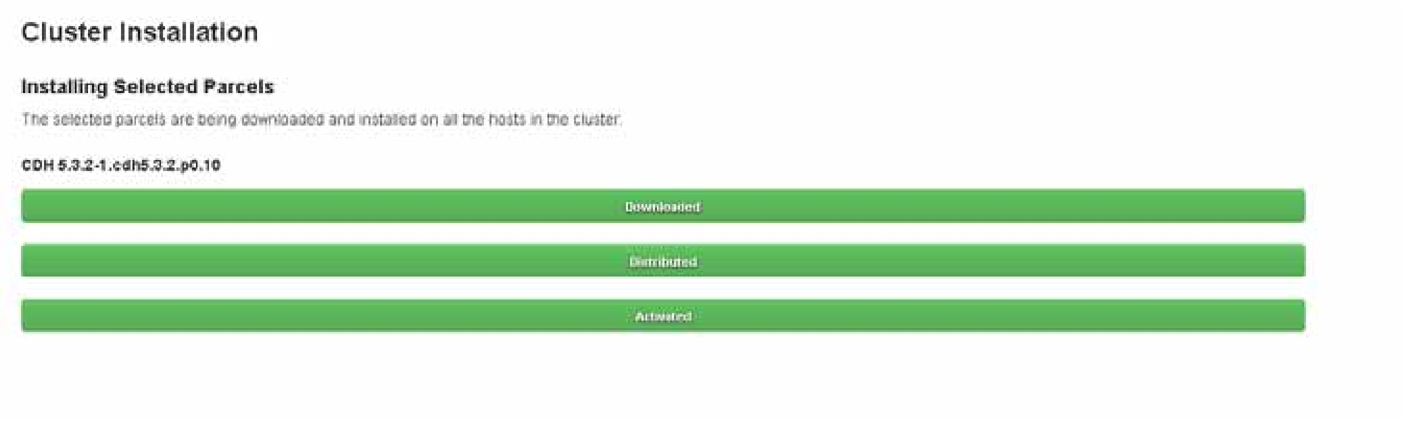
Installing Selected Parcels

The selected parcels are being downloaded and installed on all the hosts in the cluster.

CDH 5.3.2-1.cdh5.3.2.p0.10

18. Once the installation is completed successfully click **Continue** to select the required services.

Figure 174 Cluster Installation: Selected Parcels Installation Complete



Cluster Installation

Installing Selected Parcels

The selected parcels are being downloaded and installed on all the hosts in the cluster.

CDH 5.3.2-1.cdh5.3.2.p0.10

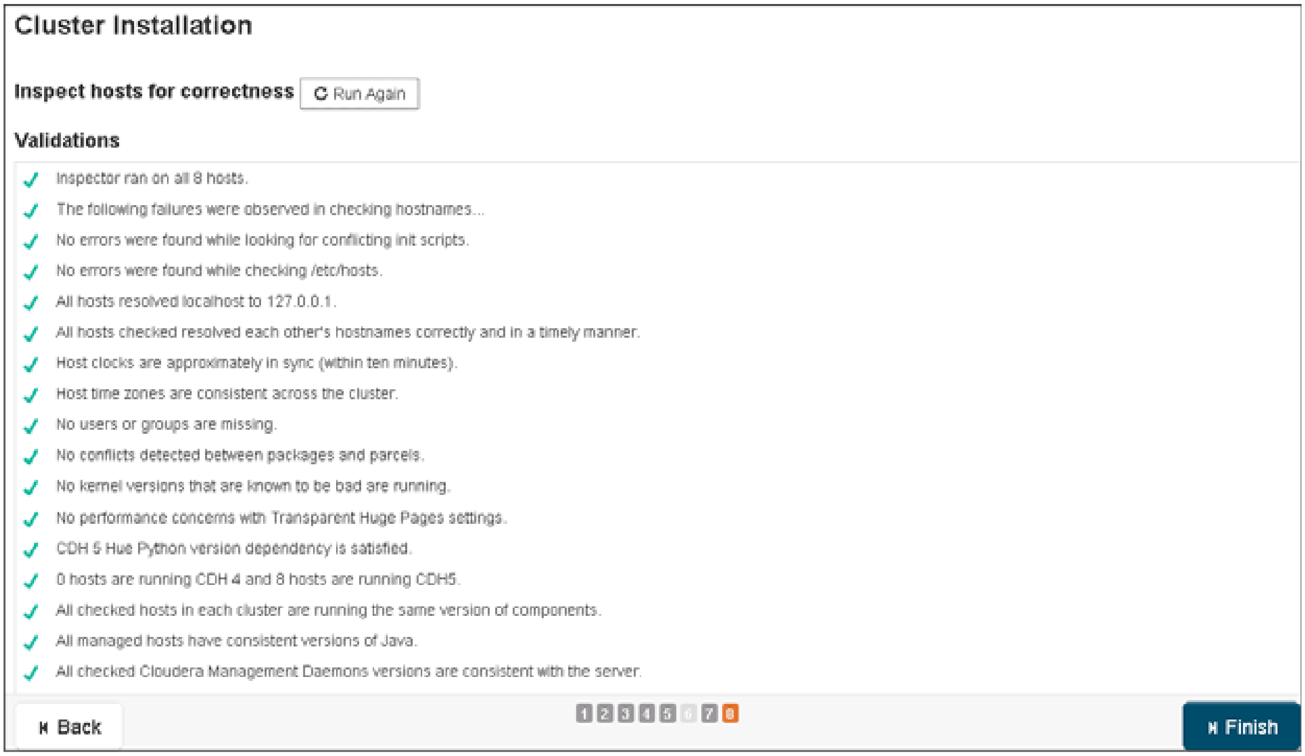
Downloaded

Distributed

Activated

19. Wait for Cloudera Manager to inspect the hosts on which it has just performed the installation.
20. Review and verify the summary. Click **Finish**.

Figure 175 Inspecting Hosts for Correctness



Cluster Installation

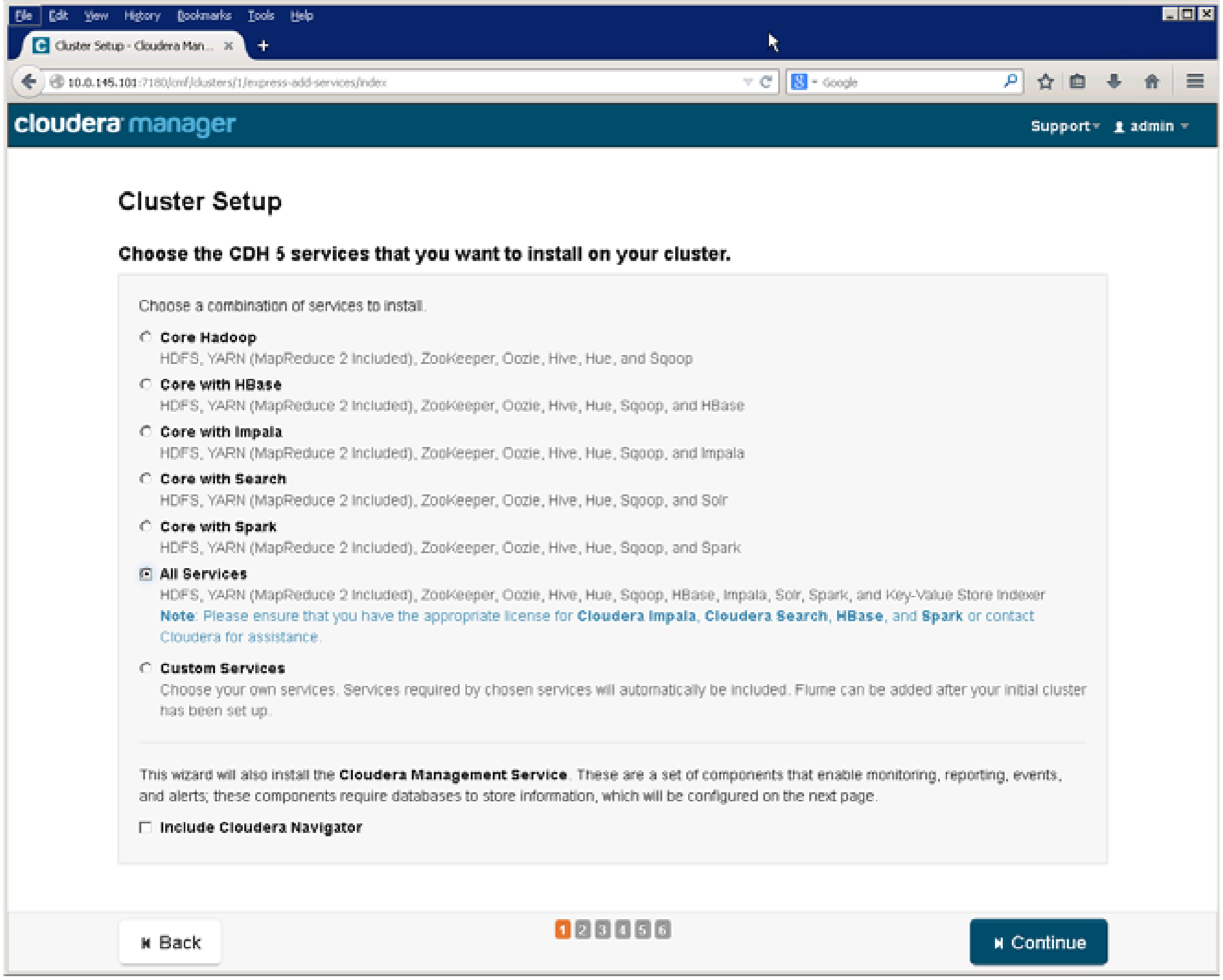
Inspect hosts for correctness

Validations

- ✓ Inspector ran on all 8 hosts.
- ✓ The following failures were observed in checking hostnames...
- ✓ No errors were found while looking for conflicting init scripts.
- ✓ No errors were found while checking /etc/hosts.
- ✓ All hosts resolved localhost to 127.0.0.1.
- ✓ All hosts checked resolved each other's hostnames correctly and in a timely manner.
- ✓ Host clocks are approximately in sync (within ten minutes).
- ✓ Host time zones are consistent across the cluster.
- ✓ No users or groups are missing.
- ✓ No conflicts detected between packages and parcels.
- ✓ No kernel versions that are known to be bad are running.
- ✓ No performance concerns with Transparent Huge Pages settings.
- ✓ CDH 5 Hue Python version dependency is satisfied.
- ✓ 0 hosts are running CDH 4 and 8 hosts are running CDH5.
- ✓ All checked hosts in each cluster are running the same version of components.
- ✓ All managed hosts have consistent versions of Java.
- ✓ All checked Cloudera Management Daemons versions are consistent with the server.

21. Select services that need to be started on the cluster.

Figure 176 Selecting CDH Version and Services



File Edit View History Bookmarks Tools Help
Cluster Setup - Cloudera Man...
10.0.145.101:7180/cmf/clusters/1/express-add-services/index
Google
cloudera manager
Support
admin

Cluster Setup

Choose the CDH 5 services that you want to install on your cluster.

Choose a combination of services to install.

○ **Core Hadoop**
HDFS, YARN (MapReduce 2 Included), ZooKeeper, Oozie, Hive, Hue, and Sqoop

○ **Core with HBase**
HDFS, YARN (MapReduce 2 Included), ZooKeeper, Oozie, Hive, Hue, Sqoop, and HBase

○ **Core with Impala**
HDFS, YARN (MapReduce 2 Included), ZooKeeper, Oozie, Hive, Hue, Sqoop, and Impala

○ **Core with Search**
HDFS, YARN (MapReduce 2 Included), ZooKeeper, Oozie, Hive, Hue, Sqoop, and Solr

○ **Core with Spark**
HDFS, YARN (MapReduce 2 Included), ZooKeeper, Oozie, Hive, Hue, Sqoop, and Spark

● **All Services**
HDFS, YARN (MapReduce 2 Included), ZooKeeper, Oozie, Hive, Hue, Sqoop, HBase, Impala, Solr, Spark, and Key-Value Store Indexer
Note: Please ensure that you have the appropriate license for **Cloudera Impala**, **Cloudera Search**, **HBase**, and **Spark** or contact Cloudera for assistance.

○ **Custom Services**
Choose your own services. Services required by chosen services will automatically be included. Flume can be added after your initial cluster has been set up.

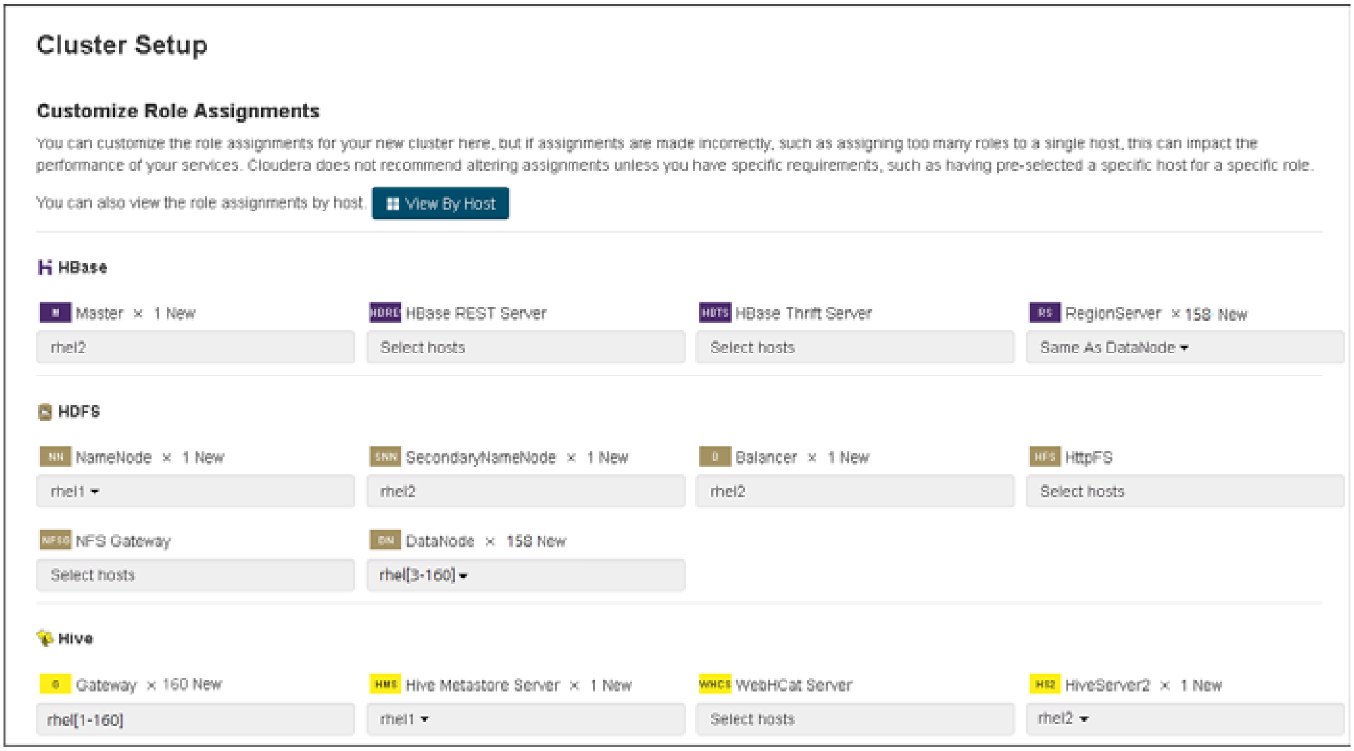
This wizard will also install the **Cloudera Management Service**. These are a set of components that enable monitoring, reporting, events, and alerts; these components require databases to store information, which will be configured on the next page.

□ **Include Cloudera Navigator**

22. This is one of the critical steps in the installation. Inspect and customize the role assignments of all the nodes based on your requirements and click **Continue**.

Reconfigure the service assignment to match the table in "Role Assignment" section on page 188.

Figure 177 Cluster Setup: Role Assignment - Part1



Cluster Setup

Customize Role Assignments

You can customize the role assignments for your new cluster here, but if assignments are made incorrectly, such as assigning too many roles to a single host, this can impact the performance of your services. Cloudera does not recommend altering assignments unless you have specific requirements, such as having pre-selected a specific host for a specific role.

You can also view the role assignments by host. View By Host

HBase

Master × 1 New
rhel2

HBase REST Server
Select hosts

HBase Thrift Server
Select hosts

RegionServer × 158 New
Same As DataNode ▾

HDFS

NameNode × 1 New
rhel1 ▾

SecondaryNameNode × 1 New
rhel2

Balancer × 1 New
rhel2

HttpFS
Select hosts

NFS Gateway
Select hosts

DataNode × 158 New
rhel[3-160] ▾

Hive

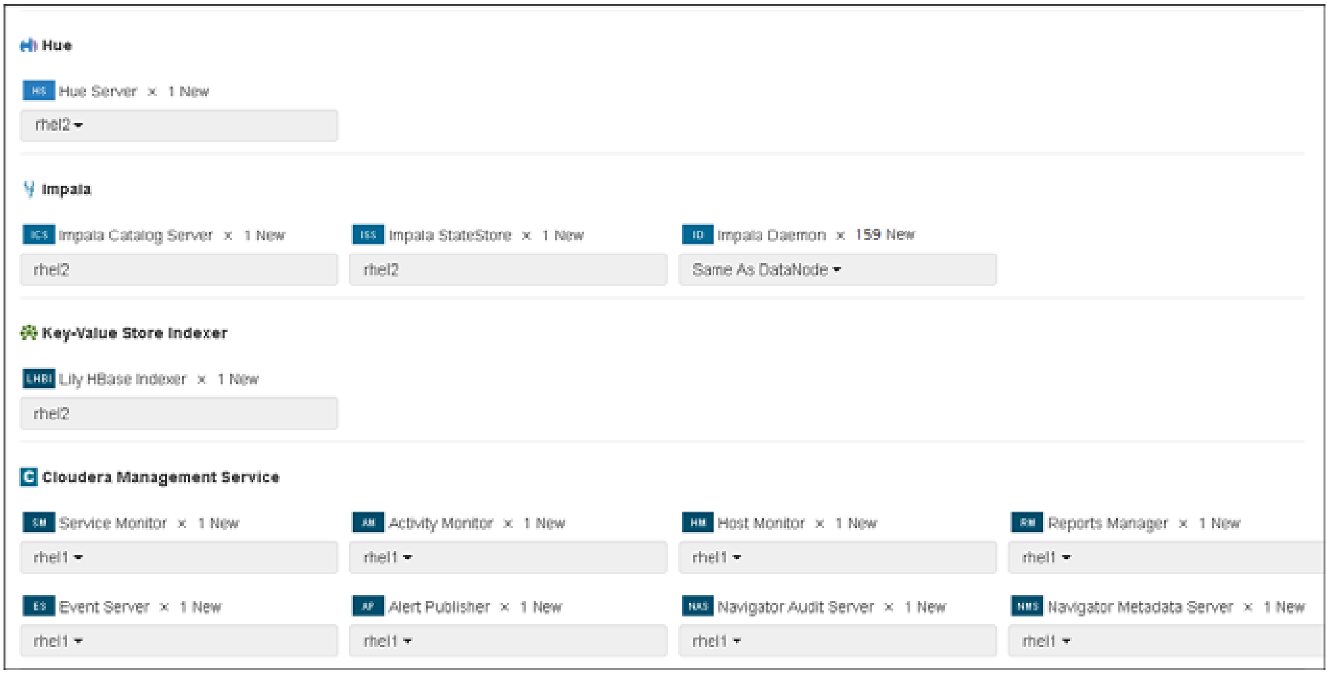
Gateway × 160 New
rhel[1-160]

Hive Metastore Server × 1 New
rhel1 ▾

WebHCat Server
Select hosts

HiveServer2 × 1 New
rhel2 ▾

Figure 178 Cluster Setup: Role Assignment - Part2



Hue

Hue Server × 1 New
rhel2 ▾

Impala

Impala Catalog Server × 1 New
rhel2

Impala StateStore × 1 New
rhel2

Impala Daemon × 159 New
Same As DataNode ▾

Key-Value Store Indexer

Lily HBase Indexer × 1 New
rhel2

Cloudera Management Service

Service Monitor × 1 New
rhel1 ▾

Activity Monitor × 1 New
rhel1 ▾

Host Monitor × 1 New
rhel1 ▾

Reports Manager × 1 New
rhel1 ▾

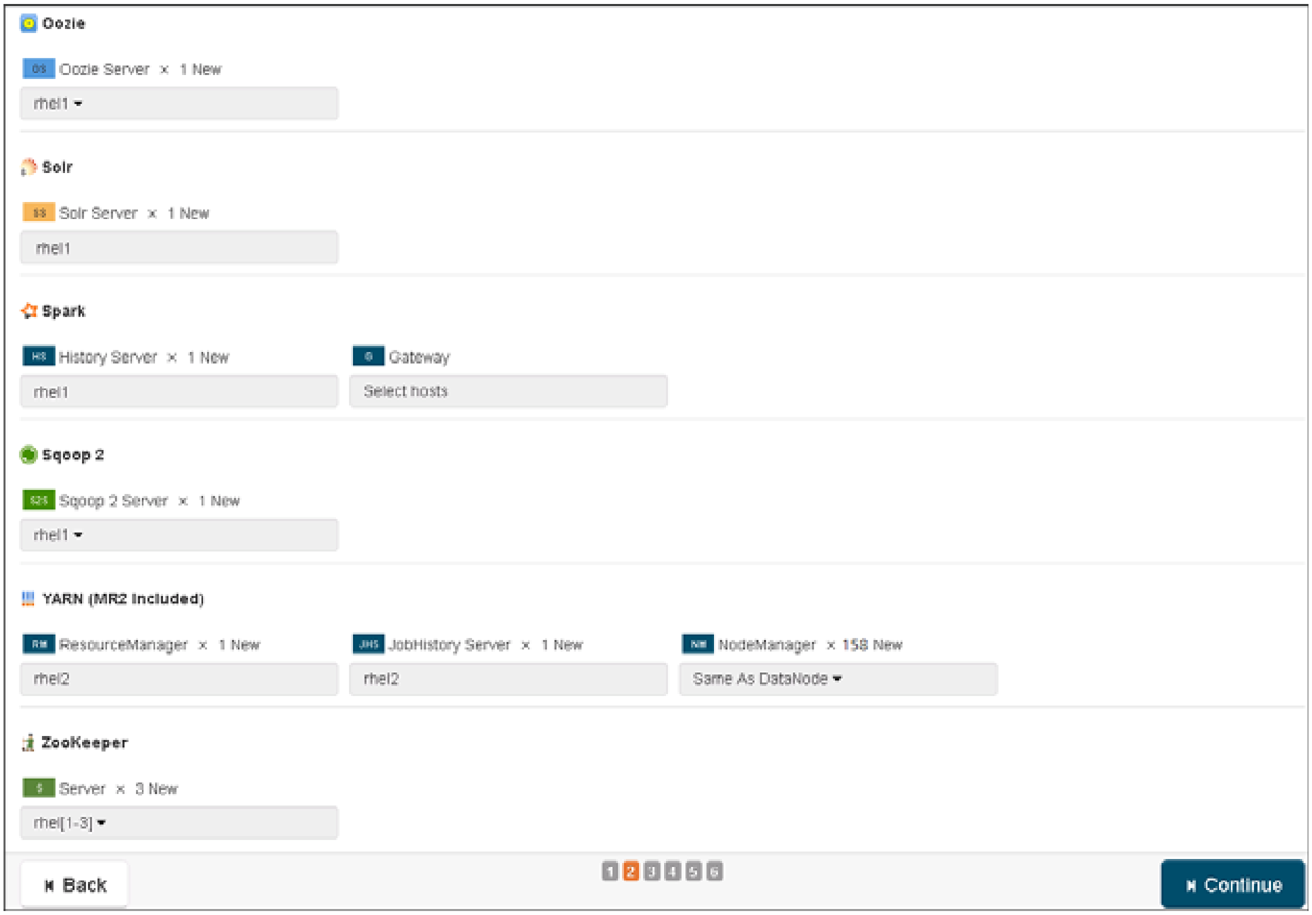
Event Server × 1 New
rhel1 ▾

Alert Publisher × 1 New
rhel1 ▾

Navigator Audit Server × 1 New
rhel1 ▾

Navigator Metadata Server × 1 New
rhel1 ▾

Figure 179 Cluster Setup: Role Assignment - Part3



Oozie

Oozie Server × 1 New
rhel1

Solr

Solr Server × 1 New
rhel1

Spark

History Server × 1 New
rhel1

Gateway
Select hosts

Sqoop 2

Sqoop 2 Server × 1 New
rhel1

YARN (MR2 Included)

ResourceManager × 1 New
rhel2

JobHistory Server × 1 New
rhel2

NodeManager × 158 New
Same As DataNode

ZooKeeper

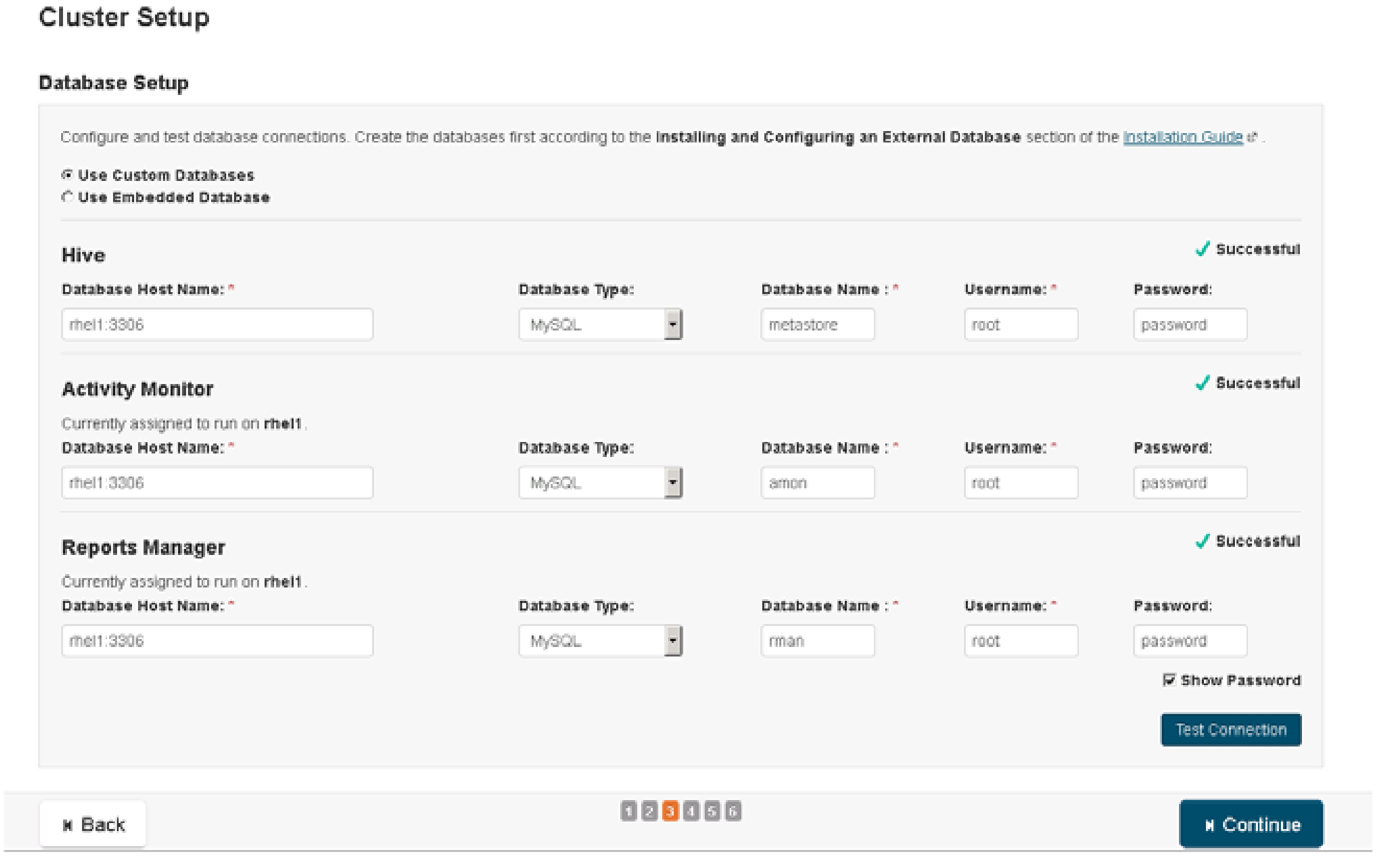
Server × 3 New
rhel[1-3]

Using Custom Database

The role assignment recommendation above is for clusters of up to 160 servers. For clusters larger than 160 nodes the recommendation is to dedicate one server each for name node, secondary name node and YARN Resource Manager.

1. Select the **Use Custom Database** radio button.
2. In Database Host Name sections use port 3306 for TCP/IP because connection to the remote server always uses TCP/IP.
3. Enter the Database Name. Username and password that was used during the database creation stage. (Please refer Setting MySQL Database for Cloudera Manager section).
4. Click **Test Connection** to verify the connection, once the connection is successful click **Continue**.

Figure 180 Database Setup



Cluster Setup

Database Setup

Configure and test database connections. Create the databases first according to the **Installing and Configuring an External Database** section of the Installation Guide .

● Use Custom Databases
○ Use Embedded Database

Hive ✓ Successful

Database Host Name: * rhel1:3306
Database Type: MySQL
Database Name : * metastore
Username: * root
Password: password

Activity Monitor ✓ Successful

Currently assigned to run on **rhel1** .

Database Host Name: * rhel1:3306
Database Type: MySQL
Database Name : * amon
Username: * root
Password: password

Reports Manager ✓ Successful

Currently assigned to run on **rhel1** .

Database Host Name: * rhel1:3306
Database Type: MySQL
Database Name : * rman
Username: * root
Password: password

☑ Show Password

5. Review and customize the configuration changes based on your requirements.

Configuring Yarn (MR2 Included) and HDFS Services

The following parameters are used for Cisco UCS Integrated Infrastructure for Big Data Performance Optimized cluster configuration described in this document. These parameters are to be changed based on the cluster configuration, number of nodes and specific workload.

Table 12 Yarn-MR2 Included

Service	Value
mapreduce.map.memory.mb	3 GiB
mapreduce.reduce.memory.mb	3 GiB
mapreduce.map.java.opts.max.heap	2560 MiB
yarn.nodemanager.resource.memorymb	180 GiB
yarn.nodemanager.resource.cpu-vcores	32
yarn.scheduler.minimum-allocation-mb	4 GiB
yarn.scheduler.maximum-allocation-mb	180 GiB

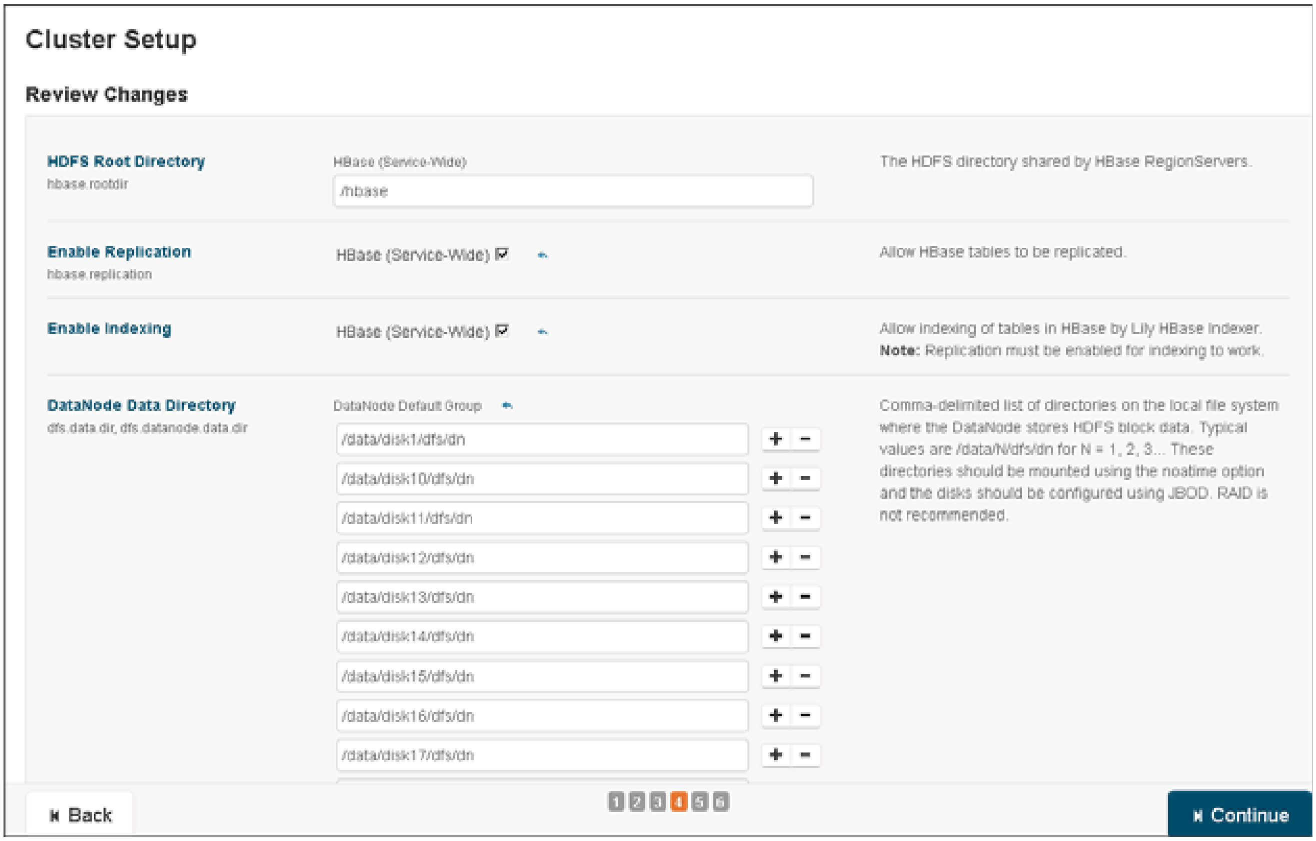
Table 12 Yarn-MR2 Included

yarn.scheduler.maximum-allocation-vcores	40
mapreduce.task.io.sort.mb	256 MiB

Table 13 HDFS

Service	Value
dfs.datanode.failed.volumes.tolerated	11
dfs.datanode.du.reserved	10 GiB
dfs.datanode.data.dir.perm	755
Java Heap Size of Namenode in Bytes	2628 MiB
dfs.namenode.handler.count	54
dfs.namenode.service.handler.count	54
Java Heap Size of Secondary namenode in Bytes	2628 MiB

Figure 181



Cluster Setup

Review Changes

HDFS Root Directory
hbase.rootdir
HBase (Service-Wide)
/hbase
The HDFS directory shared by HBase RegionServers.

Enable Replication
hbase.replication
HBase (Service-Wide) ☑
Allow HBase tables to be replicated.

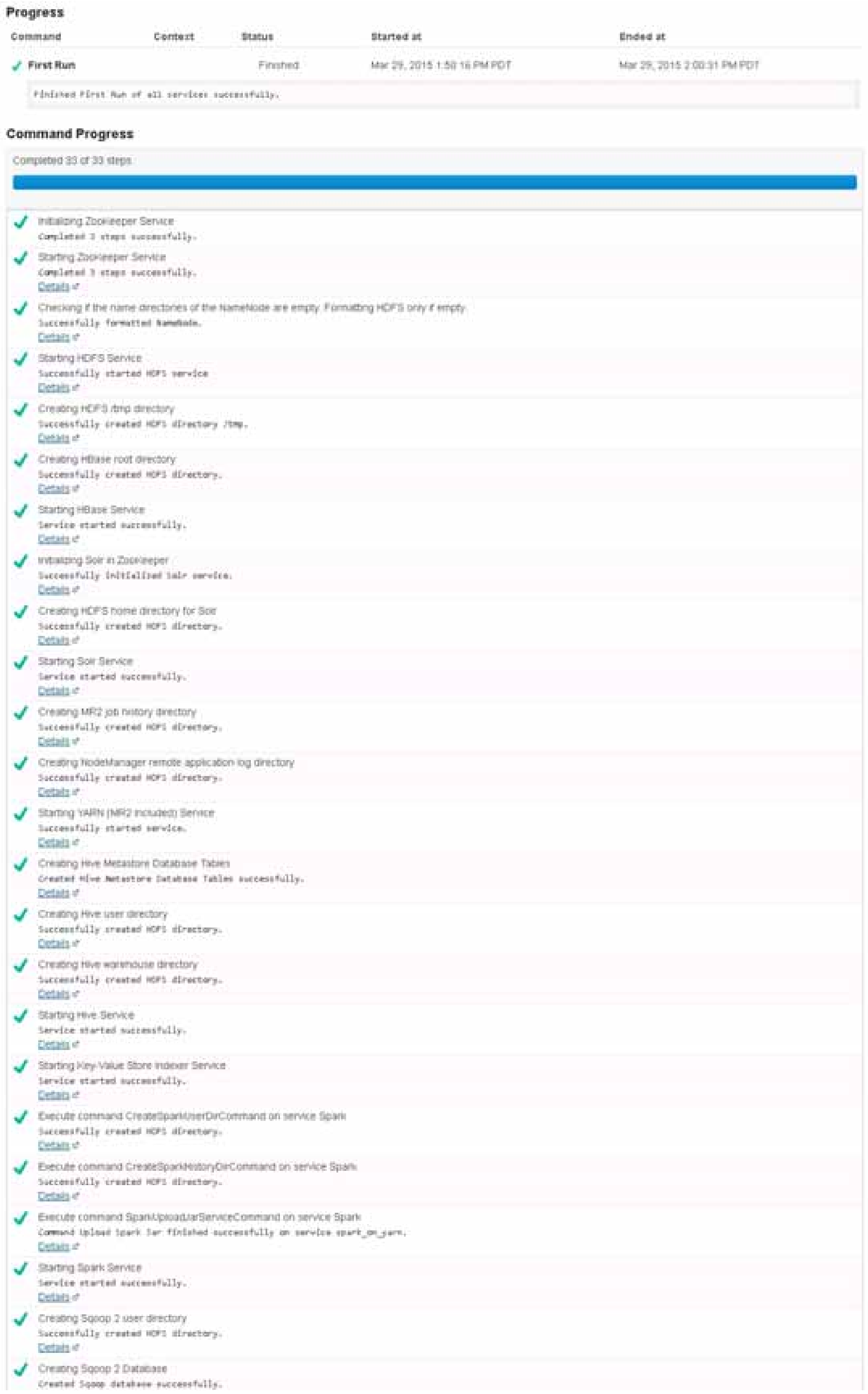
Enable Indexing
HBase (Service-Wide) ☑
Allow indexing of tables in HBase by Lily HBase Indexer. **Note:** Replication must be enabled for indexing to work.

DataNode Data Directory
dfs.data.dir, dfs.datanode.data.dir
DataNode Default Group
/data/disk1/dfs/dn
/data/disk10/dfs/dn
/data/disk11/dfs/dn
/data/disk12/dfs/dn
/data/disk13/dfs/dn
/data/disk14/dfs/dn
/data/disk15/dfs/dn
/data/disk16/dfs/dn
/data/disk17/dfs/dn
Comma-delimited list of directories on the local file system where the DataNode stores HDFS block data. Typical values are /data/N/dfs/dn for N = 1, 2, 3... These directories should be mounted using the noatime option and the disks should be configured using JBOD. RAID is not recommended.

6. Hadoop services are installed, configured and now running on all the nodes of the cluster. Click **Continue** to complete the installation.

Note In case Sqoop2 service doesn’t startup due to error “Unable to create database”, while cluster setup stage, please go to troubleshooting section in the Appendix A.

Figure 182 Starting the Cluster Services



Progress

Command	Context	Status	Started at	Ended at
✓ First Run		Finished	Mar 29, 2015 1:50:16 PM PDT	Mar 29, 2015 2:00:31 PM PDT

```
Finished First Run of all services successfully.
```

Command Progress

Completed 33 of 33 steps

✓ Initializing ZooKeeper Service
`Completed 3 steps successfully.`

✓ Starting ZooKeeper Service
`Completed 3 steps successfully.`
Details

✓ Checking if the name directories of the NameNode are empty. Formatting HDFS only if empty.
`Successfully formatted NameNode.`
Details

✓ Starting HDFS Service
`Successfully started HDFS service`
Details

✓ Creating HDFS /tmp directory
`Successfully created HDFS directory /tmp.`
Details

✓ Creating HBase root directory
`Successfully created HDFS directory.`
Details

✓ Starting HBase Service
`Service started successfully.`
Details

✓ Initializing Solr in ZooKeeper
`Successfully initialized Solr service.`
Details

✓ Creating HDFS home directory for Solr
`Successfully created HDFS directory.`
Details

✓ Starting Solr Service
`Service started successfully.`
Details

✓ Creating MR2 job history directory
`Successfully created HDFS directory.`
Details

✓ Creating NodeManager remote application log directory
`Successfully created HDFS directory.`
Details

✓ Starting YARN (MR2 Included) Service
`Successfully started service.`
Details

✓ Creating Hive Metastore Database Tables
`Created Hive Metastore Database Tables successfully.`
Details

✓ Creating Hive user directory
`Successfully created HDFS directory.`
Details

✓ Creating Hive warehouse directory
`Successfully created HDFS directory.`
Details

✓ Starting Hive Service
`Service started successfully.`
Details

✓ Starting Key-Value Store Indexer Service
`Service started successfully.`
Details

✓ Execute command CreateSparkUserDirCommand on service Spark
`Successfully created HDFS directory.`
Details

✓ Execute command CreateSparkHistoryDirCommand on service Spark
`Successfully created HDFS directory.`
Details

✓ Execute command SparkUploadJarServiceCommand on service Spark
`Command Upload Spark Jar finished successfully on service spark_on_yarn.`
Details

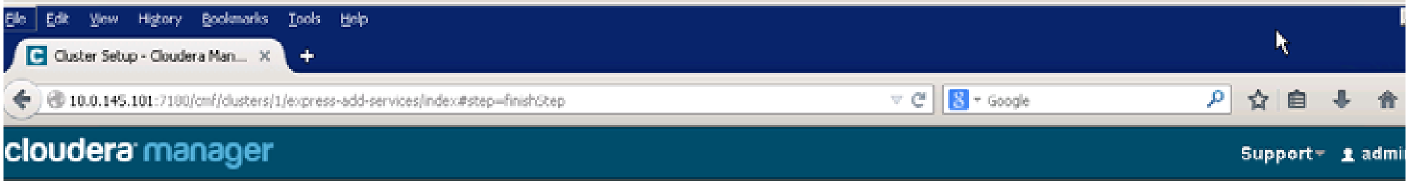
✓ Starting Spark Service
`Service started successfully.`
Details

✓ Creating Sqoop 2 user directory
`Successfully created HDFS directory.`
Details

✓ Creating Sqoop 2 Database
`Created Sqoop database successfully.`

7. Cloudera Manager will now show the status of all Hadoop services running on the cluster.

Figure 183 Cluster Setup Completion

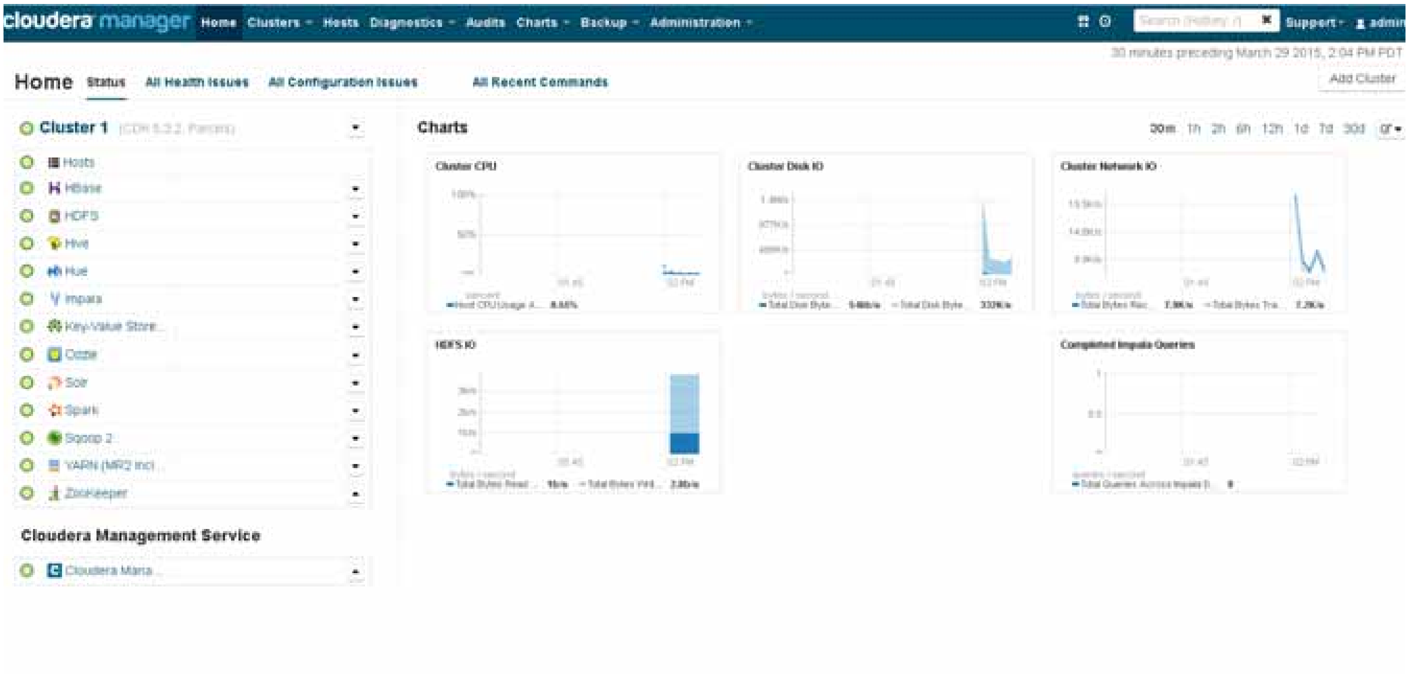

File
Edit
View
History
Bookmarks
Tools
Help
Cluster Setup - Cloudera Man...
10.0.145.101:7180/cmf/clusters/1/express-add-services/index#step=finishStep
Google
cloudera manager
Support
admi

Cluster Setup

Congratulations!

The services are installed, configured, and running on your cluster.

Figure 184 Service Status of the Cluster

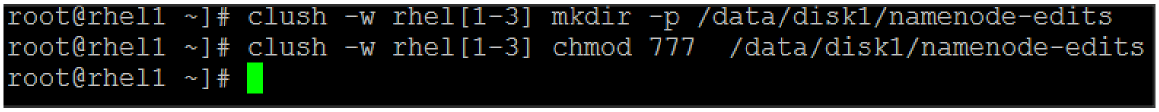


Setting up HDFS HA

The **Enable High Availability** workflow leads through adding a second (standby) NameNode and configuring JournalNodes. During the workflow, Cloudera Manager creates a **federated namespace**.

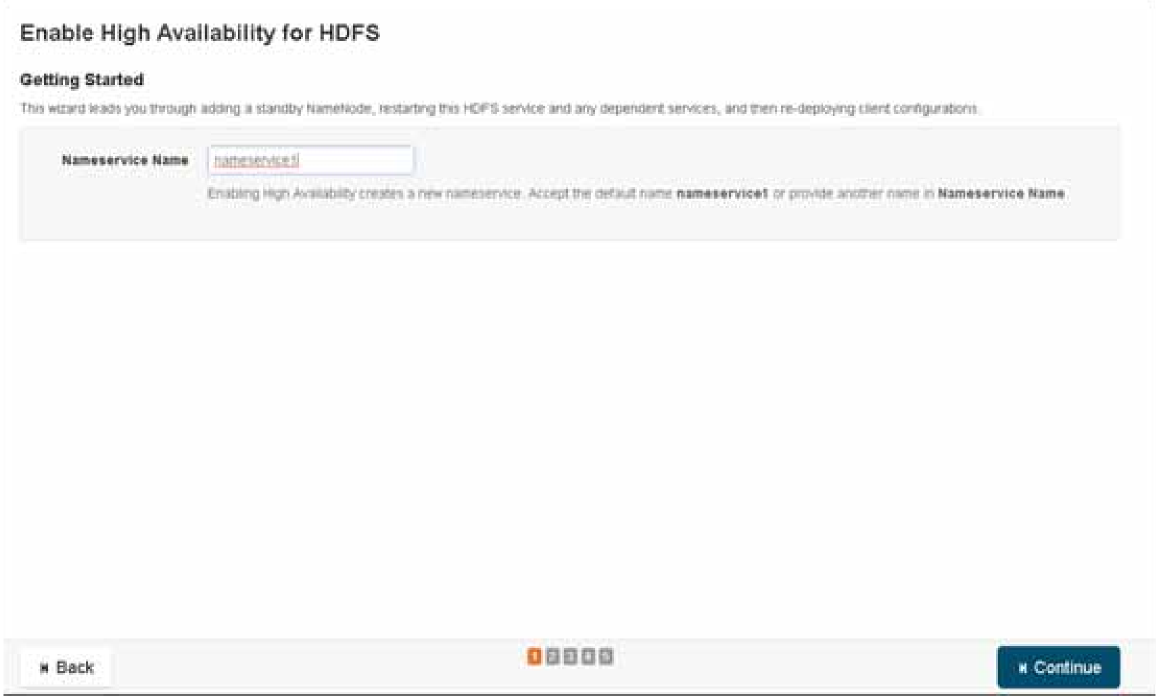
1. Log in to the admin node (rhel1) and create the Edit directory for the JournalNode hosts.

```
clush -w rhel[1-3] mkdir -p /data/disk1/namenode-edits
clush -w rhel[1-3] chmod 777 /data/disk1/namenode-edits
```



```
root@rhel1 ~]# clush -w rhel[1-3] mkdir -p /data/disk1/namenode-edits
root@rhel1 ~]# clush -w rhel[1-3] chmod 777  /data/disk1/namenode-edits
root@rhel1 ~]# 
```

2. Log in to the Cloudera manager and go to the HDFS service.
3. In the top right corner Select **Actions** > **Enable High Availability**. A screen showing the hosts that are eligible to run a standby NameNode and the JournalNodes displays.



Enable High Availability for HDFS

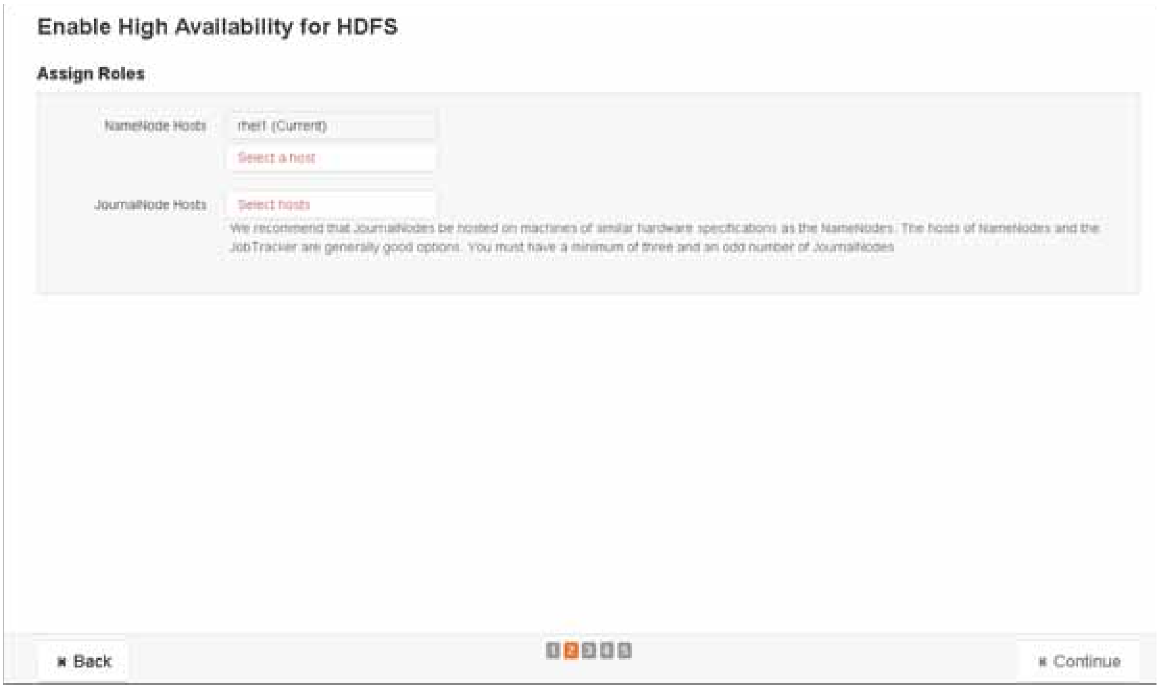
Getting Started

This wizard leads you through adding a standby NameNode, restarting this HDFS service and any dependent services, and then re-deploying client configurations.

Nameservice Name: nameservice1

Enabling High Availability creates a new nameservice. Accept the default name **nameservice1** or provide another name in **Nameservice Name**.

4. Specify a name for the nameservice or accept the default name nameservice1 and click **Continue**.
5. In the **NameNode Hosts** field, click **Select a host**. The host selection dialog displays.



Enable High Availability for HDFS

Assign Roles

NameNode Hosts: rhel1 (Current)

Select a host

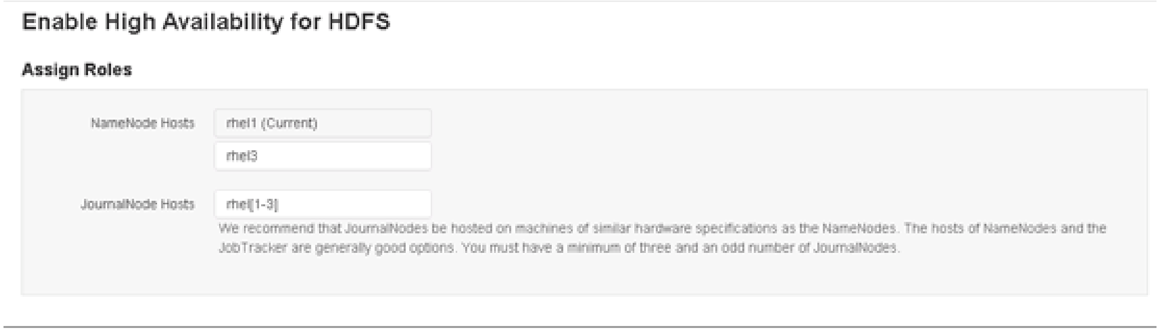
JournalNode Hosts: Select hosts

We recommend that JournalNodes be hosted on machines of similar hardware specifications as the NameNodes. The hosts of NameNodes and the JobTracker are generally good options. You must have a minimum of three and an odd number of JournalNodes

6. Check the checkbox next to the hosts (rhel3) where you want the standby NameNode to be set up and click **OK**.

Note The standby NameNode cannot be on the same host as the active NameNode, and the host that is chosen should have the same hardware configuration (RAM, disk space, number of cores, and so on) as the active NameNode.

7. In the **JournalNode Hosts** field, click **Select hosts**. The host selection dialog displays.
8. Check the checkboxes next to an odd number of hosts (a minimum of three) to act as JournalNodes and click **OK**. Here we are using the same nodes as Zookeeper nodes.



Enable High Availability for HDFS

Assign Roles

NameNode Hosts: rhel1 (Current)

rhel3

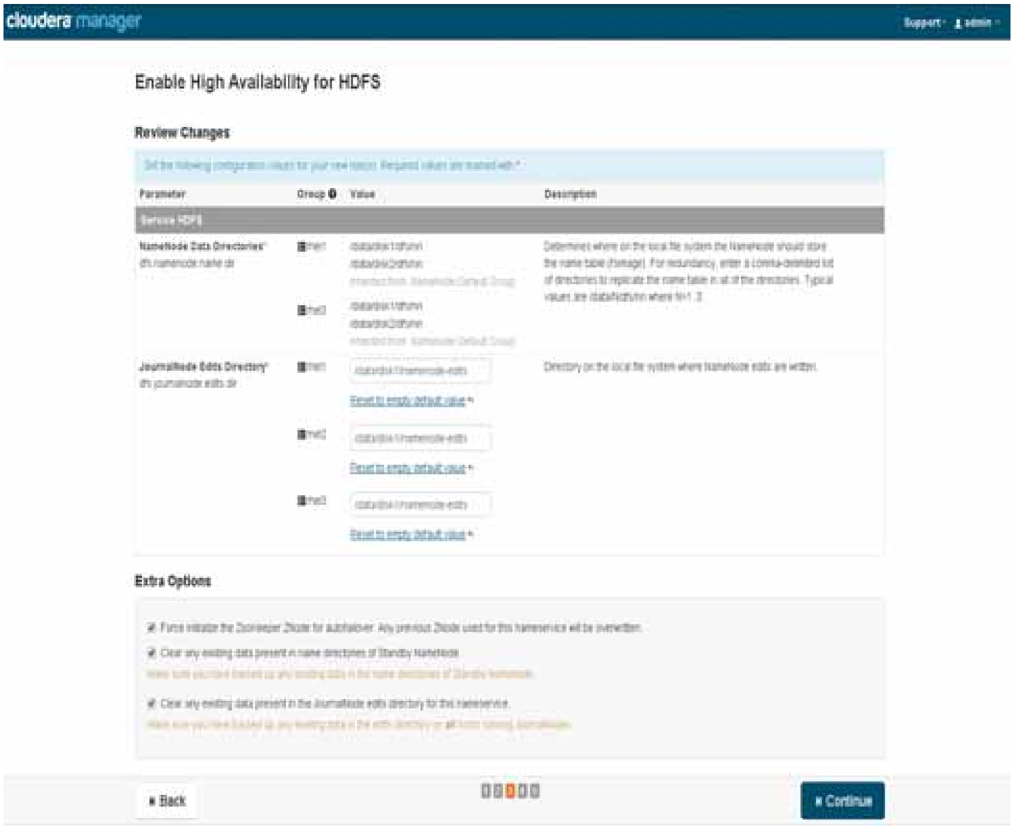
JournalNode Hosts: rhel[1-3]

We recommend that JournalNodes be hosted on machines of similar hardware specifications as the NameNodes. The hosts of NameNodes and the JobTracker are generally good options. You must have a minimum of three and an odd number of JournalNodes.

Note JournalNodes should be hosted on hosts with similar hardware specification as the NameNodes. It is recommended that you put a JournalNode each on the same hosts as the active and standby NameNodes, and the third JournalNode on ResourceManager node.

9. Click **Continue**.
10. In the **JournalNode Edits Directory** property, enter a directory location created earlier in step 1 for the JournalNode edits directory into the fields for each JournalNode host.

Note The directories you specify should be empty, and must have the appropriate permissions.



Enable High Availability for HDFS

Review Changes

Set the following configuration values for your new role(s). Required values are marked with *.

Parameter	Group	Value	Description
Service HDFS			
NameNode Data Directories* dfs.namenode.name.dir	rhel1	/data/disk1/dfs/nn /data/disk2/dfs/nn Inherited from: NameNode Default Group	Determines where on the local file system the NameNode should store the name table (fsimage). For redundancy, enter a comma-delimited list of directories to replicate the name table in all of the directories. Typical values are /data/N/dfs/nn where N=1..3.
	rhel2	/data/disk1/dfs/nn /data/disk2/dfs/nn Inherited from: NameNode Default Group	
JournalNode Edits Directory* dfs.journalnode.edits.dir	rhel1	/data/disk1/namenode-edits Reset to empty default value *	Directory on the local file system where NameNode edits are written.
	rhel2	/data/disk1/namenode-edits Reset to empty default value *	
	rhel3	/data/disk1/namenode-edits Reset to empty default value *	

Extra Options

☑ Force initialize the ZooKeeper ZNode for autofailover. Any previous ZNode used for this nameservice will be overwritten.

☑ Clear any existing data present in name directories of Standby NameNode.
Make sure you have backed up any existing data in the name directories of Standby NameNode.

☑ Clear any existing data present in the JournalNode edits directory for this nameservice.
Make sure you have backed up any existing data in the edits directory on all hosts running JournalNodes.

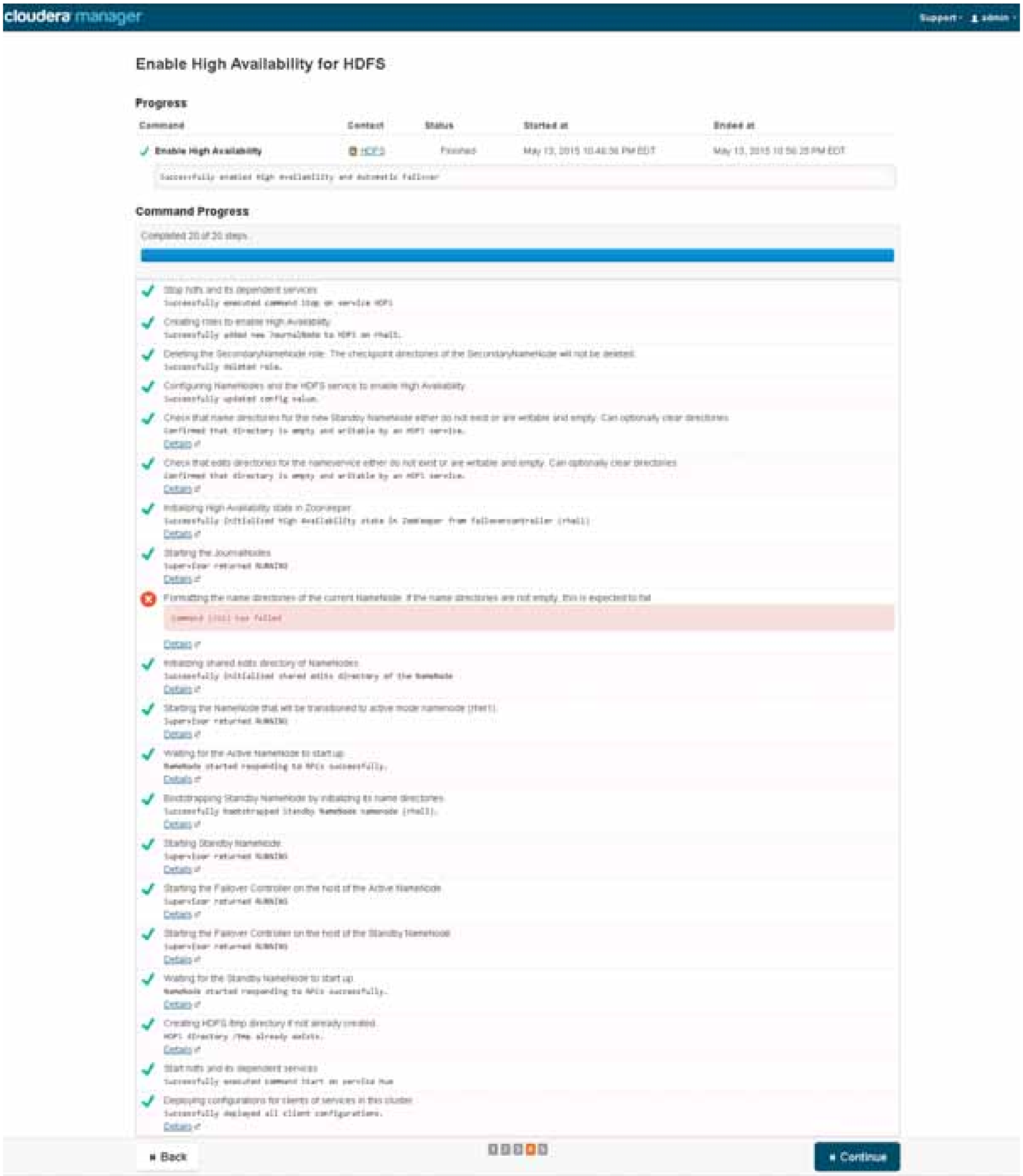
11. **Extra Options**: Decide whether Cloudera Manager should clear existing data in ZooKeeper, standby NameNode, and JournalNodes. If the directories are not empty (for example, re-enabling a previous HA configuration), Cloudera Manager will not automatically delete the contents—select to delete the contents by keeping the default checkbox selection. The recommended default is to clear the directories.

Note If choosen not to do so, the data should be in sync across the edits directories of the JournalNodes and should have the same version data as the NameNodes.

12. Click **Continue**.

Cloudera Manager executes a set of commands that will stop the dependent services, delete, create, and configure roles and directories as appropriate, create a nameservice and failover controller, and restart the dependent services and deploy the new client configuration.

Note Formatting of name directory is expected to fail as the directories are not empty as is the case here.



Enable High Availability for HDFS

Progress

Command	Context	Status	Started at	Ended at
✓ Enable High Availability	HDFS	Finished	May 13, 2015 10:48:56 PM EDT	May 13, 2015 10:56:25 PM EDT

```
Successfully enabled high availability and automatic failover
```

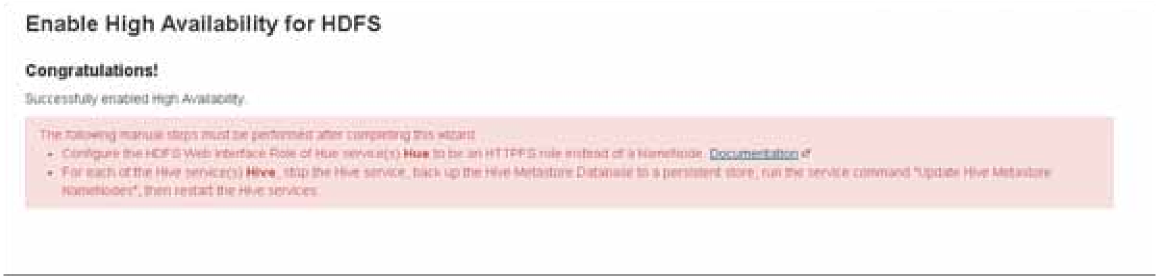
Command Progress

Completed 20 of 20 steps.

- ✓ Stop hdfs and its dependent services
  `Successfully executed command Stop on service HDFS`
- ✓ Creating roles to enable High Availability
  `Successfully added new JournalNode to HDFS on rhel1.`
- ✓ Deleting the SecondaryNameNode role. The checkpoint directories of the SecondaryNameNode will not be deleted.
  `Successfully deleted role.`
- ✓ Configuring NameNodes and the HDFS service to enable High Availability
  `Successfully updated config value.`
- ✓ Check that name directories for the new Standby NameNode either do not exist or are writable and empty. Can optionally clear directories.
  `Confirmed that directory is empty and writable by an HDFS service.`
  Details
- ✓ Check that edits directories for the nameservice either do not exist or are writable and empty. Can optionally clear directories.
  `Confirmed that directory is empty and writable by an HDFS service.`
  Details
- ✓ Initializing High Availability state in ZooKeeper
  `Successfully initialized High Availability state in ZooKeeper from failovercontroller (rhel1).`
  Details
- ✓ Starting the JournalNodes
  `Supervisor returned RUNNING`
  Details
- ✗ Formatting the name directories of the current NameNode. If the name directories are not empty, this is expected to fail.
  `Command (311) has failed`
  Details
- ✓ Initializing shared edits directory of NameNodes
  `Successfully initialized shared edits directory of the NameNode.`
  Details
- ✓ Starting the NameNode that will be transitioned to active mode namenode (rhel1).
  `Supervisor returned RUNNING`
  Details
- ✓ Waiting for the Active NameNode to start up.
  `NameNode started responding to RPCs successfully.`
  Details
- ✓ Bootstrapping Standby NameNode by initializing its name directories.
  `Successfully bootstrapped Standby NameNode namenode (rhel1).`
  Details
- ✓ Starting Standby NameNode
  `Supervisor returned RUNNING`
  Details
- ✓ Starting the Failover Controller on the host of the Active NameNode
  `Supervisor returned RUNNING`
  Details
- ✓ Starting the Failover Controller on the host of the Standby NameNode
  `Supervisor returned RUNNING`
  Details
- ✓ Waiting for the Standby NameNode to start up
  `NameNode started responding to RPCs successfully.`
  Details
- ✓ Creating HDFS /tmp directory if not already created
  `HDFS directory /tmp already exists.`
  Details
- ✓ Start hdfs and its dependent services
  `Successfully executed command Start on service Hue`
- ✓ Deploying configurations for clients of services in this cluster
  `Successfully deployed all client configurations.`
  Details

13. In the next screen additional steps are suggested by the Cloudera Manager to update the Hue and Hive metastore. Click **finish** for the screen shown below.

Note The following subsections will cover configuring Hue and Hive for HA as needed.



Enable High Availability for HDFS

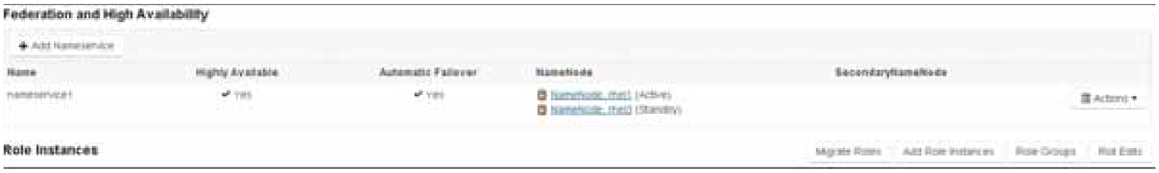
Congratulations!

Successfully enabled High Availability.

The following manual steps must be performed after completing this wizard:

- Configure the HDFS Web Interface Role of Hue service(s) **Hue** to be an HTTPFS role instead of a NameNode. Documentation
- For each of the Hive service(s) **Hive**, stop the Hive service, back up the Hive Metastore Database to a persistent store, run the service command "Update Hive Metastore NameNodes", then restart the Hive services.

14. In the Cloudera Manager, Click on **Home** > **HDFS** > **Instances** to see Namenode in High Availability.



Federation and High Availability

Name	Highly Available	Automatic Failover	NameNode	SecondaryNameNode
nameservice1	✓ Yes	✓ Yes	NameNode (rhel1) (Active) NameNode (rhel2) (Standby)	

Role Instances

Configuring Hive Metastore to Use HDFS HA

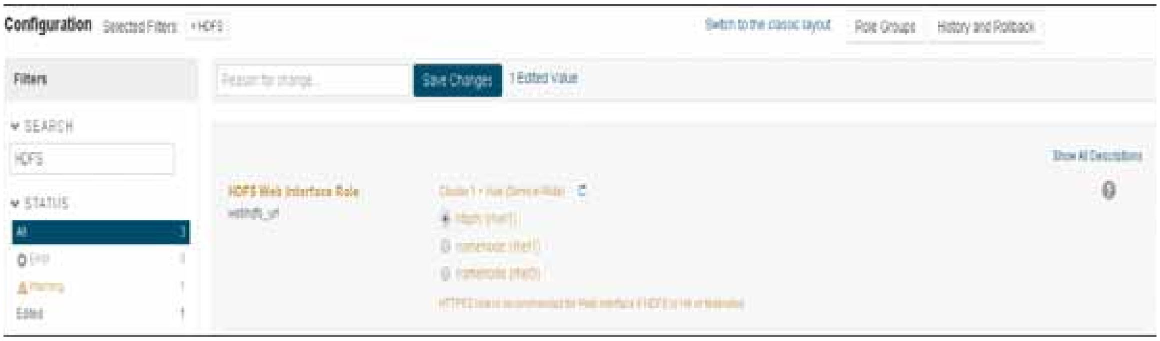
The Hive metastore can be configured to use HDFS high availability.

1. Go the Hive service.
2. Select **Actions** > **Stop**.
3. Click **Stop** to confirm the command.
4. Back up the Hive metastore database.
5. Select **Actions** > **Update Hive Metastore NameNodes** and confirm the command.
6. Select **Actions** > **Start**.
7. Restart the Hue and Impala services if stopped prior to updating the metastore.

Configuring Hue to Work with HDFS HA

1. Go to the HDFS service.
2. Click the **Instances** tab.
3. Click **Add Role Instances**.
4. Select the text box below the HttpFS field. The Select Hosts dialog displays.
5. Select the host on which to run the role and click **OK**.
6. Click **Continue**.
7. Check the checkbox next to the HttpFS role and select **Actions** for **Selected** > **Start**.

8. After the command has completed, go to the Hue service.
9. Click the **Configuration** tab.
10. Locate the HDFS Web Interface Role property or search for it by typing its name in the Search box.
11. Select the HttpFS role you just created instead of the NameNode role, and save your changes.

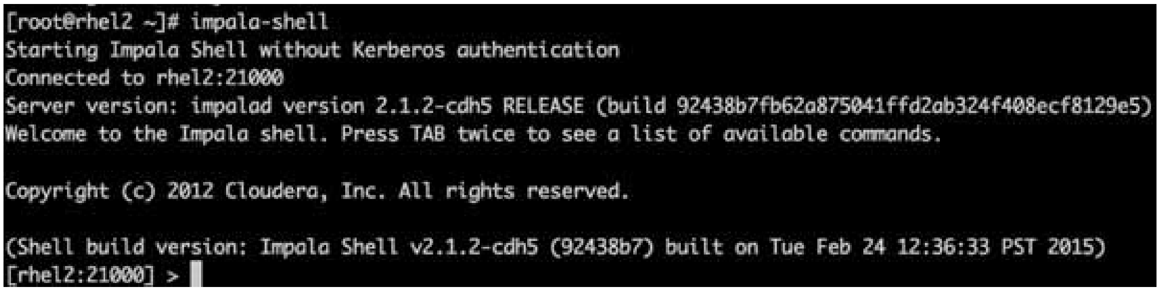


HDFS Web Interface Role
webhdfs_url
Cluster 1 > Hue (Service-Wide)
● httpfs (rhel1)
○ namenode (rhel1)
○ namenode (rhel2)

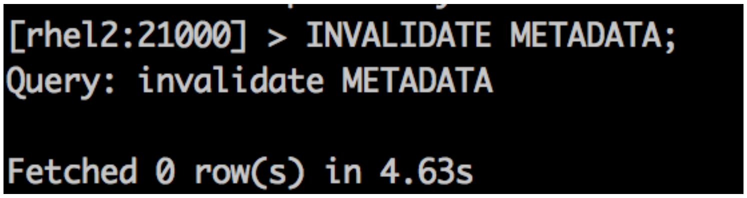
12. Restart the Hue service.

Configuring Impala to Work with HDFS HA

1. Complete the steps to reconfigure the Hive metastore database, as described in the preceding section. Impala shares the same underlying database with Hive, to manage metadata for databases, tables, and so on.
2. Log in to the admin node (rhel1) and ssh to rheI2. Run command impala-shell.
3. Issue the **INVALIDATE METADATA** statement from an Impala shell. This one-time operation makes all Impala daemons across the cluster aware of the latest settings for the Hive metastore database. Alternatively, restart the Impala service.



```
[root@rhel2 ~]# impala-shell
Starting Impala Shell without Kerberos authentication
Connected to rhel2:21000
Server version: impalad version 2.1.2-cdh5 RELEASE (build 92438b7fb62a875041ffd2ab324f408ecf8129e5)
Welcome to the Impala shell. Press TAB twice to see a list of available commands.

Copyright (c) 2012 Cloudera, Inc. All rights reserved.

(Shell build version: Impala Shell v2.1.2-cdh5 (92438b7) built on Tue Feb 24 12:36:33 PST 2015)
[rhel2:21000] >
```



```
[rhel2:21000] > INVALIDATE METADATA;
Query: invalidate METADATA

Fetched 0 row(s) in 4.63s
```

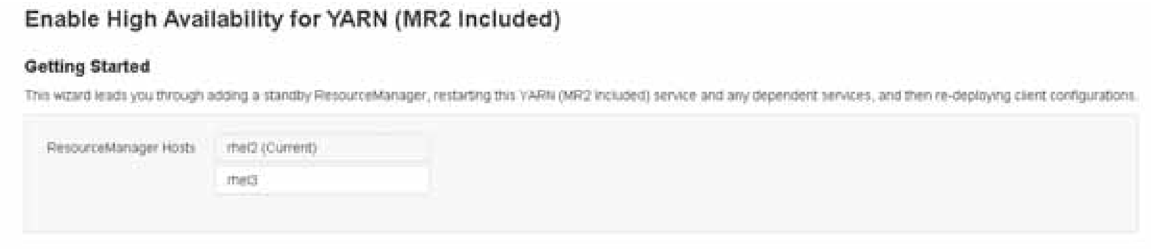
For more information, see:
http://www.cloudera.com/content/cloudera/en/documentation/core/v5-3-x/topics/impala_invalidate_metadata.html

Configuring Oozie to Use HDFS HA

To configure an Oozie workflow to use HDFS HA, use the HDFS nameservice (nameservice1) instead of the NameNode URI in the <name-node> element of the workflow.

Setting up MapReduce v2 (YARN) HA

1. Log in to the **Cloudera manager** and go to the **YARN service**.
2. Select **Actions** > **Enable High Availability**. A screen showing the hosts that are eligible to run a standby ResourceManager displays. The host where the current ResourceManager is running is not available as a choice.
3. Select the host (rhel3) where the standby ResourceManager is to be installed, and click **Continue**.



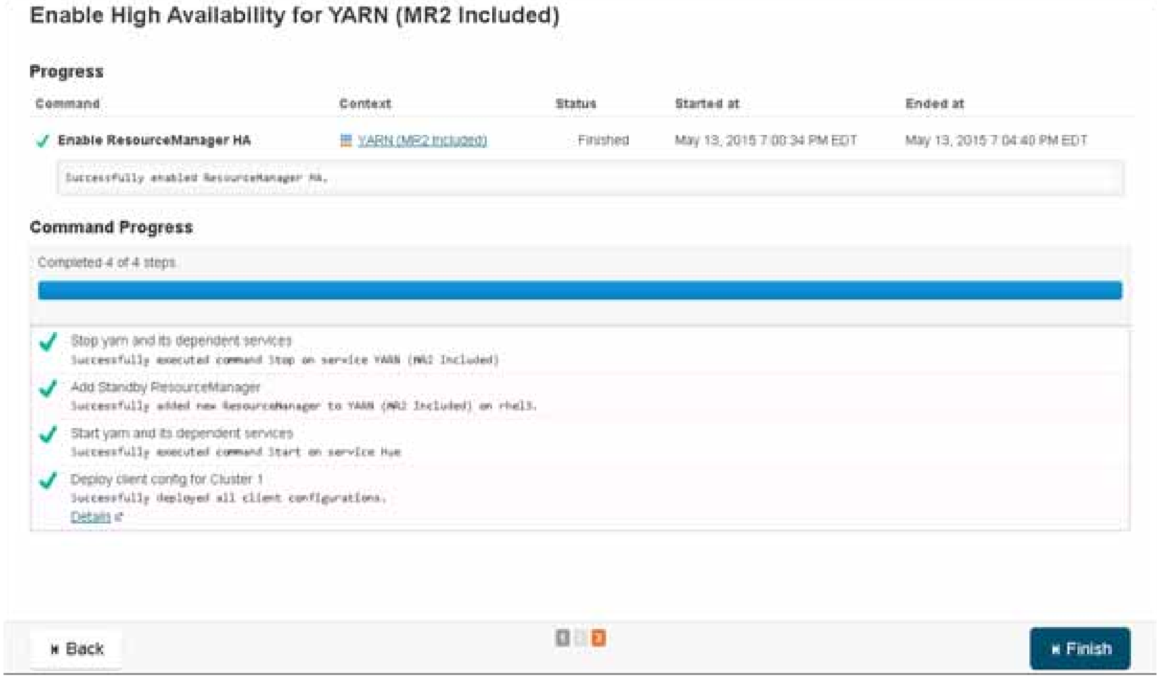
Enable High Availability for YARN (MR2 Included)

Getting Started

This wizard leads you through adding a standby ResourceManager, restarting this YARN (MR2 Included) service and any dependent services, and then re-deploying client configurations.

ResourceManager Hosts: rhel2 (Current)
rhel3

4. Cloudera Manager proceeds to execute a set of commands that stop the YARN service, add a standby ResourceManager, initialize the ResourceManager high availability state in ZooKeeper, restart YARN, and redeploy the relevant client configurations.



Enable High Availability for YARN (MR2 Included)

Progress

Command	Context	Status	Started at	Ended at
✓ Enable ResourceManager HA	YARN (MR2 Included)	Finished	May 13, 2015 7:00:34 PM EDT	May 13, 2015 7:04:40 PM EDT

```
Successfully enabled ResourceManager HA.
```

Command Progress

Completed 4 of 4 steps.

✓ Stop yarn and its dependent services

```
Successfully executed command Stop on service YARN (MR2 Included)
```

✓ Add Standby ResourceManager

```
Successfully added new ResourceManager to YARN (MR2 Included) on rhel3.
```

✓ Start yarn and its dependent services

```
Successfully executed command Start on service Hue
```

✓ Deploy client config for Cluster 1

```
Successfully deployed all client configurations.
```

Details

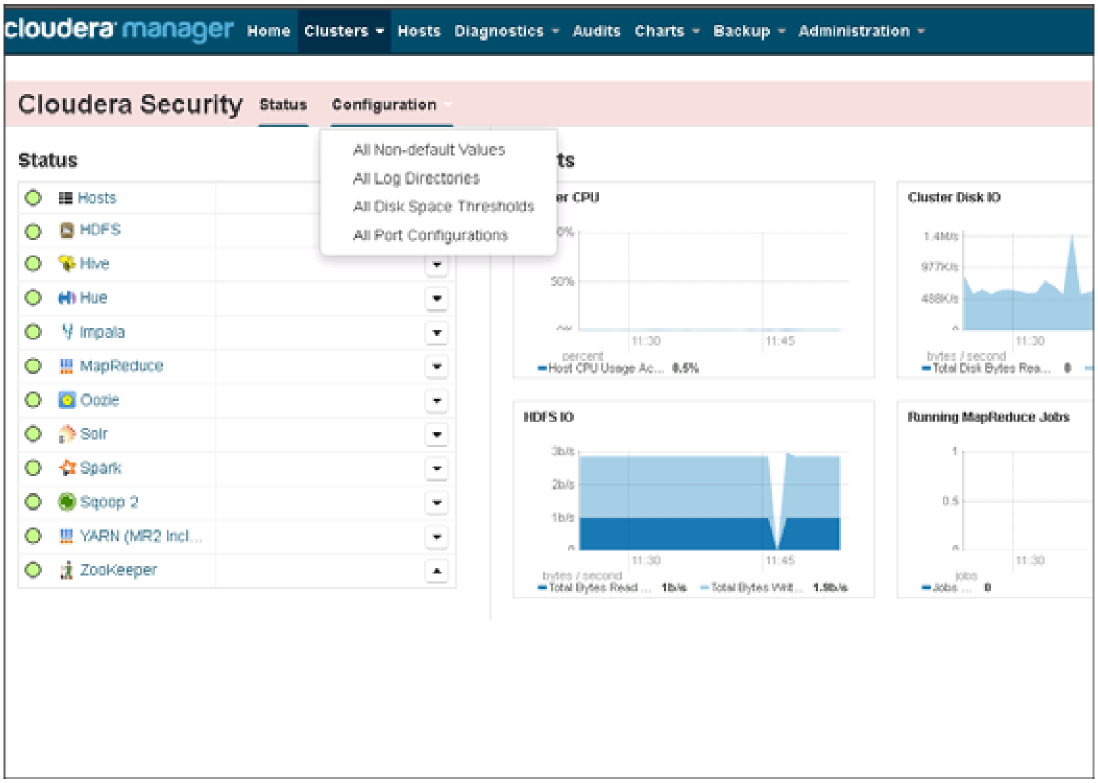
5. Click **Finish** once the installation is completed successfully.

Changing the log directory

To change the default log from the /var prefix to /data/disk1, follow these steps:

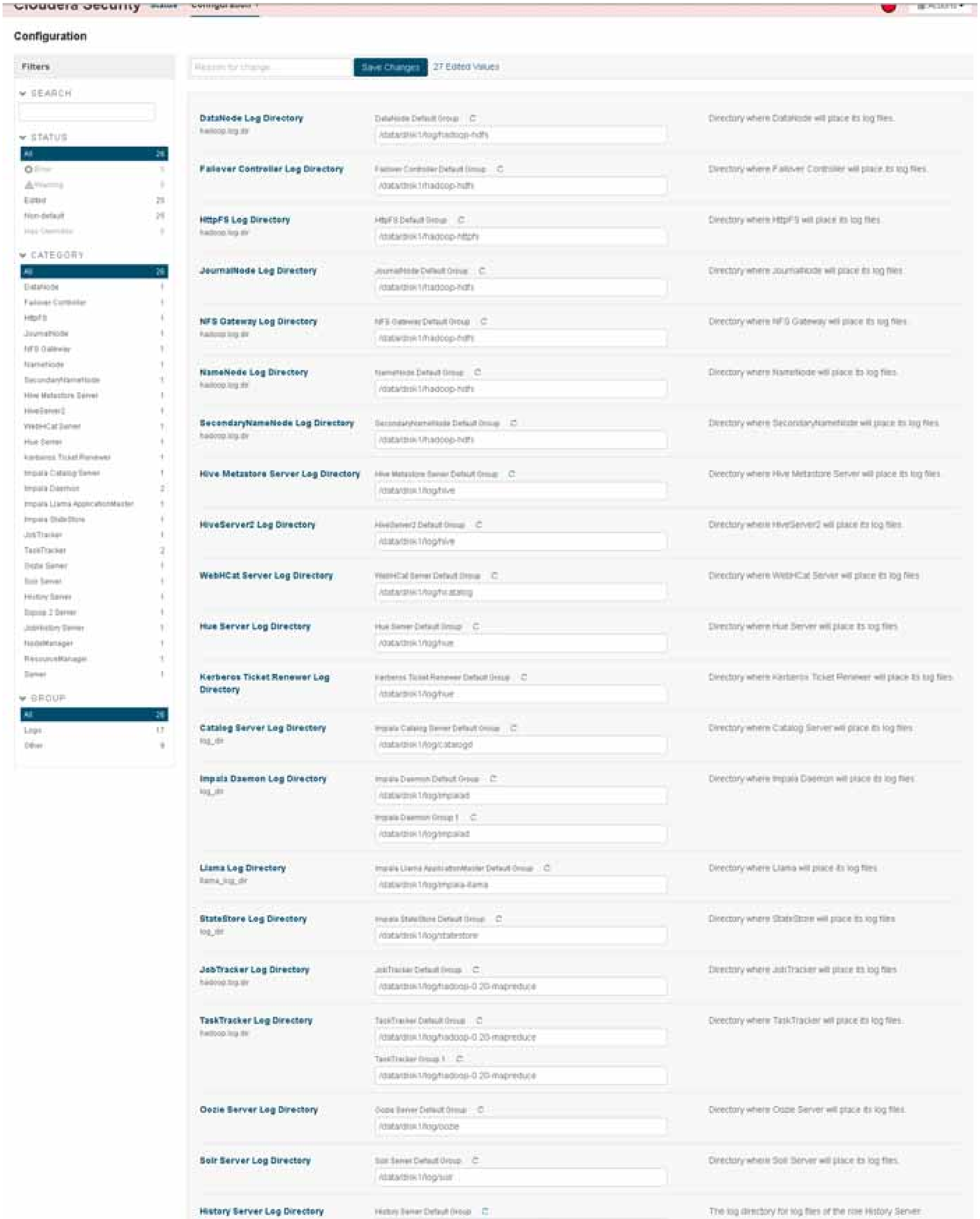
1. Log into the cloudera home page and click **Clusters**.
2. From the configuration drop-down menu select “All Log Directories”.

Figure 185 Changing Log Directory



3. Change the path of the log directory to /data/disk1/log/<service-name> as shown in the fig below.

Figure 186 Change Path of the Log Directory - Part1



DataNode Log Directory
hadoop.log.dir
DataNode Default Group
/data/disk1/log/hadoop-hdfs
Directory where DataNode will place its log files.

Failover Controller Log Directory
Failover Controller Default Group
/data/disk1/hadoop-hdfs
Directory where Failover Controller will place its log files.

HttpFS Log Directory
hadoop.log.dir
HttpFS Default Group
/data/disk1/hadoop-httpfs
Directory where HttpFS will place its log files.

JournalNode Log Directory
JournalNode Default Group
/data/disk1/hadoop-hdfs
Directory where JournalNode will place its log files.

NFS Gateway Log Directory
hadoop.log.dir
NFS Gateway Default Group
/data/disk1/hadoop-hdfs
Directory where NFS Gateway will place its log files.

NameNode Log Directory
hadoop.log.dir
NameNode Default Group
/data/disk1/hadoop-hdfs
Directory where NameNode will place its log files.

SecondaryNameNode Log Directory
hadoop.log.dir
SecondaryNameNode Default Group
/data/disk1/hadoop-hdfs
Directory where SecondaryNameNode will place its log files.

Hive Metastore Server Log Directory
Hive Metastore Server Default Group
/data/disk1/log/hive
Directory where Hive Metastore Server will place its log files.

HiveServer2 Log Directory
HiveServer2 Default Group
/data/disk1/log/hive
Directory where HiveServer2 will place its log files.

WebHCat Server Log Directory
WebHCat Server Default Group
/data/disk1/log/hcatalog
Directory where WebHCat Server will place its log files.

Hue Server Log Directory
Hue Server Default Group
/data/disk1/log/hue
Directory where Hue Server will place its log files.

Kerberos Ticket Renewer Log Directory
Kerberos Ticket Renewer Default Group
/data/disk1/log/hue
Directory where Kerberos Ticket Renewer will place its log files.

Catalog Server Log Directory
log_dir
Impala Catalog Server Default Group
/data/disk1/log/catalogd
Directory where Catalog Server will place its log files.

Impala Daemon Log Directory
log_dir
Impala Daemon Default Group
/data/disk1/log/impalad
Impala Daemon Group 1
/data/disk1/log/impalad
Directory where Impala Daemon will place its log files.

Llama Log Directory
llama_log_dir
Impala Llama ApplicationMaster Default Group
/data/disk1/log/impala-llama
Directory where Llama will place its log files.

StateStore Log Directory
log_dir
Impala StateStore Default Group
/data/disk1/log/statestore
Directory where StateStore will place its log files.

JobTracker Log Directory
hadoop.log.dir
JobTracker Default Group
/data/disk1/log/hadoop-0.20-mapreduce
Directory where JobTracker will place its log files.

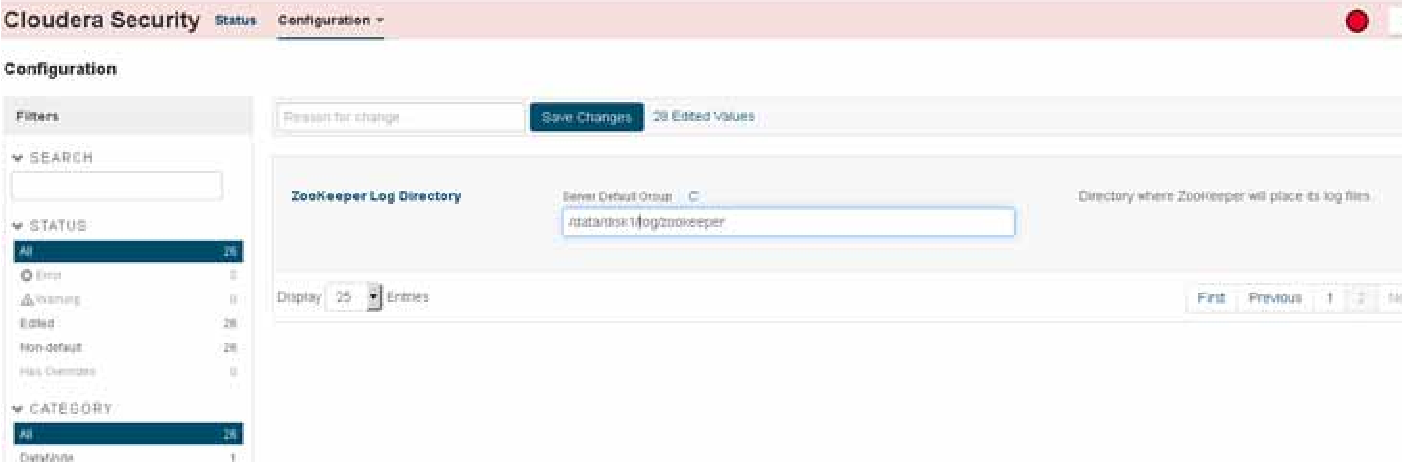
TaskTracker Log Directory
hadoop.log.dir
TaskTracker Default Group
/data/disk1/log/hadoop-0.20-mapreduce
TaskTracker Group 1
/data/disk1/log/hadoop-0.20-mapreduce
Directory where TaskTracker will place its log files.

Oozie Server Log Directory
Oozie Server Default Group
/data/disk1/log/oozie
Directory where Oozie Server will place its log files.

Solr Server Log Directory
Solr Server Default Group
/data/disk1/log/solr
Directory where Solr Server will place its log files.

History Server Log Directory
History Server Default Group
The log directory for log files of the role History Server.

Figure 187 Directory Path for Log File



ZooKeeper Log Directory

Server Default Group: /data/disk1/log/zookeeper

Directory where ZooKeeper will place its log files.

4. Click **Save Changes**.

Conclusion

Hadoop has become a popular data management across all verticals. Cisco UCS Integrated Infrastructure for Big Data and Cisco Application Centric Infrastructure (ACI) along with Cloudera offers a dependable deployment model for enterprise Hadoop that offer a fast and predictable path for businesses to unlock value in big data. This architecture allows using the UCS Manager capabilities in FI for provisioning the servers within a single domain while interconnecting multiple Fabric Interconnect domains with ACI.

The configuration detailed in the document can be extended to clusters of various sizes depending on what application demands as discussed in the Scalability section. Next generation Big Data Infrastructure needs to cater to the emerging trends in Big Data Applications to meet multiple Lines of Business (LOB) SLAs. Cisco UCS Integrated Infrastructure for Big Data and Cisco ACI brings numerous advantages to a Big Data cluster – fewer point of management for the network, enhanced performance, superior failure handling characteristics, unprecedented scalability. Further, ACI paves way to the next generation data center network accelerating innovation with its SDN capabilities in the Big Data space.

Bill of Materials

This section gives the BOM for the 160 node Performance optimized Cluster. See Table 14 for BOM for the master rack, Table 15 for the expansion rack, Table 16 and 17 for software components and Table 18 for Nexus 9k and APIC.

Table 14 Bill of Materials for C240M4SX Base Rack

Part Number	Description	Quantity
UCS-SL-CPA3-P	Performance Optimized Cluster	1
UCSC-C240-M4SX	UCS C240 M4 SFF 24 HD w/o CPU, mem, HD, PCIe, PS, railkt w/expndr	16

Table 14 ***Bill of Materials for C240M4SX Base Rack***

Part Number	Description	Quantity
UCSC-MRAID12G	Cisco 12G SAS Modular Raid Controller	16
UCSC-MRAID12G-2GB	Cisco 12Gbps SAS 2GB FBWC Cache module (Raid 0/1/5/6)	16
UCSC-MLOM-CSC-02	Cisco UCS VIC1227 VIC MLOM - Dual Port 10Gb SFP+	16
CAB-9K12A-NA	Power Cord 125VAC 13A NEMA 5-15 Plug North America	32
UCSC-PSU2V2-1200W	1200W V2 AC Power Supply for 2U C-Series Servers	32
UCSC-RAILB-M4	Ball Bearing Rail Kit for C220 M4 and C240 M4 rack servers	16
UCSC-HS-C240M4	Heat Sink for UCS C240 M4 Rack Server	32
UCSC-SCCBL240	Supercap cable 250mm	16
UCS-CPU-E52680D	2.50 GHz E5-2680 v3/120W 12C/30MB Cache/DDR4 2133MHz	32
UCS-MR-1X162RU-A	16GB DDR4-2133-MHz RDIMM/PC4-17000/dual rank/x4/1.2v	256
UCS-HD12T10KS2-E	1.2 TB 6G SAS 10K rpm SFF HDD	384
UCS-SD120G0KSB-EV	120 GB 2.5 inch Enterprise Value 6G SATA SSD (BOOT)	32
UCSC-PCI-1C-240M4	Right PCI Riser Bd (Riser 1) 2onbd SATA bootdrvs+ 2PCI slts	16
UCS-FI-6296UP-UPG	UCS 6296UP 2RU Fabric Int/No PSU/48 UP/ 18p LIC	2
CON-SNTP-FI6296UP	SMARTNET 24X7X4 UCS 6296UP 2RU Fabric Int/2 PSU/4 Fans	2
SFP-H10GB-CU3M	10GBASE-CU SFP+ Cable 3 Meter	60
UCS-ACC-6296UP	UCS 6296UP Chassis Accessory Kit	2
UCS-PSU-6296UP-AC	UCS 6296UP Power Supply/100-240VAC	4
N10-MGT012	UCS Manager v2.2	2
UCS-L-6200-10G-C	2rd Gen FI License to connect C-direct only	108
UCS-BLKE-6200	UCS 6200 Series Expansion Module Blank	6
UCS 6296UP Fan Module	UCS 6296UP Fan Module	8
CAB-9K12A-NA	Power Cord 125VAC 13A NEMA 5-15 Plug North America	4
UCS-FI-E16UP	UCS 6200 16-port Expansion module/16 UP/ 8p LIC	6
RACK-UCS2	Cisco R42610 standard rack w/side panels	1

Table 14 ***Bill of Materials for C240M4SX Base Rack***

Part Number	Description	Quantity
RP208-30-1P-U-2=	Cisco RP208-30-U-2 Single Phase PDU 20x C13 4x C19 (Country Specific)	2
CON-UCW3-RPDUX	UC PLUS 24X7X4 Cisco RP208-30-U-X Single Phase PDU 2x (Country Specific)	6

Table 15 ***Bill of Materials for C240M4SX Expansion Rack***

Part Number	Description	Quantity
UCSC-C240-M4SX	UCS C240 M4 SFF 24 HD w/o CPU, mem, HD, PCIe, PS, railkt w/expndr	64
UCSC-MRAID12G	Cisco 12G SAS Modular Raid Controller	64
UCSC-MRAID12G-2GB	Cisco 12Gbps SAS 2GB FBWC Cache module (Raid 0/1/5/6)	64
UCSC-MLOM-CSC-02	Cisco UCS VIC1227 VIC MLOM - Dual Port 10Gb SFP+	64
CAB-9K12A-NA	Power Cord 125VAC 13A NEMA 5-15 Plug North America	128
UCSC-PSU2V2-1200W	1200W V2 AC Power Supply for 2U C-Series Servers	128
UCSC-RAILB-M4	Ball Bearing Rail Kit for C220 M4 and C240 M4 rack servers	64
UCSC-HS-C240M4	Heat Sink for UCS C240 M4 Rack Server	128
UCSC-SCCBL240	Supercap cable 250mm	64
UCS-CPU-E52680D	2.50 GHz E5-2680 v3/120W 12C/30MB Cache/DDR4 2133MHz	128
UCS-MR-1X162RU-A	16GB DDR4-2133-MHz RDIMM/PC4-17000/dual rank/x4/1.2v	1024
UCS-HD12T10KS2-E	1.2 TB 6G SAS 10K rpm SFF HDD	1536
UCS-SD120G0KSB-EV	120 GB 2.5 inch Enterprise Value 6G SATA SSD (BOOT)	128
UCSC-PCI-1C-240M4	Right PCI Riser Bd (Riser 1) 2onbd SATA bootdrvs+ 2PCI slts	64

Note If using 6 TB drives for C3160, use the following PID instead of 4TB drives.

SFP-H10GB-CU5M=	10GBASE-CU SFP+ Cable 5 Meter	128
RACK-UCS2	Cisco R42610 standard rack w/side panels	4

RP208-30-1P-U-2=	Cisco RP208-30-U-2 Single Phase PDU 20x C13 4x C19 (Country Specific)	8
CON-UCW3-RPDUX	UC PLUS 24X7X4 Cisco RP208-30-U-X Single Phase PDU 2x (Country Specific)	24

Table 16 Red Hat Enterprise Linux License

Red Hat Enterprise Linux		
RHEL-2S-1G-3A	Red Hat Enterprise Linux	160
CON-ISV1-RH2S1G3A	3 year Support for Red Hat Enterprise Linux	160

Table 17 Cloudera License

Note Choose one of the part numbers.

Part Number	**Description**	**Quantity**
UCS-BD-CEBN=	Cloudera Enterprise Basic Edition	160
UCS-BD-CEFN=	Cloudera Enterprise Flex Edition	160
UCS-BD-CEDN=	Cloudera Enterprise Data Hub Edition	160

Table 18 Bill of Materials for Nexus Device and APIC

Part Number	**Description**	**Quantity**
N9K-C9508-B2	Nexus 9508 Chassis Bundle with 1 Sup, 3 PS, 2 SC, 6 FM, 3 FT	2
N9K-C9396PX	Nexus 9300 with 48p 1/10G SFP+ and 1 uplink module slot	2
N9k-X9736PQ	Spine Line-Card	2
APIC-L1	APIC Appliance	3
N9K POWERCABLES	Power Cables	3
CAB-C13-C14-AC	Power cord, C13 to C14 (recessed receptacle), 10A	4
QSFP-H40G-CU3M	40GBASE-CR4 Passive Copper Cable, 3m	24
N9K-M12PQ	ACI Uplink Module for Nexus 9300, 12p 40G QSFP	3
N9K-C9500-RMK	Nexus 9500 Rack Mount Kit	2
CAB-C19-CBN	Cabinet Jumper Power Cord, 250 VAC 16A, C20-C19 Connectors	6
N9K-C9500-LC-CV	Nexus 9500 Linecard slot cover	16
N9K-C9500-SUP-CV	Nexus 9500 Supervisor slot cover	2

Table 18 Bill of Materials for Nexus Device and APIC

N9K-PAC-3000W-B	Nexus 9500 3000W AC PS, Port-side Intake	6
N9K-SUP-A	Supervisor for Nexus 9500	2
N9K-SC-A	System Controller for Nexus 9500	4
N9K FABRIC	Fabric Module	2
N9300 RACK	Rack Mount Kit	3
N9K-C9300-RMK	Nexus 9300 Rack Mount Kit	3

Appendix A

Troubleshooting

Troubleshooting Sqoop2 process startup

In case Sqoop2 service doesn’t startup due to error “Unable to create database”, while cluster setup stage, do the following:

Note This step is not needed if Sqoop2 service comes up fine.

1. Form the node connected to the internet download and Copy derby from Apache Derby.

```
wget
http://apache.mirrors.pair.com//db/derby/db-derby-10.11.1.1/db-derby-10.11.1.1-bin.zip
```

2. Copy to Admin node (rhel1) and unzip the file.

```
scp db-derby-10.11.1.1-bin.zip rhel1:/root/
unzip db-derby-10.11.1.1-bin.zip
```

3. Copy derby.jar and derbyclient.jar to /var/lib/sqoop2/ on Admin Node (rhel1).

```
cd db-derby-10.11.1.1-bin/lib/
cp derby.jar /var/lib/sqoop2/
cp derbyclient.jar /var/lib/sqoop2/
```

4. Copy derby.jar and derbyclient.jar to /var/lib/sqoop2/ on all Nodes.

```
cd /var/lib/sqoop2/

# ls
derbyclient.jar  derby.jar  mysql-connector-java.jar  postgresql-9.0-801.jdbc4.jar
tomcat-deployment

clush -a -b -c derby*
clush -a -b ls /var/lib/sqoop2/
```

5. Change the link to derby.jar and derbyclient.jar in parcels.

```
clush -a -b rm  -f
/opt/cloudera/parcels/CDH-5.3.2-1.cdh5.3.2.p0.10/lib/sqoop2/webapps/sqoop/WEB-INF/lib/
derby-10.8.2.2.jar
```

```
clush -a -b ln -s /var/lib/sqoop2/derby.jar
/opt/cloudera/parcels/CDH-5.3.2-1.cdh5.3.2.p0.10/lib/sqoop2/webapps/sqoop/WEB-INF/lib/
derby-10.8.2.2.jar

clush -a -b ls -l
/opt/cloudera/parcels/CDH-5.3.2-1.cdh5.3.2.p0.10/lib/sqoop2/webapps/sqoop/WEB-INF/lib/
derby-10.8.2.2.jar
```

6. Retry cluster setup operation.

Appendix

Cisco UCS Director Express for Big Data

Introduction

Hadoop has become a strategic data platform embraced by mainstream enterprises as it offers the fastest path for businesses to unlock value in big data while maximizing existing investments.

As you consider Hadoop to meet your growing data and business needs, operational challenges often emerge. Despite its compelling advantages, Hadoop clusters can be difficult, complex, and time consuming to deploy. Moreover, with so much data increasing so quickly, there is a need to find ways to consistently deploy Hadoop clusters and manage them efficiently.

Note The UCSD Express appliances (UCSD Express VM and Baremetal Agent VM) can also be installed on an existing VMware ESXi server with proper network connectivity (See Figure 174) to the UCS domain that manages the Hadoop servers. In such a case, skip the sections until Downloading the UCS Director Express software components.

UCS Director Express for Big Data

Cisco UCS Director Express for Big Data provides a single-touch solution that automates deployment of Hadoop on Cisco UCS Common Platform Architecture (CPA) for Big Data infrastructure. It also provides a single management pane across both Cisco UCS integrated infrastructure and Hadoop software. All elements of the infrastructure are handled automatically with little need for user input. Through this approach, configuration of physical computing, internal storage, and networking infrastructure is integrated with the deployment of operating systems, Java packages, and Hadoop along with the provisioning of Hadoop services. Cisco UCS Director Express for Big Data is integrated with major Hadoop distributions from Cloudera, MapR, and Hortonworks, providing single-pane management across the entire infrastructure. It complements and communicates with Hadoop managers, providing a system wide perspective and enabling administrators to correlate Hadoop activity with network and computing activity on individual Hadoop nodes.

Key features of UCS Director (UCSD) Express for Big Data

- **Faster and Easier Big Data Infrastructure Deployment:** Cisco UCS Director Express for Big Data extends the Cisco UCS Integrated Infrastructure for Big Data with one-click provisioning, installation, and configuration, delivering a consistent, repeatable, flexible, and reliable end-to-end Hadoop deployment.
- **Massive Scalability and Performance:** Cisco's unique approach provides appliance-like capabilities for Hadoop with flexibility that helps ensure that resources are deployed right the first time and can scale without arbitrary limitations.
- **Centralized Visibility:** Cisco UCS Director Express for Big Data provides centralized visibility into the complete infrastructure to identify potential failures and latent threats before they affect application and business performance.
- **Open and Powerful:** Provides open interfaces that allows further integration into third-party tools and services while allowing flexibility for your own add-on services.

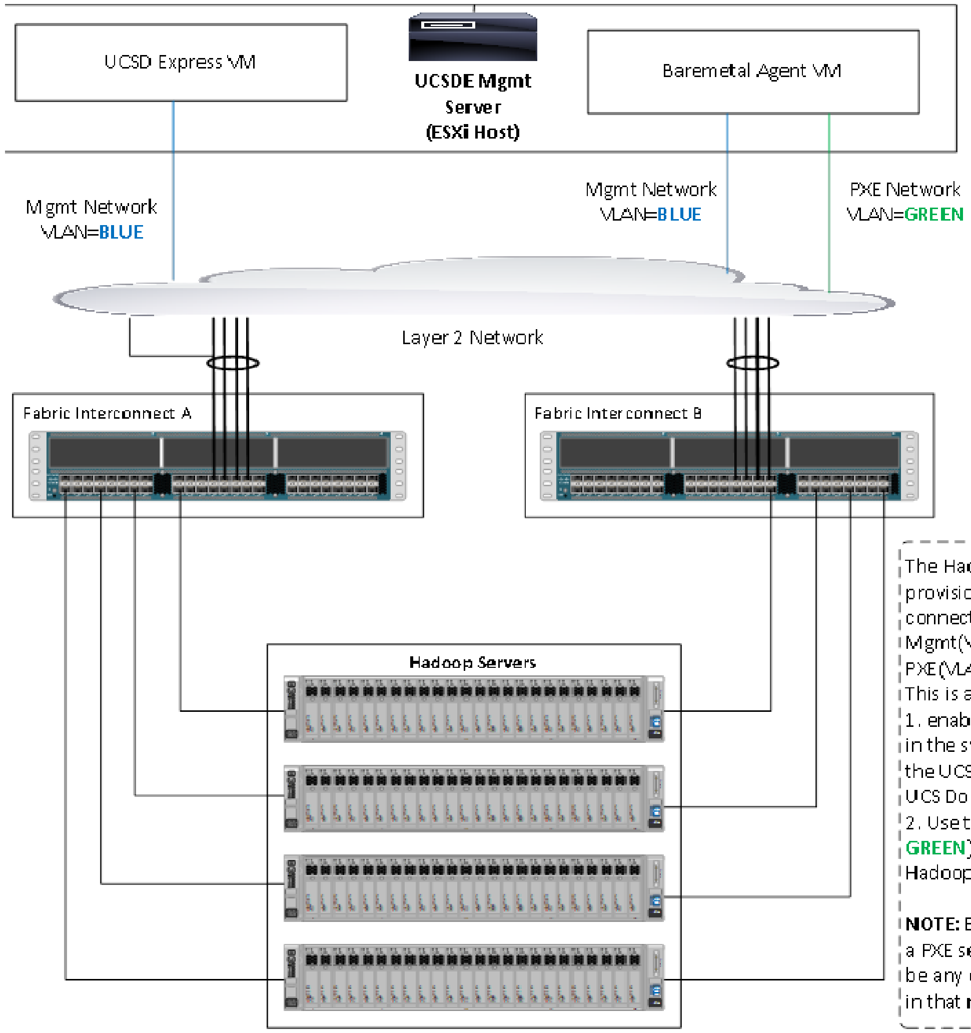
UCSD Express Management Server Configuration

The basic requirement for deploying and executing the UCSD Express software is a server with VMWare ESXi based virtualization environment. Such a physical server machine with ESXi must be connected to the target Hadoop servers in the UCS domain by means of the management network and a dedicated PXE network.

The following are the potential network topologies:

1. The UCSD Express Management server is outside of the UCS Domain containing the C-Series servers that would be used to form the Hadoop cluster. For example, a standalone (CIMC managed) C220 M4 rack server provisioned with UCSD Express VMs is connected to the UCS Domain

Figure 188 UCSD Express Management Server that lives outside the UCS Domain

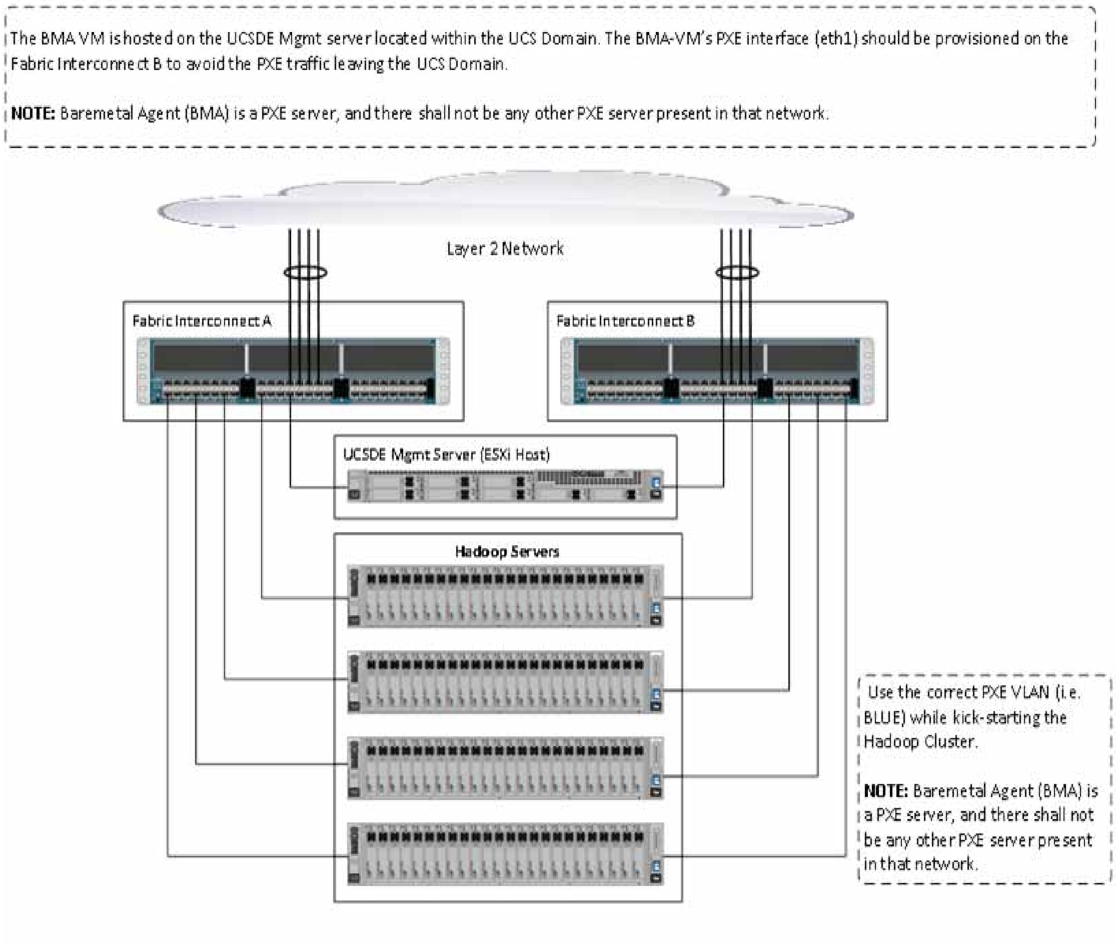


The Hadoop Servers must be provisioned with the Layer 2 connectivity to both the Mgmt(VLAN=**BLUE**) and PXE(VLAN=**GREEN**) networks. This is accomplished by
1. enabling the respective VLANs in the switches interconnecting the UCSD Express Server and the UCS Domain.
2. Use the correct PXE VLAN (i.e. **GREEN**) while kick-starting the Hadoop Cluster.

NOTE: Baremetal Agent (BMA) is a PXE server, and there shall not be any other PXE server present in that network.

2. The UCSD Express Management server is hosted on a C220 M4 rack server that is connected to and managed by the same UCS Domain. This is the method used in this document.

Figure 189 UCSD Express Management Server that is being managed as part of the same UCS Domain



The BMA VM is hosted on the UCSDE Mgmt server located within the UCS Domain. The BMA-VM's PXE interface (eth1) should be provisioned on the Fabric Interconnect B to avoid the PXE traffic leaving the UCS Domain.

NOTE: Baremetal Agent (BMA) is a PXE server, and there shall not be any other PXE server present in that network.

Use the correct PXE VLAN (i.e. BLUE) while kick-starting the Hadoop Cluster.

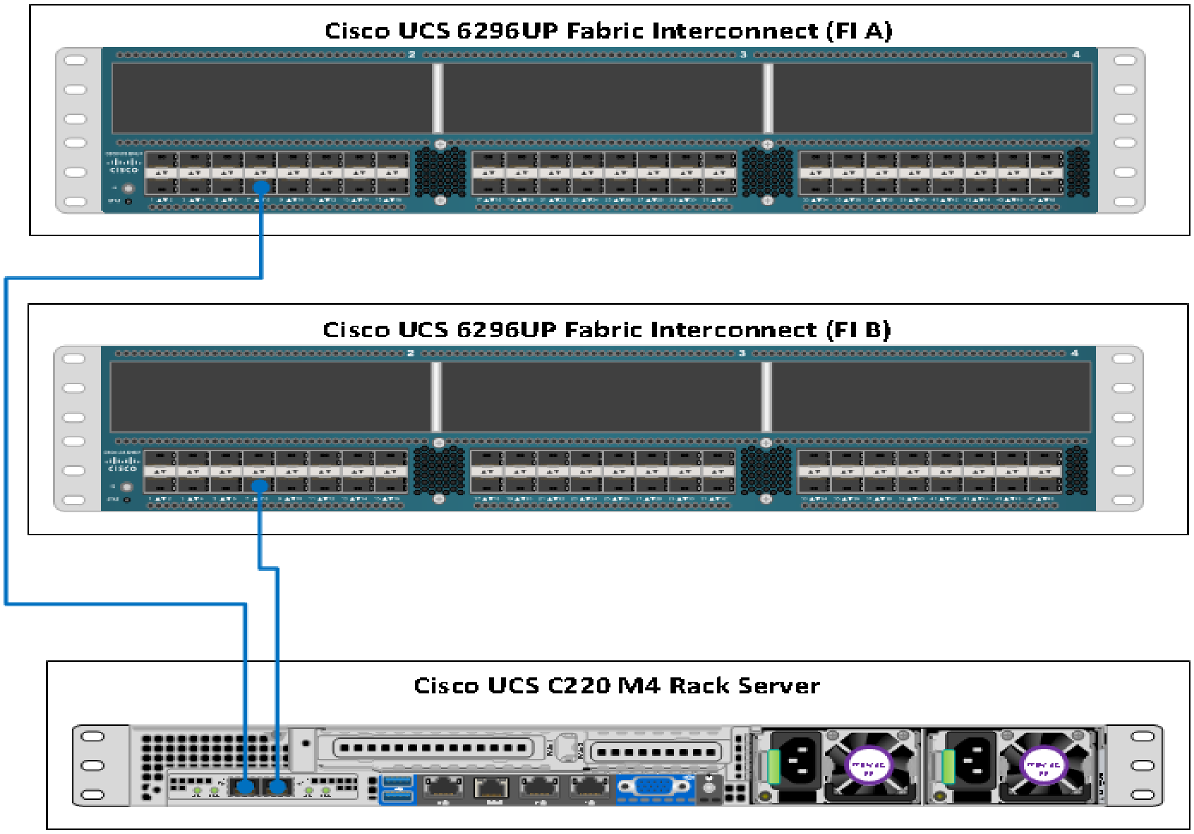
NOTE: Baremetal Agent (BMA) is a PXE server, and there shall not be any other PXE server present in that network.

UCSD Management Server Cabling

For this deployment a C220 M4 rack server equipped with Intel Xeon E5-2620 v3 processors, 128 GB of memory, Cisco UCS Virtual Interface Card 1227, Cisco 12-Gbps SAS Modular Raid Controller with 512-MB FBWC, 4 X 600 GB 10K SFF SAS drives is used (any other Cisco UCS server can also be used for this purpose).

The C220 M4 server shall be connected to the UCS Fabric Interconnects as shown in Figure 188. The ports on the on the Fabric Interconnects must be configured as server ports.

Figure 190 Fabric Topology for C220 M4


Cisco UCS 6296UP Fabric Interconnect (FI A)
Cisco UCS 6296UP Fabric Interconnect (FI B)
Cisco UCS C220 M4 Rack Server

Software Versions

The UCSD management server is a C220 M4 server that is managed by the UCS Manager. Refer to the software information section in the main part of this Cisco UCS Integrated Infrastructure for Big Data with Hortonworks. See Software Distributions and Versions. In addition, the following software distributions are necessary.

UCS Director Express for Big Data (1.1)

For more information visit http://www.cisco.com/c/en/us/support/servers-unified-computing/ucs-director-express-big-data-1-1/model.html

VMware vSphere 5.5

UCS Director express requires the VMware vSphere 5.5 hypervisor. For more information see http://www.vmware.com

Fabric Configuration

The UCSD management server is a C220 M4 server that is managed by the UCS Manager. Refer to the Fabric Configuration section in the main part of this document for more details.

Configuring VLANs

UCSD Express management server requires two network interfaces. It's service profile need to be

- Management Network – default (VLAN 1)
- PXE Network

Table 19 UCSD Express Management Server vNIC configurations

VLAN	Fabric	NIC Port	Function	Failover
default(VLAN1)	A	eth0	Management, User connectivity	Fabric Failover to B
vlan85_PXE	B	eth1	PXE	Fabric Failover to A

PXE VLAN dedicated for PXE booting purpose. Follow these steps in Configuring VLANs to create a dedicated VLAN for PXE. The management network shall continue to be on the default VLAN.

Other UCS configurations

Perform all other UCS configurations such as QOS policy, necessary policies and service profile template by following the documentation above. See the section Creating Pools for Service Profile Templates onwards in this Cisco UCS Integrated Infrastructure for Big Data with Hortonworks cisco validated design.

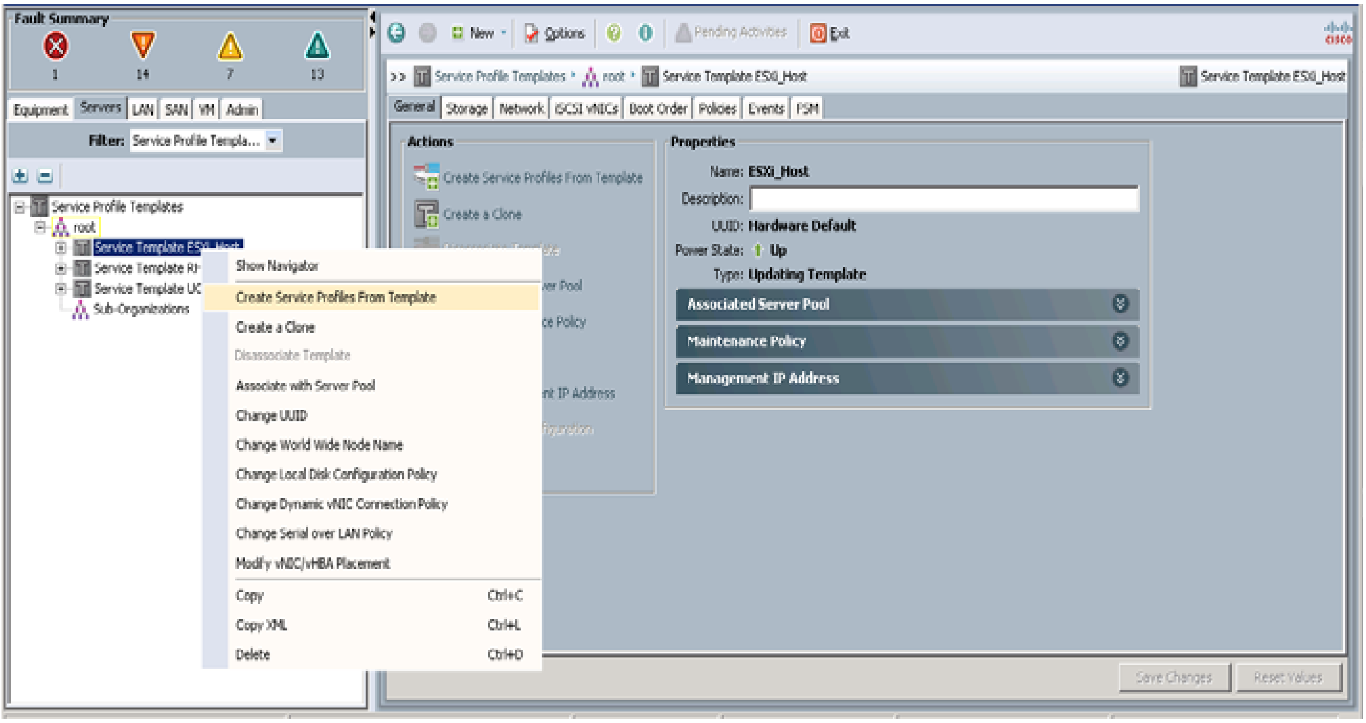
Note Create the service profile template named as ESXi_Host with two vNICs as shown in the above table. For vNIC eth0, select default VLAN as the native VLAN, and for vNIC eth1, select PXE VLAN (vlan85_PXE) as the native VLAN.

Creating Service Profile from the Template

Select the Servers tab in the left pane of the UCS Manager GUI.

1. Go to Service Profile **Templates > root**.
2. Right-click **Service Profile Templates ESXi_Host**.
3. Select **Create Service Profiles From Template**.

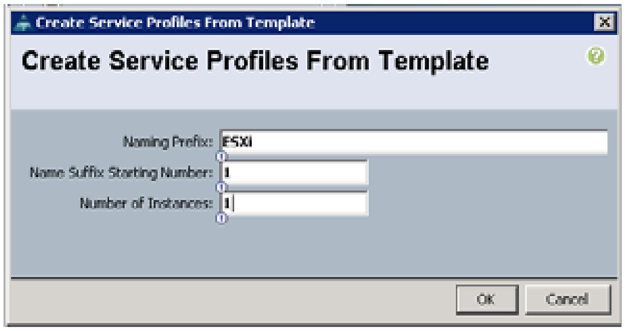
Figure 191 Creating Service Profiles from Template


Fault Summary
1
14
7
13
Equipment
Servers
LAN
SAN
VM
Admin
Filter: Service Profile Templa...
Service Profile Templates
root
Service Template ESXi_Host
Service Template RH
Service Template UC
Sub-Organizations
Show Navigator
Create Service Profiles From Template
Create a Clone
Disassociate Template
Associate with Server Pool
Change UUID
Change World Wide Node Name
Change Local Disk Configuration Policy
Change Dynamic vNIC Connection Policy
Change Serial over LAN Policy
Modify vNIC/vHBA Placement
Copy Ctrl+C
Copy XML Ctrl+L
Delete Ctrl+D
New
Options
Pending Activities
Exit
>> Service Profile Templates > root > Service Template ESXi_Host
Service Template ESXi_Host
General
Storage
Network
iSCSI vNICs
Boot Order
Policies
Events
FSM
Actions
Create Service Profiles From Template
Create a Clone
Properties
Associated Server Pool
Maintenance Policy
Management IP Address
Save Changes
Reset Values

Name: ESXi_Host
Description:
UUID: Hardware Default
Power State: Up
Type: Updating Template

4. The Create Service Profile from Template window appears.

Figure 192 Selecting Name and Total number of Service Profiles


Create Service Profiles From Template
Create Service Profiles From Template
OK
Cancel

Naming Prefix: ESXi
Name Suffix Starting Number: 1
Number of Instances: 1

Association of the Service Profiles will take place automatically.

Installing VMware vSphere ESXi 5.5

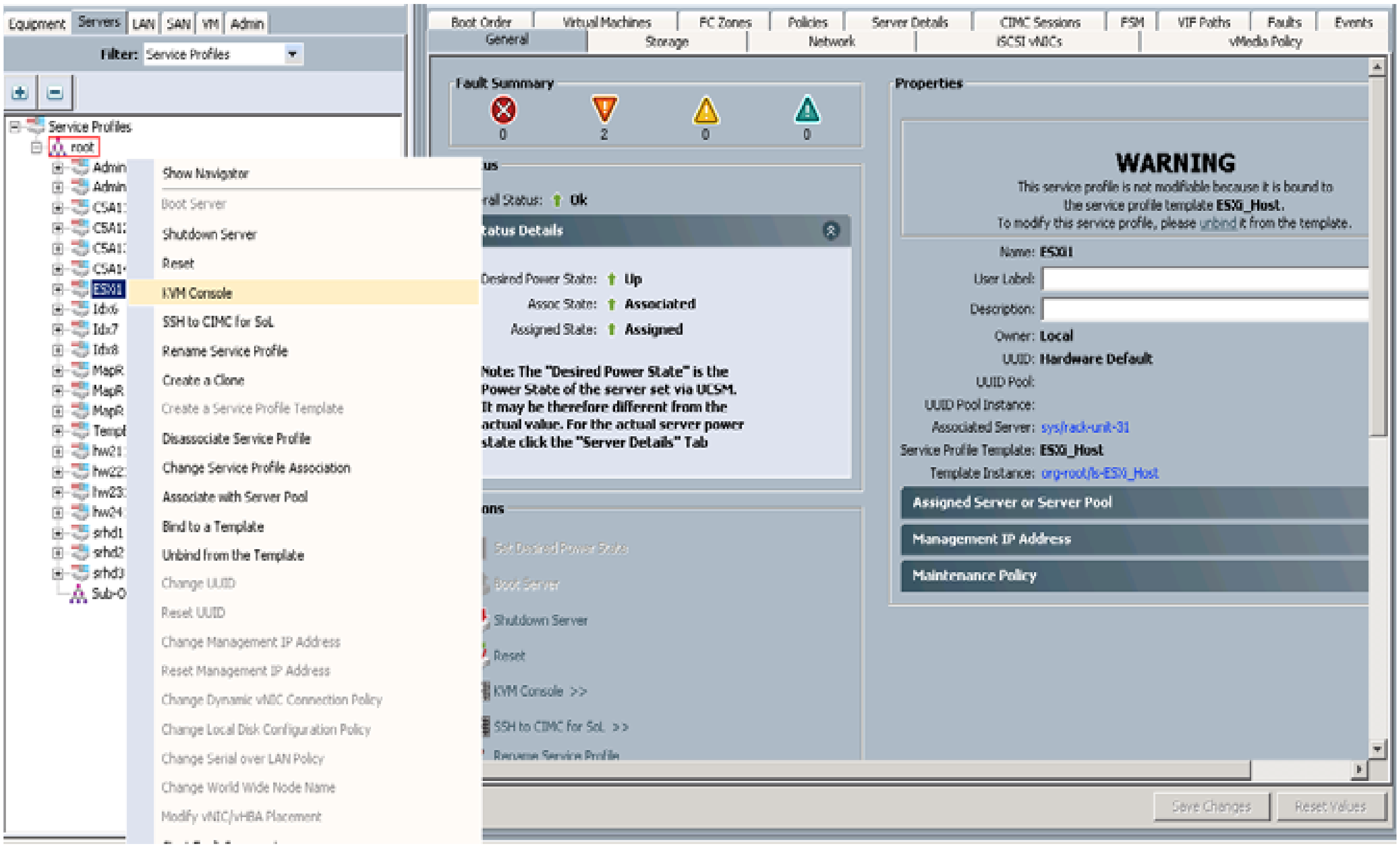
The following section provides detailed procedures for installing VMware vSphere ESXi 5.5.

There are multiple methods to install VMware vSphere ESXi 5.5. The installation procedure described in this deployment guide uses KVM console and virtual media from Cisco UCS Manager.

1. Log in to the Cisco UCS 6296 Fabric Interconnect and launch the Cisco UCS Manager application.

2. Select the **Servers** tab.
3. In the navigation pane expand Service Profiles.
4. Right click on the newly created service profile ESXi1 and select KVM Console.

Figure 193 Selecting KVM Console



rall Status: Ok

tatus Details

Desired Power State: Up

Assoc State: Associated

Assigned State: Assigned

Note: The "Desired Power State" is the Power State of the server set via UCSM. It may be therefore different from the actual value. For the actual server power state click the "Server Details" Tab

WARNING

This service profile is not modifiable because it is bound to the service profile template **ESXi_Host**.
To modify this service profile, please unbind it from the template.

Name: ESXi1

User Label:

Description:

Owner: Local

UUID: Hardware Default

UUID Pool:

UUID Pool Instance:

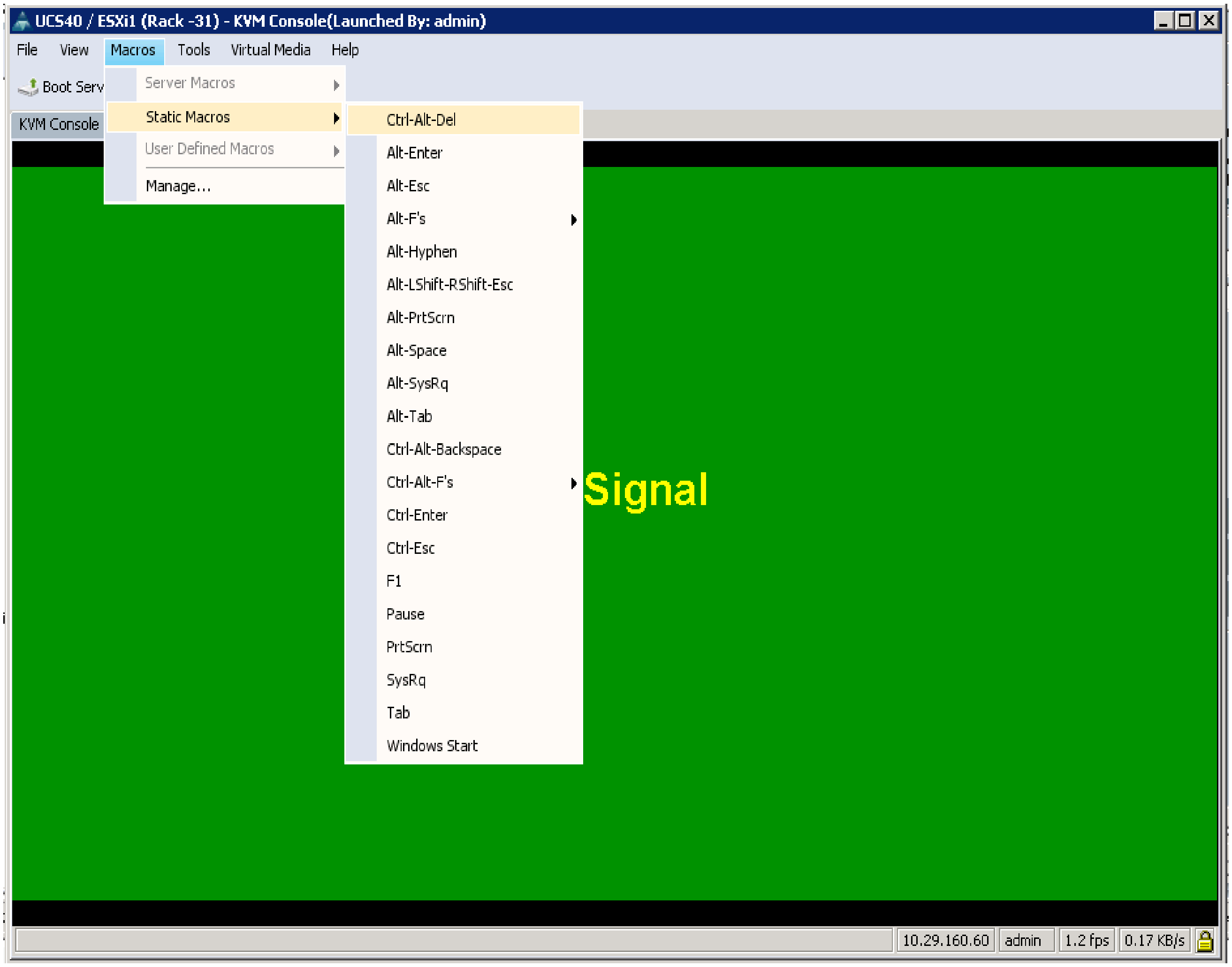
Associated Server: sys/rack-unit-31

Service Profile Template: ESXi_Host

Template Instance: org-root/ls-ESXi_Host

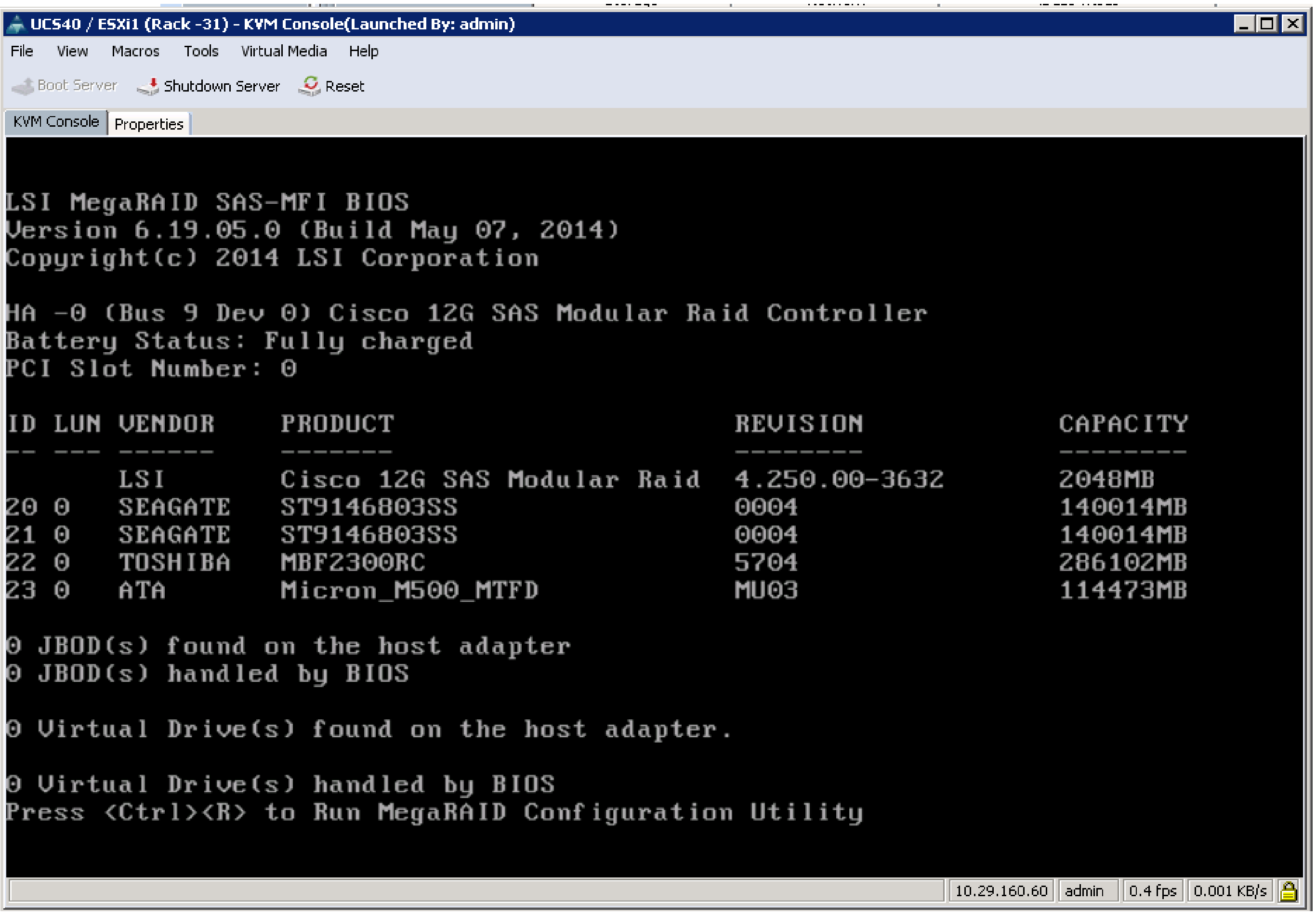
5. In the KVM window, force a reboot by executing the **Ctrl-Alt-Del** macro.

Figure 194 Sending Ctrl-Alt-Del to Reset the Server



6. As the server goes through a reboot, monitor the progress via the KVM window. When the LSI MegaRAID SAS-MFI BIOS screen appears, press **Ctrl-R** to Enter the Cisco 12G SAS Modular Raid Controller BIOS Configuration Utility.

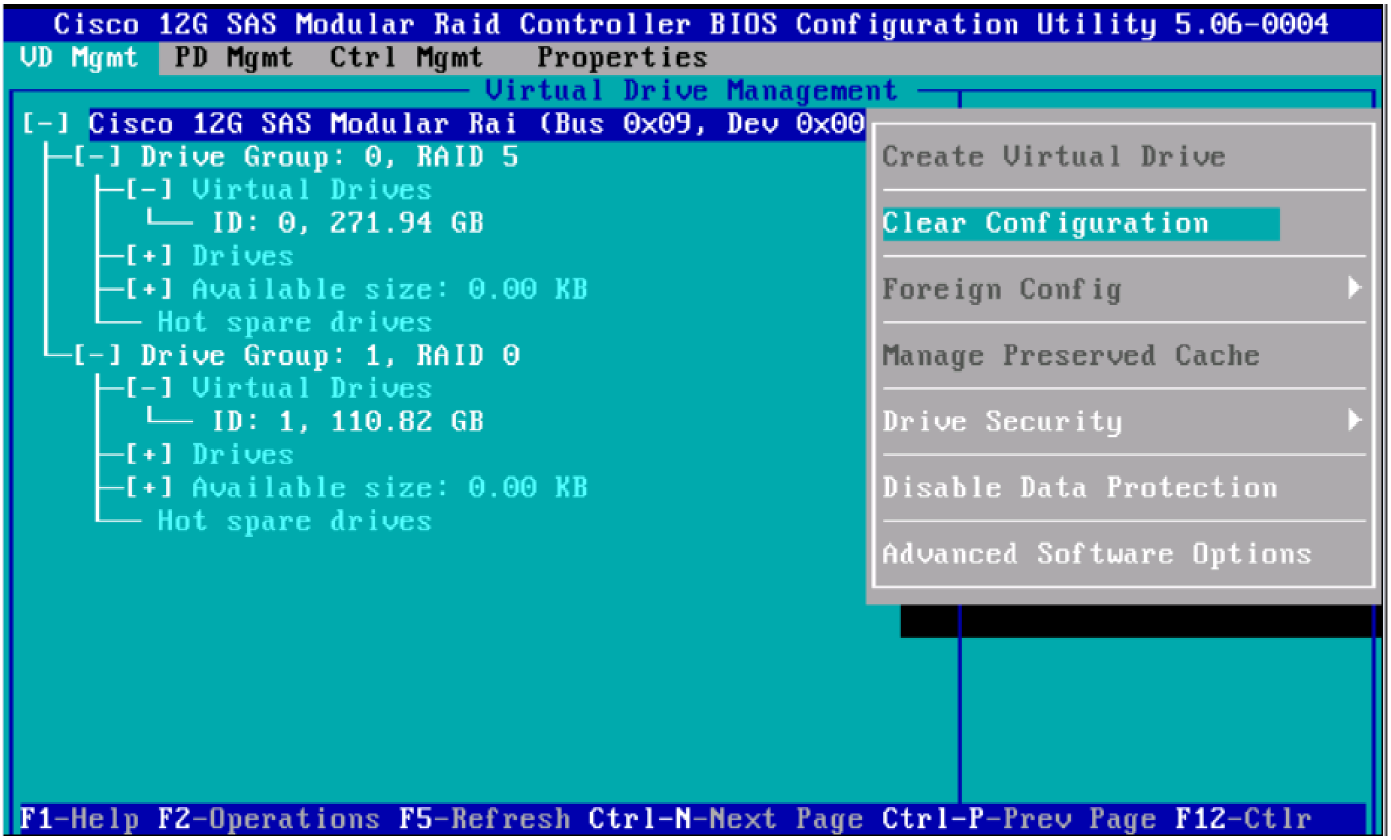
Figure 195 KVM Window displaying the LSI MegaRAID SAS-MFI BIOS screen



UCS40 / ESXi1 (Rack -31) - KVM Console(Launched By: admin)
File View Macros Tools Virtual Media Help
Boot Server Shutdown Server Reset
KVM Console Properties
10.29.160.60 admin 0.4 fps 0.001 KB/s

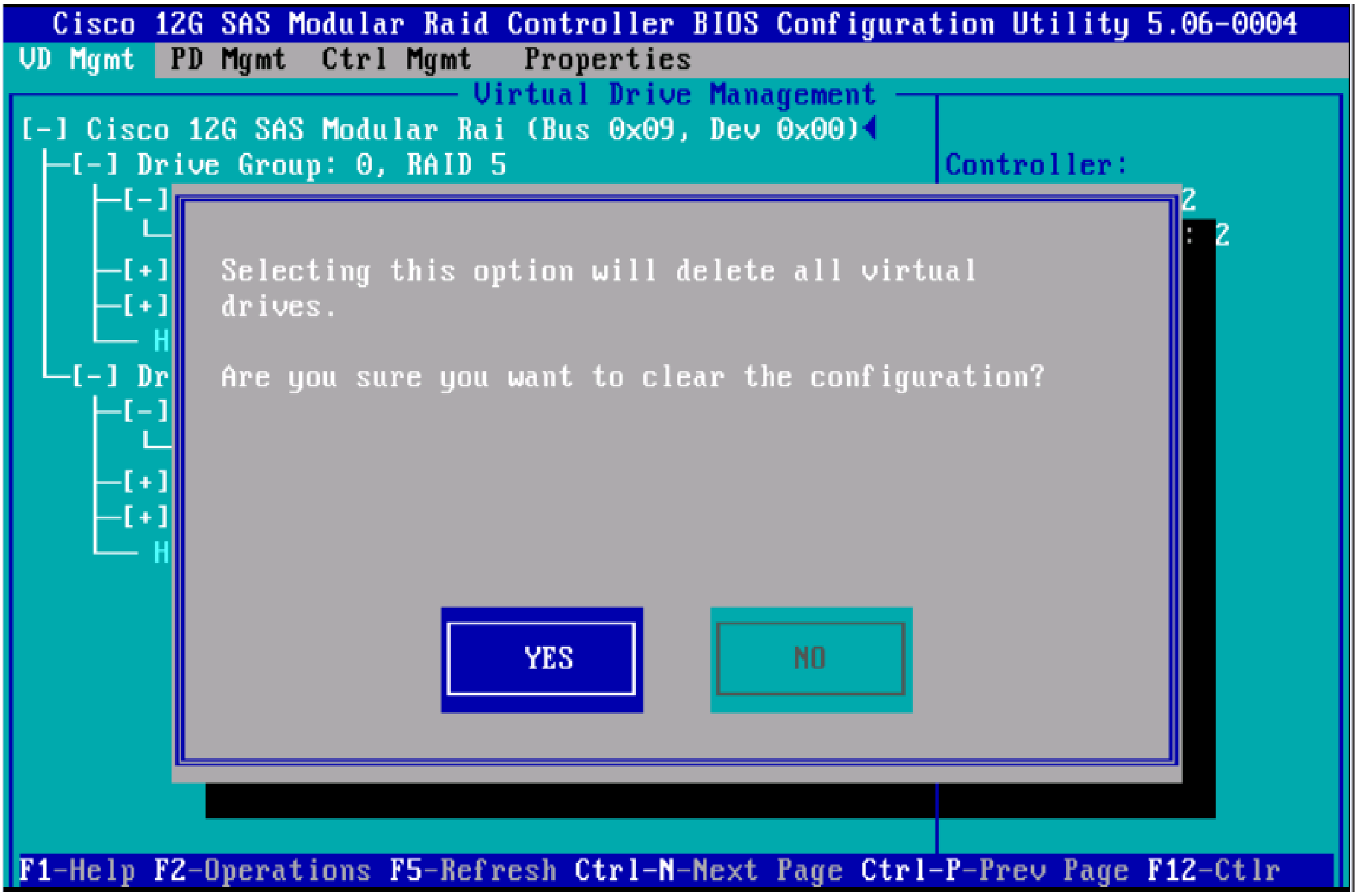
```
LSI MegaRAID SAS-MFI BIOS
Version 6.19.05.0 (Build May 07, 2014)
Copyright(c) 2014 LSI Corporation

HA -0 (Bus 9 Dev 0) Cisco 12G SAS Modular Raid Controller
Battery Status: Fully charged
PCI Slot Number: 0

ID LUN VENDOR    PRODUCT                      REVISION          CAPACITY
-- --- ------    -------                      --------          --------
       LSI       Cisco 12G SAS Modular Raid   4.250.00-3632     2048MB
20 0   SEAGATE   ST9146803SS                  0004              140014MB
21 0   SEAGATE   ST9146803SS                  0004              140014MB
22 0   TOSHIBA   MBF2300RC                    5704              286102MB
23 0   ATA       Micron_M500_MTFD             MU03              114473MB

0 JBOD(s) found on the host adapter
0 JBOD(s) handled by BIOS

0 Virtual Drive(s) found on the host adapter.

0 Virtual Drive(s) handled by BIOS
Press <Ctrl><R> to Run MegaRAID Configuration Utility
```

7. In the MegaRAID configuration utility, under VD Mgmt section, use the arrow keys to select the Cisco 12G SAS Modular RAID (Bus 0xNN, Dev 0xNN) line item.
8. Press the function key **F2**.
9. Select the option Clear Configuration, and press **ENTER.**



```
 Cisco 12G SAS Modular Raid Controller BIOS Configuration Utility 5.06-0004
VD Mgmt  PD Mgmt  Ctrl Mgmt   Properties
                                  Virtual Drive Management
[-] Cisco 12G SAS Modular Rai (Bus 0x09, Dev 0x00
  ├[-] Drive Group: 0, RAID 5                         Create Virtual Drive
  │  ├[-] Virtual Drives
  │  │  └── ID: 0, 271.94 GB                          Clear Configuration
  │  ├[+] Drives
  │  ├[+] Available size: 0.00 KB                     Foreign Config        ▶
  │  └── Hot spare drives
  └[-] Drive Group: 1, RAID 0                         Manage Preserved Cache
     ├[-] Virtual Drives
     │  └── ID: 1, 110.82 GB                          Drive Security        ▶
     ├[+] Drives
     ├[+] Available size: 0.00 KB                     Disable Data Protection
     └── Hot spare drives
                                                      Advanced Software Options

F1-Help F2-Operations F5-Refresh Ctrl-N-Next Page Ctrl-P-Prev Page F12-Ctlr
```

10. To the question Are you sure you want to clear the configuration? click **YES** and press **ENTER** key.



Cisco 12G SAS Modular Raid Controller BIOS Configuration Utility 5.06-0004

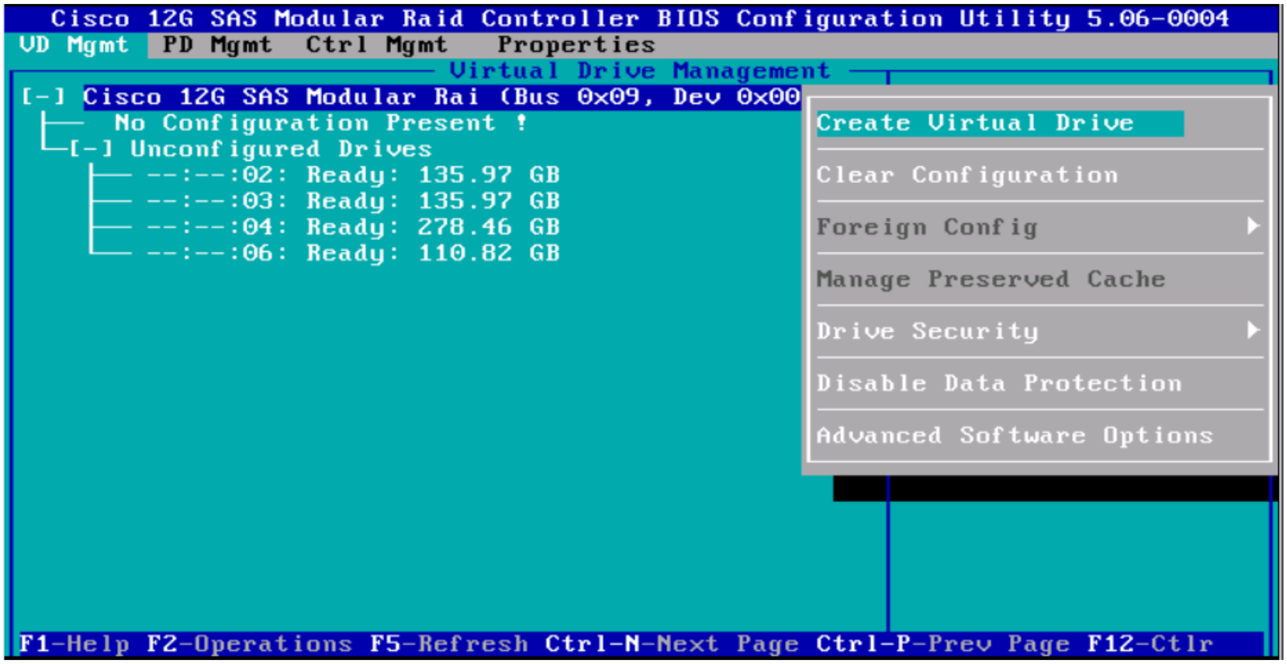
VD Mgmt
PD Mgmt
Ctrl Mgmt
Properties
Virtual Drive Management
[-] Cisco 12G SAS Modular Rai (Bus 0x09, Dev 0x00)
[-] Drive Group: 0, RAID 5
[-]
[+]
[+]
H
[-] Dr
[-]
[+]
[+]
H
Controller:
YES
NO
F1-Help F2-Operations F5-Refresh Ctrl-N-Next Page Ctrl-P-Prev Page F12-Ctlr

Selecting this option will delete all virtual drives.

Are you sure you want to clear the configuration?

11. In the VD Mgmt section, use the arrow keys to select the Cisco 12G SAS Modular RAID (Bus 0xNN, Dev 0xNN) line item.

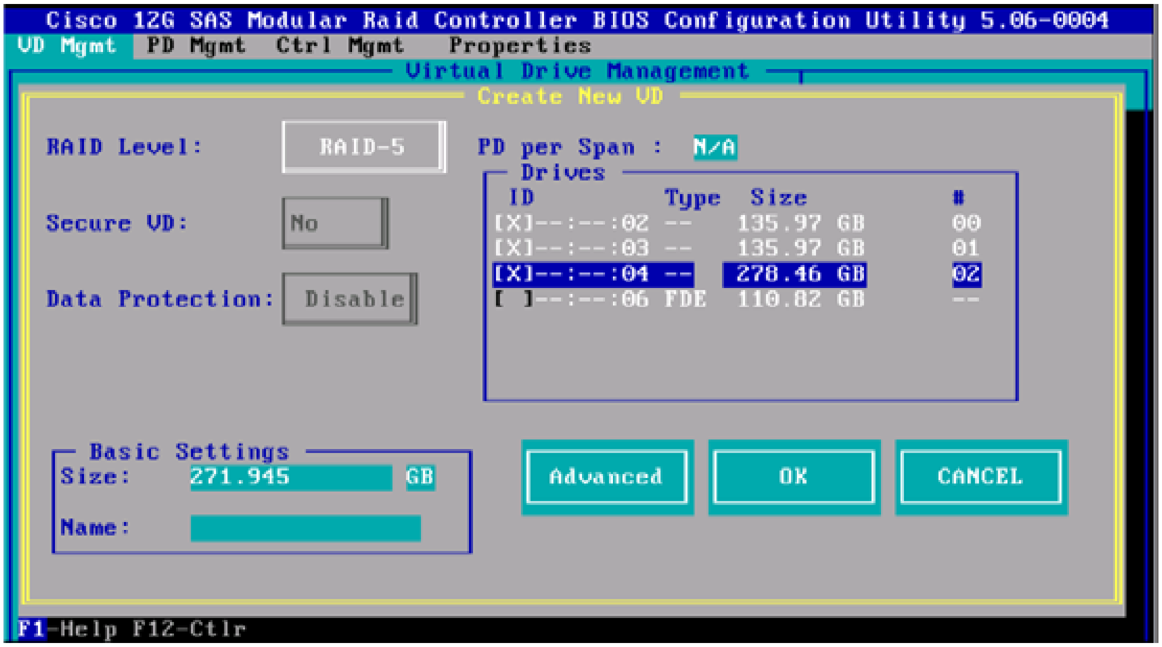
12. Press the function key **F2**, select Create Virtual Drive and press **ENTER**.



```
Cisco 12G SAS Modular Raid Controller BIOS Configuration Utility 5.06-0004
VD Mgmt  PD Mgmt  Ctrl Mgmt  Properties
                     Virtual Drive Management
[-] Cisco 12G SAS Modular Rai (Bus 0x09, Dev 0x00   Create Virtual Drive
    ├── No Configuration Present !                   Clear Configuration
    └─[-] Unconfigured Drives                        Foreign Config        ▶
          ├── --:--:02: Ready: 135.97 GB             Manage Preserved Cache
          ├── --:--:03: Ready: 135.97 GB             Drive Security        ▶
          ├── --:--:04: Ready: 278.46 GB             Disable Data Protection
          └── --:--:06: Ready: 110.82 GB             Advanced Software Options
F1-Help F2-Operations F5-Refresh Ctrl-N-Next Page Ctrl-P-Prev Page F12-Ctlr
```

13. In the RAID Level: press **ENTER** and choose **RAID-5**.

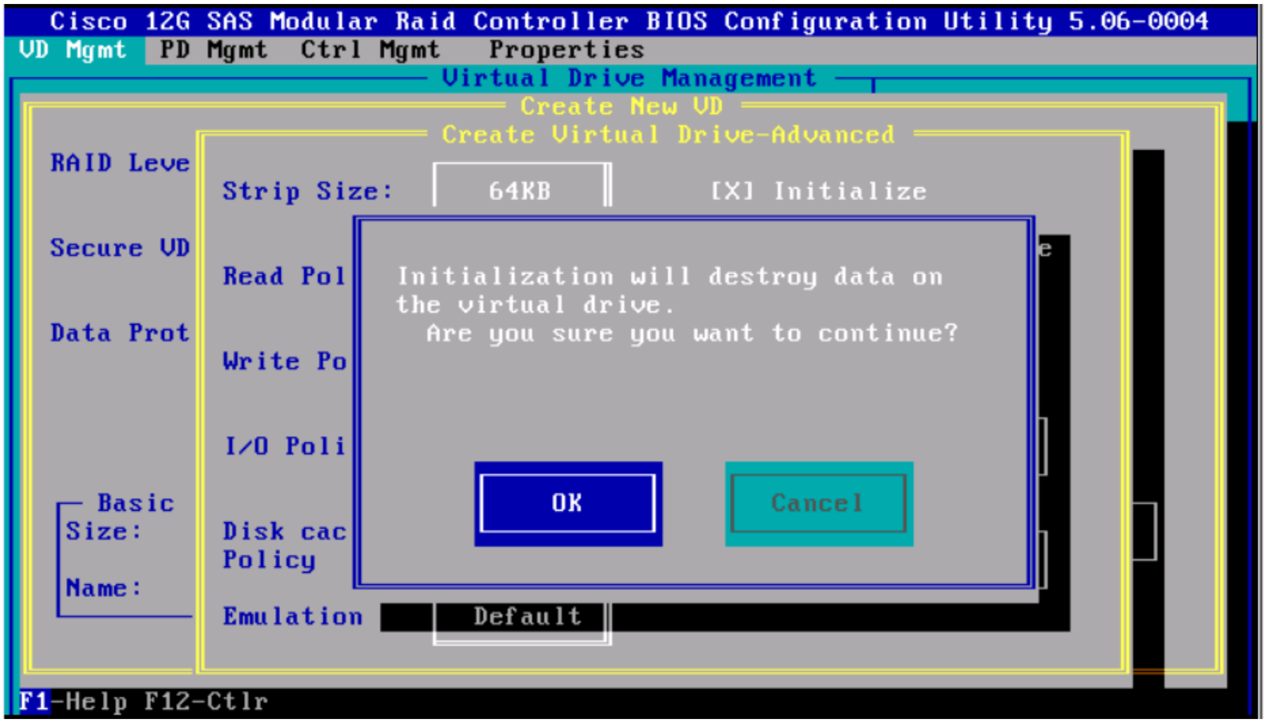
14. In the Drives section, press **SPACE** on the desired number of drives to select them to be part of the RAID group. Use the Up and Down arrow keys to navigate.



```
Cisco 12G SAS Modular Raid Controller BIOS Configuration Utility 5.06-0004
VD Mgmt  PD Mgmt  Ctrl Mgmt  Properties
                     Virtual Drive Management
                        Create New VD
RAID Level:        RAID-5       PD per Span : N/A
                                 Drives
                                 ID          Type  Size        #
Secure VD:         No            [X]--:--:02 --    135.97 GB   00
                                 [X]--:--:03 --    135.97 GB   01
                                 [X]--:--:04 --    278.46 GB   02
Data Protection:   Disable       [ ]--:--:06 FDE   110.82 GB   --

  Basic Settings
 Size:    271.945     GB        Advanced     OK     CANCEL

 Name:
F1-Help F12-Ctlr
```

15. Select the **Advanced** button, and Check the Initialize checkbox.

16. Press **OK** to continue with initialization.

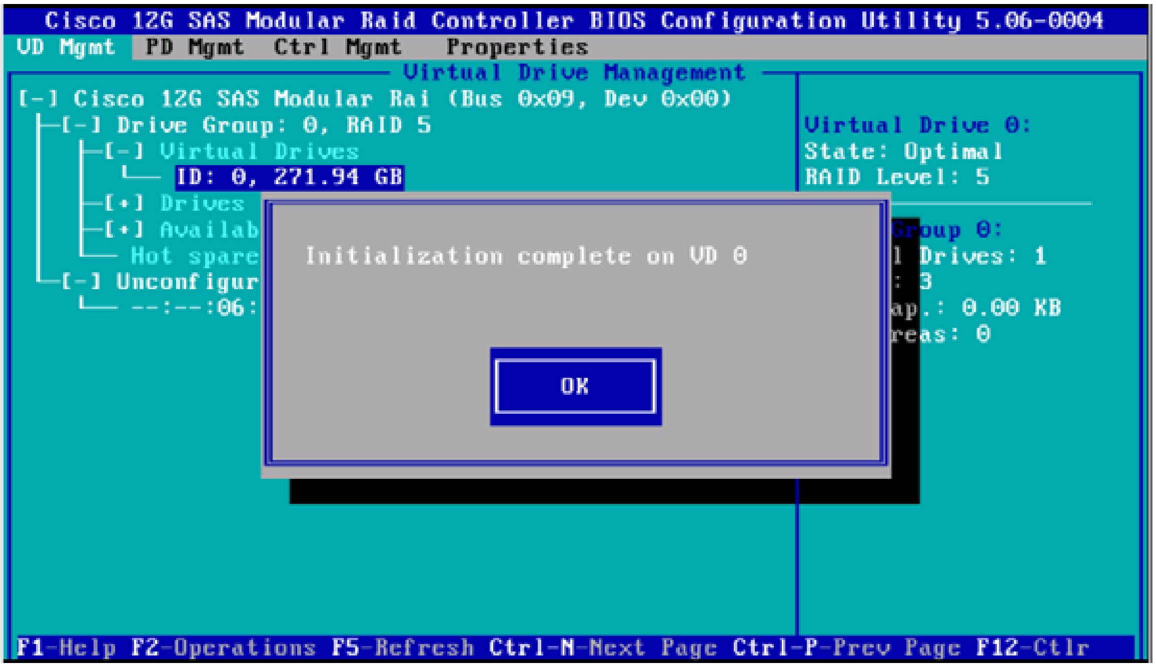


Cisco 12G SAS Modular Raid Controller BIOS Configuration Utility 5.06-0004

Strip Size: 64KB [X] Initialize

Initialization will destroy data on the virtual drive.
Are you sure you want to continue?

17. After the initialization is complete, the following message appears. Press **OK** to continue.



Cisco 12G SAS Modular Raid Controller BIOS Configuration Utility 5.06-0004

VD Mgmt
PD Mgmt
Ctrl Mgmt
Properties
Virtual Drive Management
OK
F1-Help F2-Operations F5-Refresh Ctrl-N-Next Page Ctrl-P-Prev Page F12-Ctlr

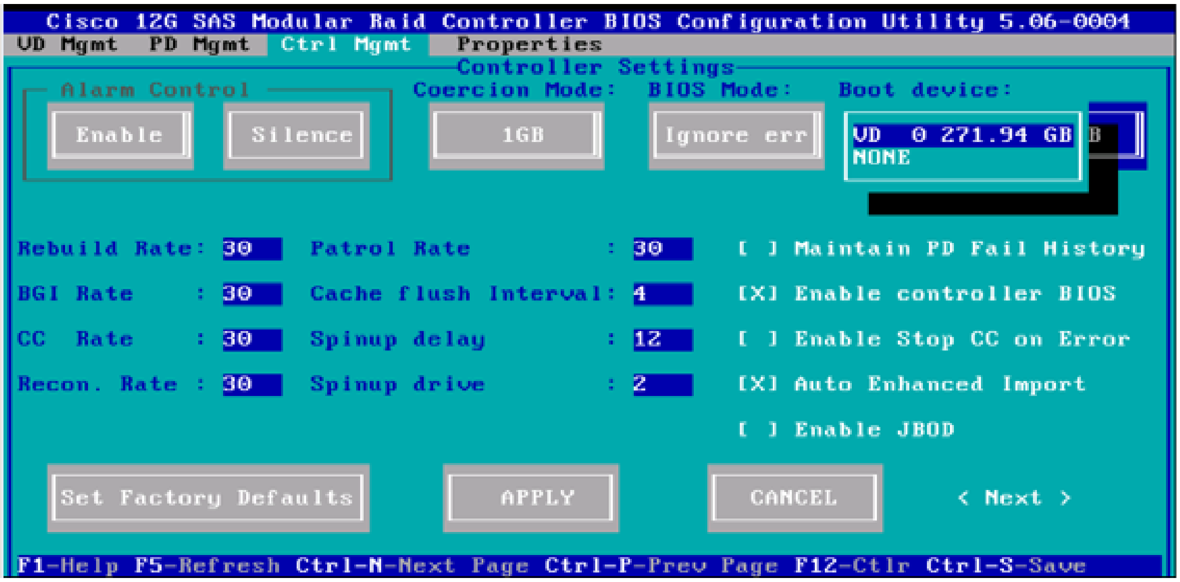
```
[-] Cisco 12G SAS Modular Rai (Bus 0x09, Dev 0x00)
 ├[-] Drive Group: 0, RAID 5
 │ ├[-] Virtual Drives
 │ │  └── ID: 0, 271.94 GB
 │ ├[+] Drives
 │ ├[+] Availab
 │ └── Hot spare
 └[-] Unconfigur
    └── --:--:06:
```

```
Virtual Drive 0:
State: Optimal
RAID Level: 5

roup 0:
l Drives: 1
: 3
ap.: 0.00 KB
reas: 0
```

Initialization complete on VD 0

18. Press **Ctrl-N** twice to navigate to the Ctrl Mgmt screen.

19. Select Boot device field and press **ENTER**.

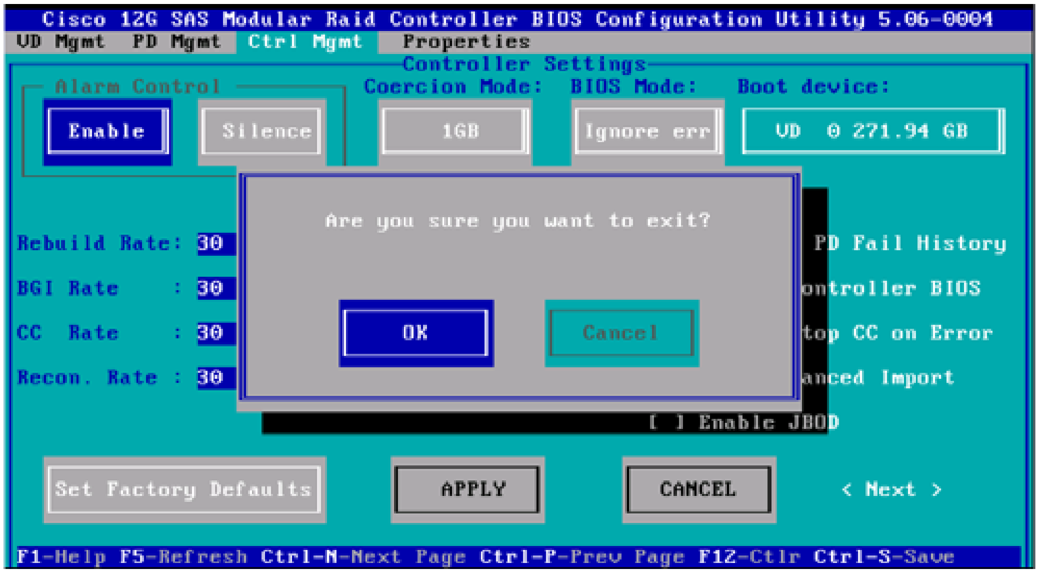


```
Cisco 12G SAS Modular Raid Controller BIOS Configuration Utility 5.06-0004
VD Mgmt   PD Mgmt   Ctrl Mgmt   Properties
                      Controller Settings
Alarm Control           Coercion Mode:  BIOS Mode:    Boot device:
Enable   Silence        1GB             Ignore err    VD  0 271.94 GB
                                                      NONE

Rebuild Rate: 30   Patrol Rate          : 30   [ ] Maintain PD Fail History
BGI Rate     : 30  Cache flush Interval: 4     [X] Enable controller BIOS
CC  Rate     : 30  Spinup delay        : 12    [ ] Enable Stop CC on Error
Recon. Rate  : 30  Spinup drive        : 2     [X] Auto Enhanced Import
                                               [ ] Enable JBOD

Set Factory Defaults     APPLY     CANCEL     < Next >

F1-Help F5-Refresh Ctrl-N-Next Page Ctrl-P-Prev Page F12-Ctlr Ctrl-S-Save
```

20. Select the **VD 0**, and press **ENTER** again.

21. Press **Ctrl+S** to save the configuration.

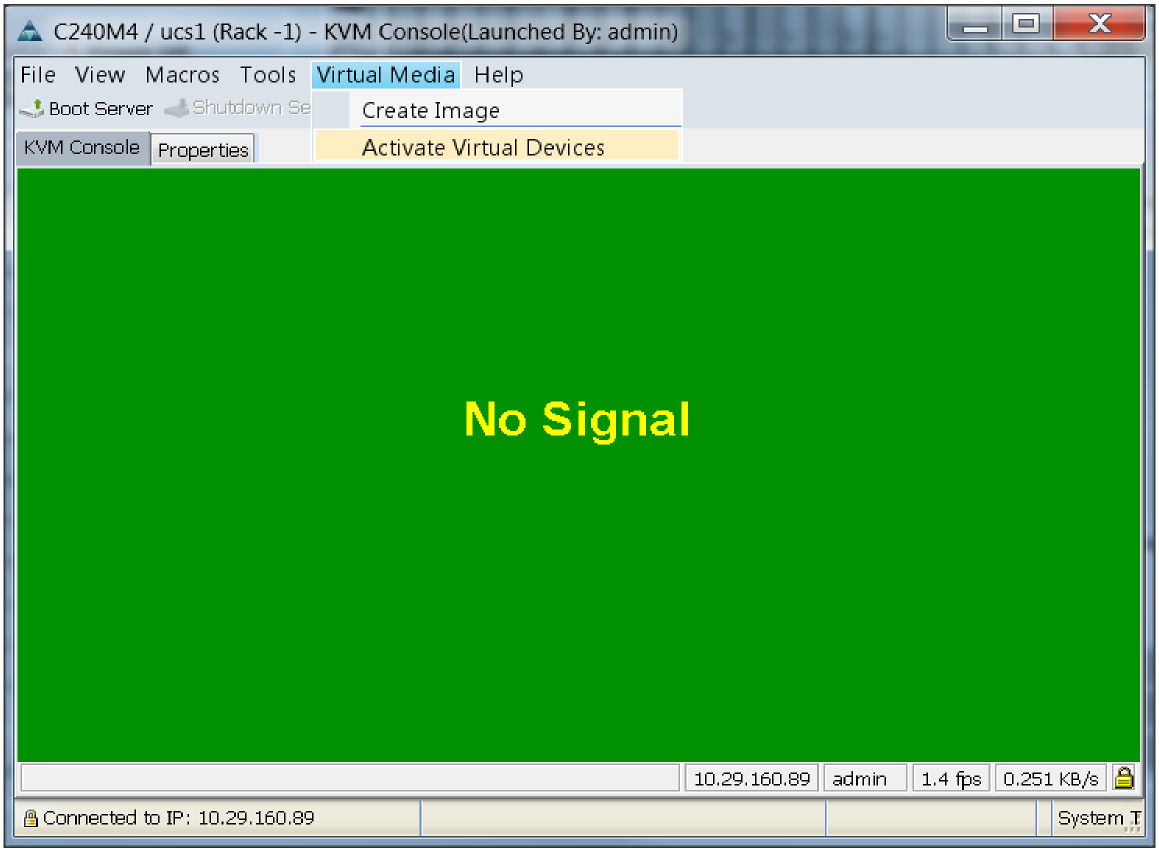
22. Press **ESC** to exit the MegaRAID configuration utility.



```
Cisco 12G SAS Modular Raid Controller BIOS Configuration Utility 5.06-0004
VD Mgmt   PD Mgmt   Ctrl Mgmt   Properties
                      Controller Settings
Alarm Control       Coercion Mode:  BIOS Mode:    Boot device:
Enable   Silence    1GB             Ignore err    VD  0 271.94 GB

Rebuild Rate: 30    Are you sure you want to exit?      PD Fail History
BGI Rate     : 30                                       ontroller BIOS
CC  Rate     : 30        OK          Cancel             top CC on Error
Recon. Rate  : 30                                       anced Import
                                             [ ] Enable JBOD

Set Factory Defaults     APPLY     CANCEL     < Next >

F1-Help F5-Refresh Ctrl-N-Next Page Ctrl-P-Prev Page F12-Ctlr Ctrl-S-Save
```

23. In the KVM window, select the Virtual Media menu.

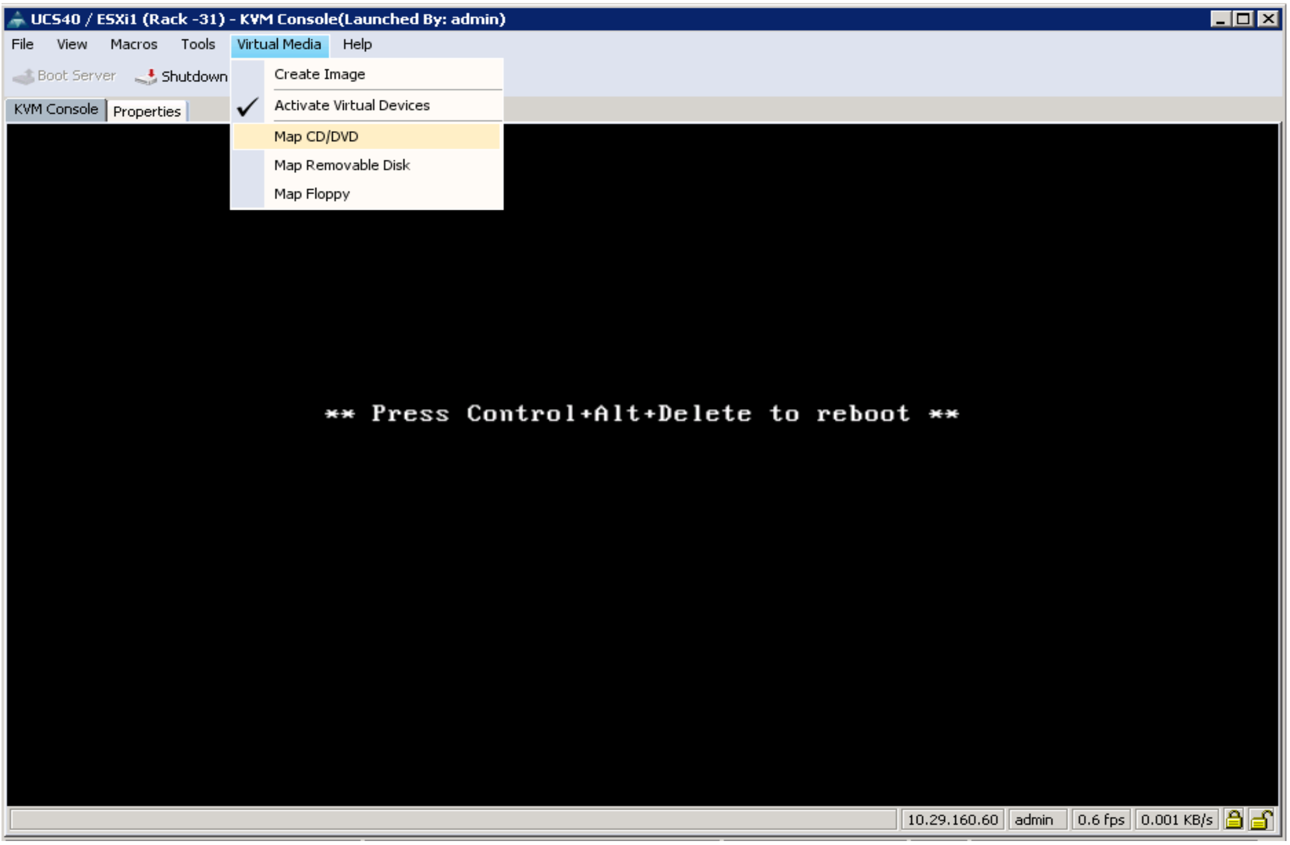
24. Click the Activate Virtual Devices found in the right hand corner of the Virtual Media selection menu.



C240M4 / ucs1 (Rack -1) - KVM Console(Launched By: admin)
File View Macros Tools Virtual Media Help
Boot Server Shutdown Se
KVM Console Properties
Create Image
Activate Virtual Devices
No Signal
10.29.160.89 admin 1.4 fps 0.251 KB/s
Connected to IP: 10.29.160.89
System T

25. In the KVM window, select the Virtual Media menu and Select **Map CD/DVD**.

Figure 196 Mapping the CD/DVD Virtual Media



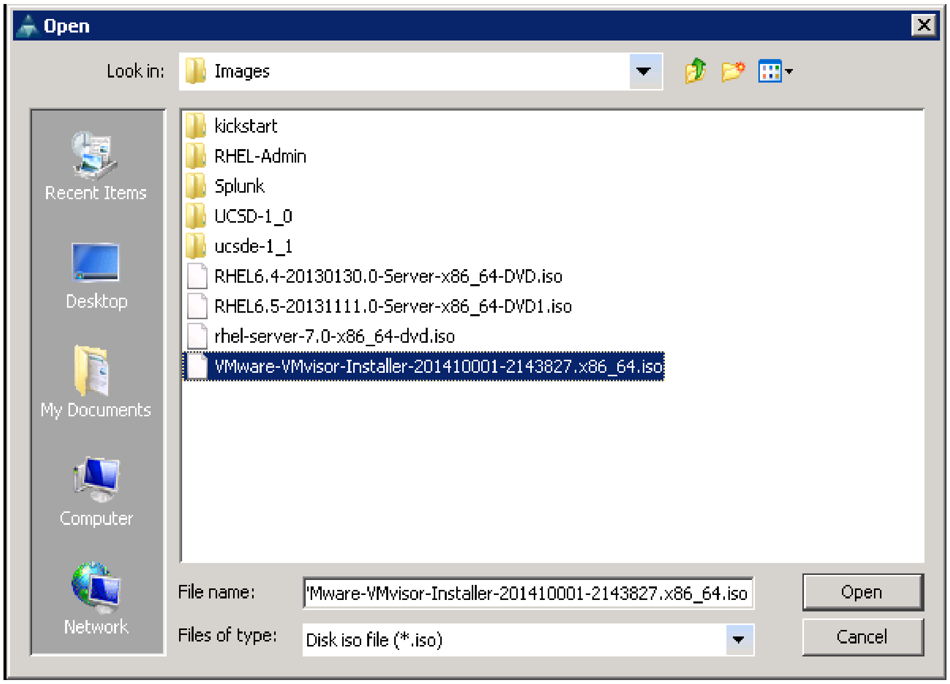
```
** Press Control+Alt+Delete to reboot **
```

26. Browse to the VMware vSphere ESXi 5.5 installer ISO image file.

Note The VMware vSphere ESXi 5.5 installable ISO is assumed to be on the client machine.

27. Click **Open** to add the image to the list of virtual media.

Figure 197 Browse to VMWare ESXi Hypervisor ISO Image



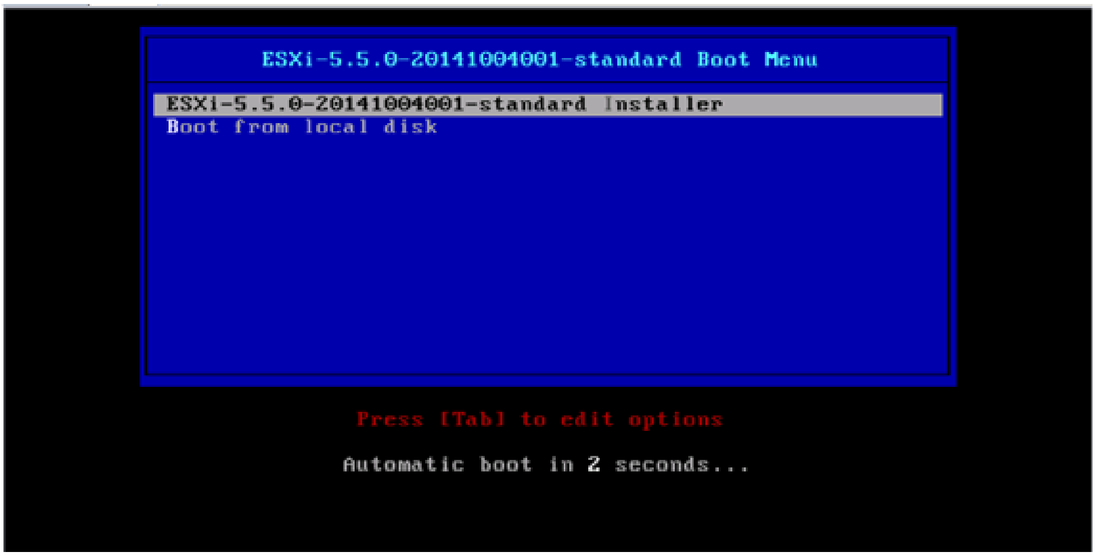
kickstart
RHEL-Admin
Splunk
UCSD-1_0
ucsde-1_1
RHEL6.4-20130130.0-Server-x86_64-DVD.iso
RHEL6.5-20131111.0-Server-x86_64-DVD1.iso
rhel-server-7.0-x86_64-dvd.iso
VMware-VMvisor-Installer-201410001-2143827.x86_64.iso

File name: 'Mware-VMvisor-Installer-201410001-2143827.x86_64.iso

Files of type: Disk iso file (*.iso)

28. In the KVM window, select the **KVM** tab to monitor during boot.
29. In the KVM window, select the **Macros > Static Macros > Ctrl-Alt-Del** button in the upper left corner.
30. Click **OK** to reboot the system.
31. On reboot, the machine detects the presence of the VMWare ESXi install media.

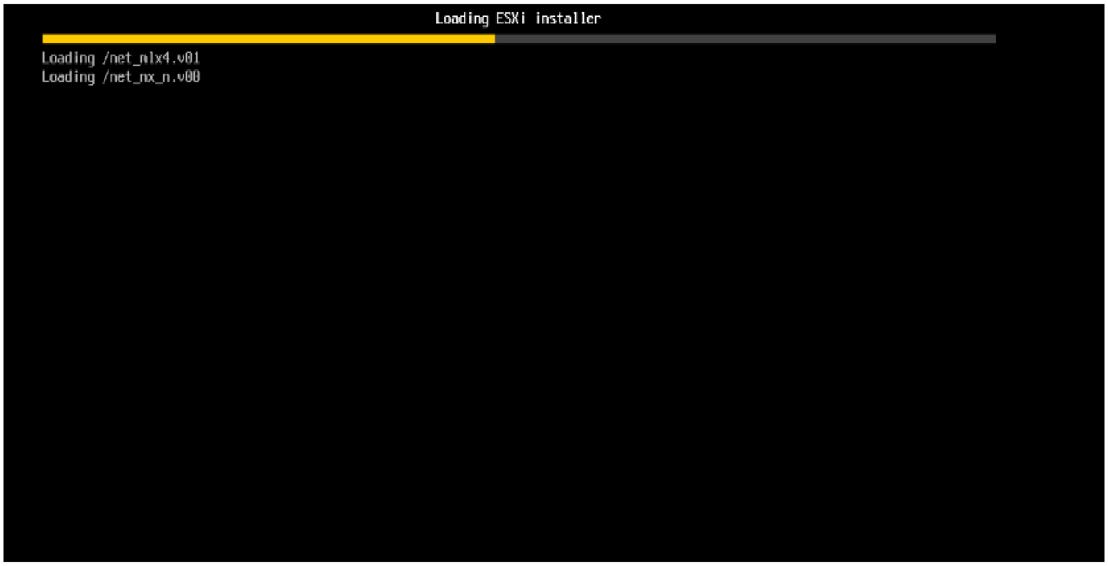
Figure 198 ESXi Standard Boot Menu



```
ESXi-5.5.0-20141004001-standard Boot Menu

ESXi-5.5.0-20141004001-standard Installer
Boot from local disk

Press [Tab] to edit options

Automatic boot in 2 seconds...
```

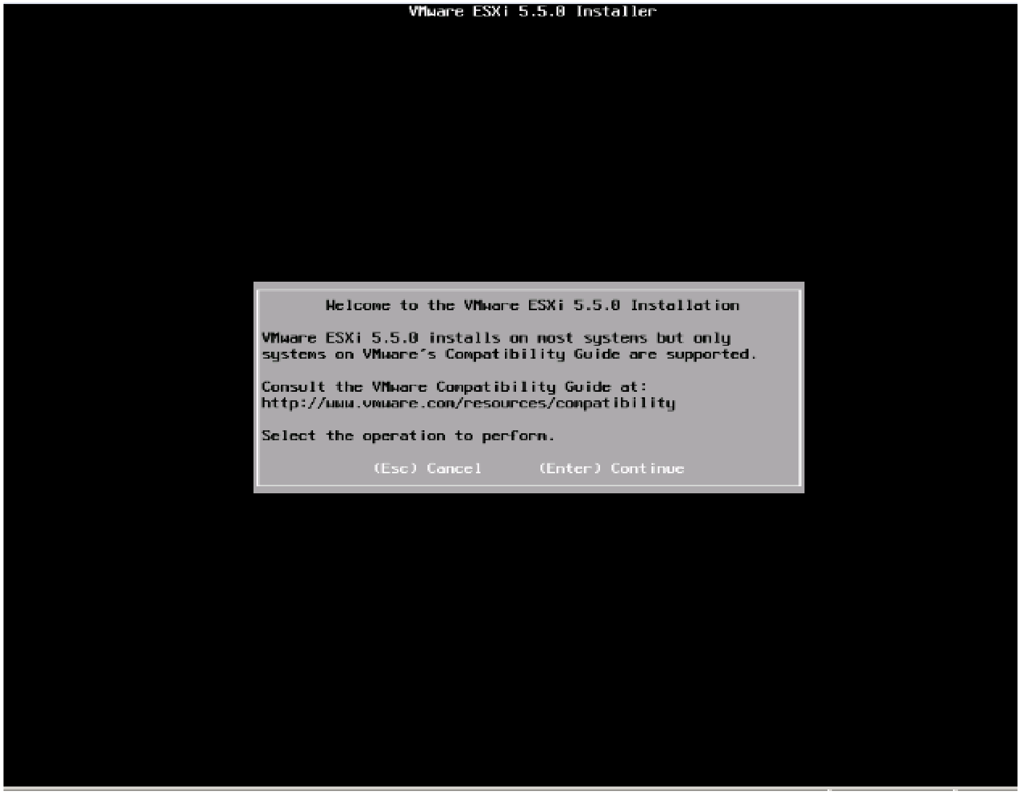
32. Select the ESXi-5.5.0-yyyymmddnnnn-standard Installer. The installer begins automatically.

Figure 199 Loading the ESXi Installer



```
Loading ESXi installer
Loading /net_mlx4.v01
Loading /net_nx_n.v00
```

Figure 200 VMWare ESXi Installation screen

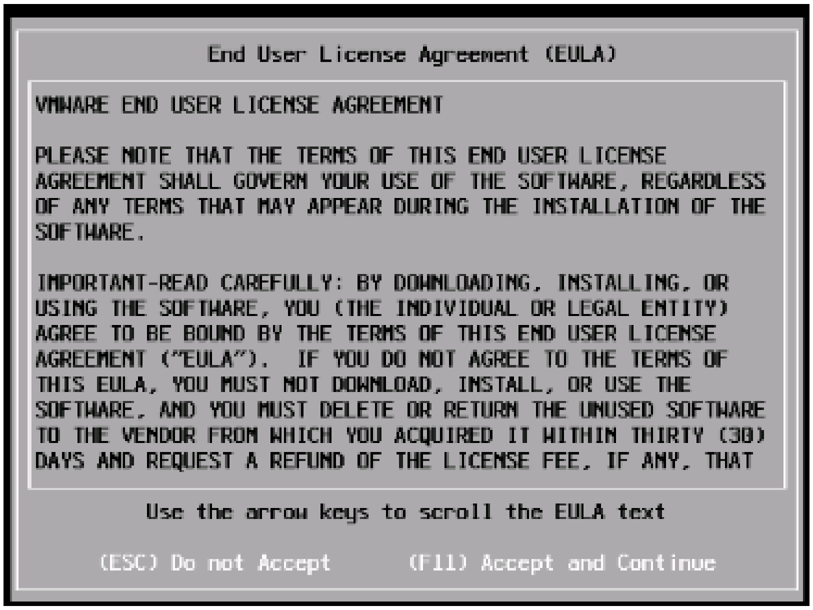


```
VMware ESXi 5.5.0 Installer

Welcome to the VMware ESXi 5.5.0 Installation

VMware ESXi 5.5.0 installs on most systems but only
systems on VMware's Compatibility Guide are supported.

Consult the VMware Compatibility Guide at:
http://www.vmware.com/resources/compatibility

Select the operation to perform.

(Esc) Cancel      (Enter) Continue
```

33. Press **ENTER** to continue.

34. Press **F11** to accept End user License Agreement (EULA) and continue.

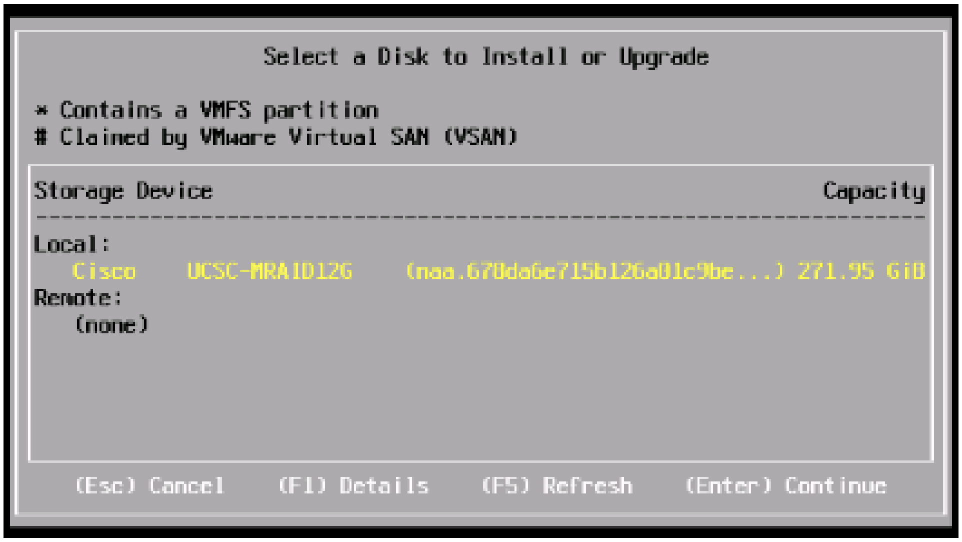
Figure 201 Accept End User License Agreement (EULA)



```
End User License Agreement (EULA)

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.

IMPORTANT-READ CAREFULLY: BY DOWNLOADING, INSTALLING, OR
USING THE SOFTWARE, YOU (THE INDIVIDUAL OR LEGAL ENTITY)
AGREE TO BE BOUND BY THE TERMS OF THIS END USER LICENSE
AGREEMENT ("EULA").  IF YOU DO NOT AGREE TO THE TERMS OF
THIS EULA, YOU MUST NOT DOWNLOAD, INSTALL, OR USE THE
SOFTWARE, AND YOU MUST DELETE OR RETURN THE UNUSED SOFTWARE
TO THE VENDOR FROM WHICH YOU ACQUIRED IT WITHIN THIRTY (30)
DAYS AND REQUEST A REFUND OF THE LICENSE FEE, IF ANY, THAT

Use the arrow keys to scroll the EULA text
```

35. Select the storage device. Press **ENTER** to proceed with the installation.

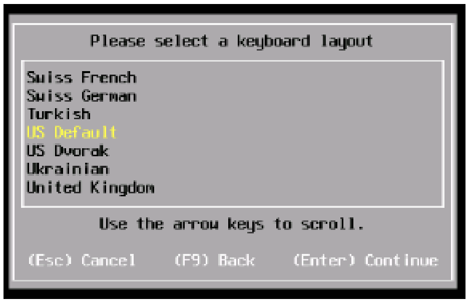
Figure 202 Selecting the Storage Device for installing the ESXi operating system.



```
Select a Disk to Install or Upgrade

* Contains a VMFS partition
# Claimed by VMware Virtual SAN (VSAN)

Storage Device                                                 Capacity
-----------------------------------------------------------------------
Local:
   Cisco    UCSC-MRAID12G    (naa.670da6e715b126a01c9be...) 271.95 GiB
Remote:
   (none)
```

36. Select the Keyboard US Default. Press **ENTER** to continue.

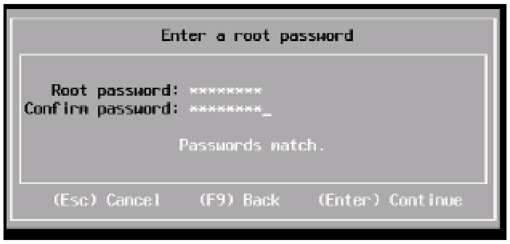
Figure 203 Choose the Keyboard layout



```
Please select a keyboard layout

Swiss French
Swiss German
Turkish
US Default
US Dvorak
Ukrainian
United Kingdom

Use the arrow keys to scroll.

(Esc) Cancel     (F9) Back     (Enter) Continue
```

37. Choose the root password and confirm it. Press **ENTER** to continue.

Figure 204 Choose the root password



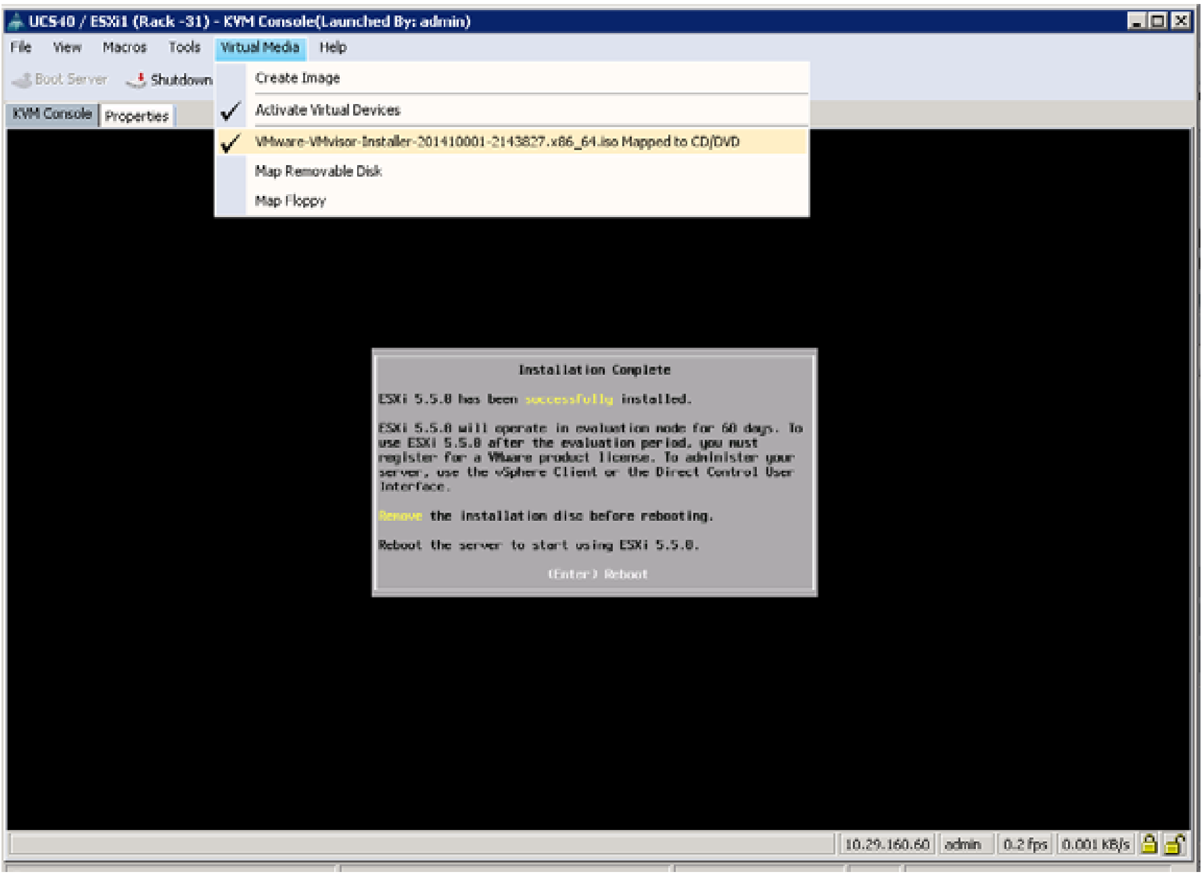
```
Enter a root password

   Root password: ********
Confirm password: ********_

Passwords match.

(Esc) Cancel     (F9) Back     (Enter) Continue
```

38. Press **F11** to confirm and begin installation.

39. Once the installation completes, the following message is displayed in the KVM.

40. Remove the VMWare vSphere Hypervisor's ISO from the Virtual Media menu, by selecting it as shown.

Figure 205 ESXi installation complete – Unmount the Virtual Media


UCS40 / ESXi1 (Rack -31) - KVM Console(Launched By: admin)
File
View
Macros
Tools
Virtual Media
Help
Boot Server
Shutdown
KVM Console
Properties
Create Image
✓ Activate Virtual Devices
✓ VMware-VMvisor-Installer-201410001-2143827.x86_64.iso Mapped to CD/DVD
Map Removable Disk
Map Floppy
10.29.160.60
admin
0.2 fps
0.001 KB/s

```
Installation Complete

ESXi 5.5.0 has been successfully installed.

ESXi 5.5.0 will operate in evaluation mode for 60 days. To
use ESXi 5.5.0 after the evaluation period, you must
register for a VMware product license. To administer your
server, use the vSphere Client or the Direct Control User
Interface.

Remove the installation disc before rebooting.

Reboot the server to start using ESXi 5.5.0.

(Enter) Reboot
```

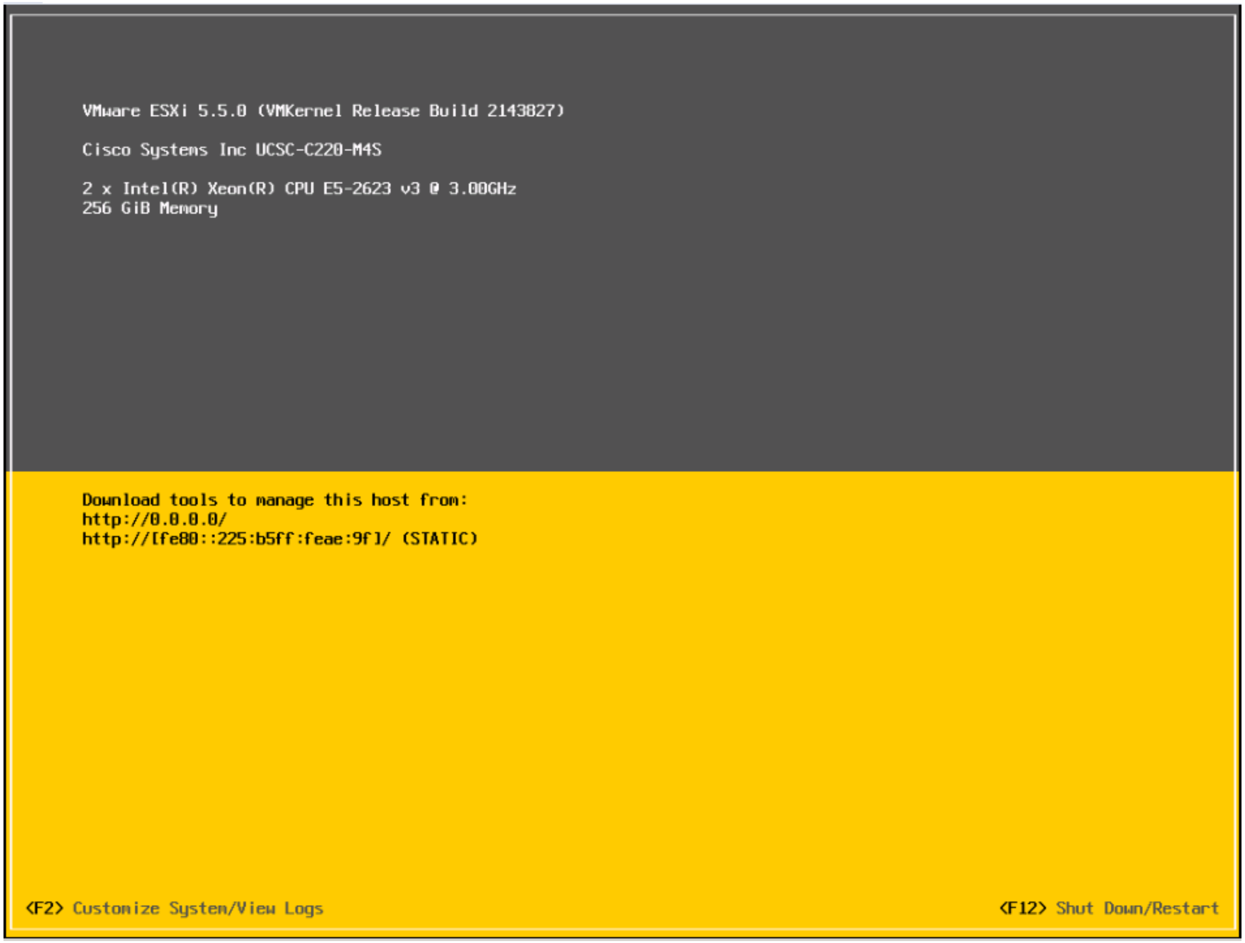
41. Click **Yes** to proceed with un-mapping of the ISO.
42. Press **ENTER** to reboot the server.

The VMWare vSphere ESXi installation is complete.

Configuring the Management Network

1. Once the server reboots, press **F2** to log on.
2. Enter username as root, and the password chosen above.

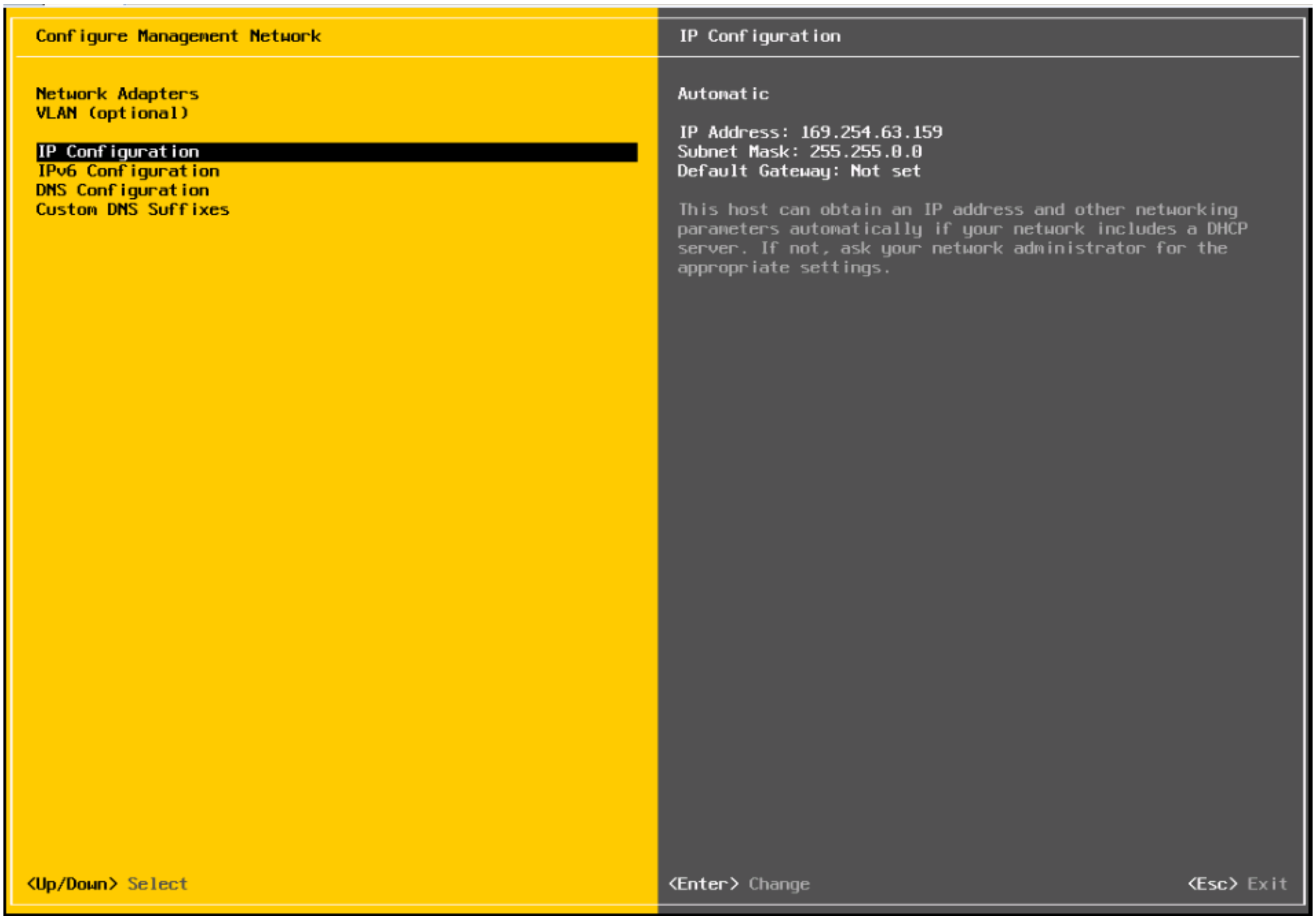
Figure 206 VMWare ESXi initial screen as seen via the KVM Console



```
VMware ESXi 5.5.0 (VMKernel Release Build 2143827)

Cisco Systems Inc UCSC-C220-M4S

2 x Intel(R) Xeon(R) CPU E5-2623 v3 @ 3.00GHz
256 GiB Memory

Download tools to manage this host from:
http://0.0.0.0/
http://[fe80::225:b5ff:feae:9f]/ (STATIC)
```

3. Press **F2** to continue
4. Select Configure Management Network, and press **ENTER.**
5. Select **IP Configuration** option.

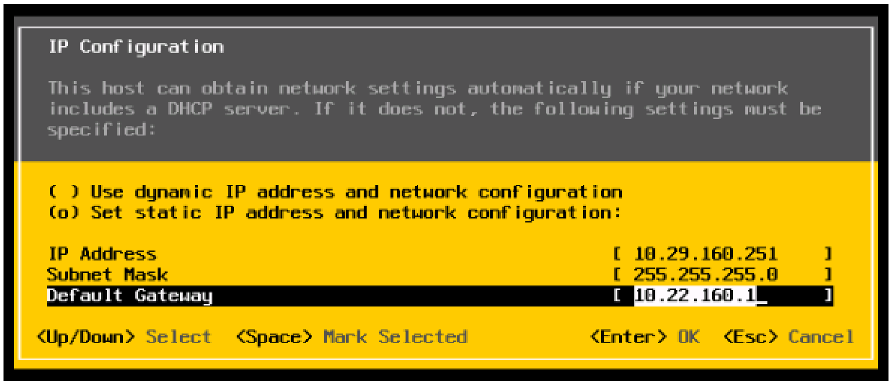
Figure 207 Enter the IP configuration option of the Management Network



```
Configure Management Network              IP Configuration

Network Adapters                          Automatic
VLAN (optional)
                                          IP Address: 169.254.63.159
IP Configuration                          Subnet Mask: 255.255.0.0
IPv6 Configuration                        Default Gateway: Not set
DNS Configuration
Custom DNS Suffixes                       This host can obtain an IP address and other networking
                                          parameters automatically if your network includes a DHCP
                                          server. If not, ask your network administrator for the
                                          appropriate settings.

<Up/Down> Select                          <Enter> Change                              <Esc> Exit
```

6. Press **ENTER** to continue.
7. Use the Up/Down arrow keys to highlight the Set Static IP address and network configuration option, and press **SPACE** key to select it.
8. Enter the static IP address, Subnet Mask and Default Gateway.

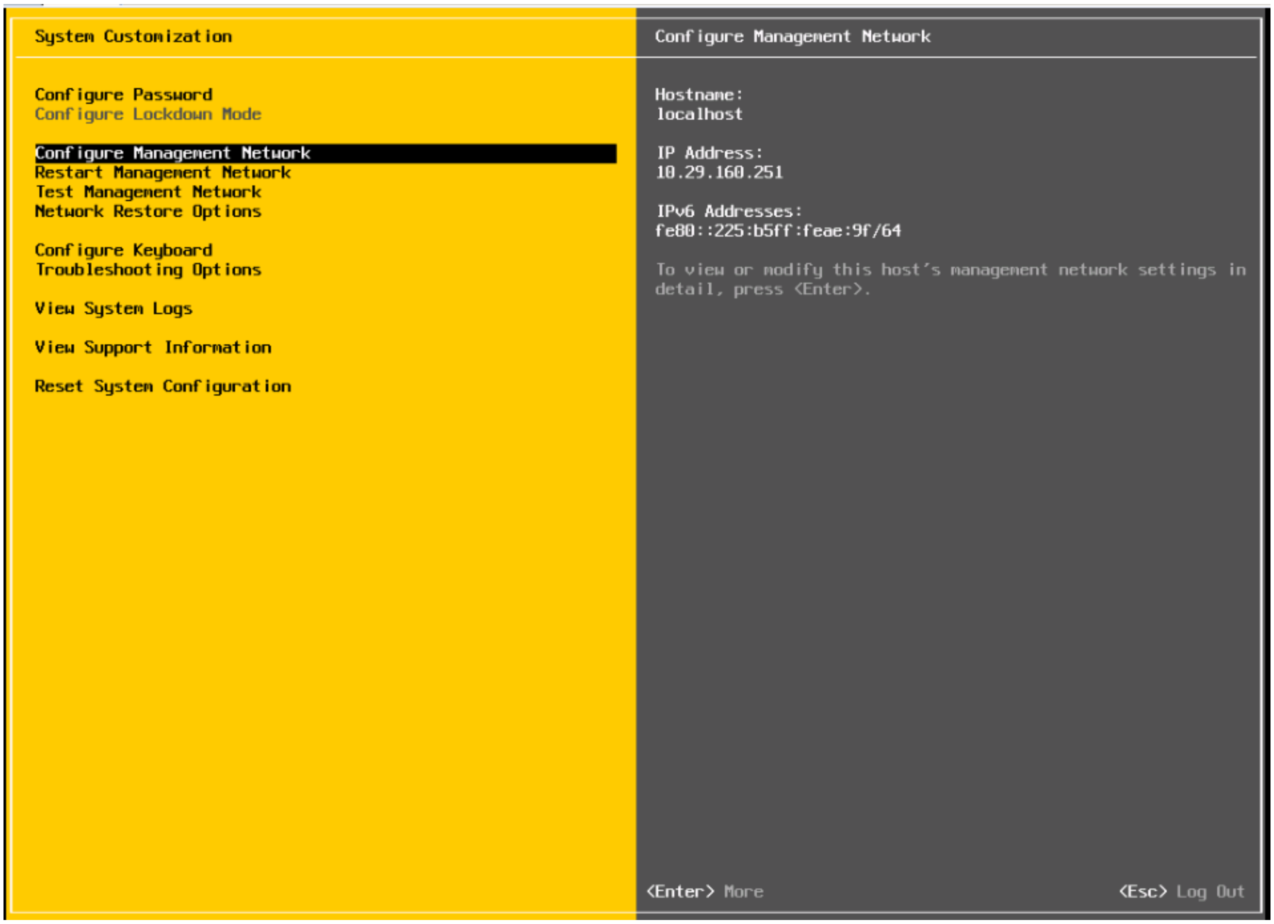
Figure 208 Enter the IP Address configuration details



```
IP Configuration

This host can obtain network settings automatically if your network
includes a DHCP server. If it does not, the following settings must be
specified:

( ) Use dynamic IP address and network configuration
(o) Set static IP address and network configuration:

IP Address                                          [ 10.29.160.251    ]
Subnet Mask                                         [ 255.255.255.0    ]
Default Gateway                                     [ 10.22.160.1_     ]

<Up/Down> Select   <Space> Mark Selected            <Enter> OK  <Esc> Cancel
```

9. Press **OK** to submit the changes.
10. Press **ESC** key exit the Management Network Screen.
11. In the Configure Management Network: Confirm dialog box, Press **Y** to restart the Management Network.
12. Verify the IP address settings in the System Customization screen.

Figure 209 Verify the IP address details in the System Customization screen

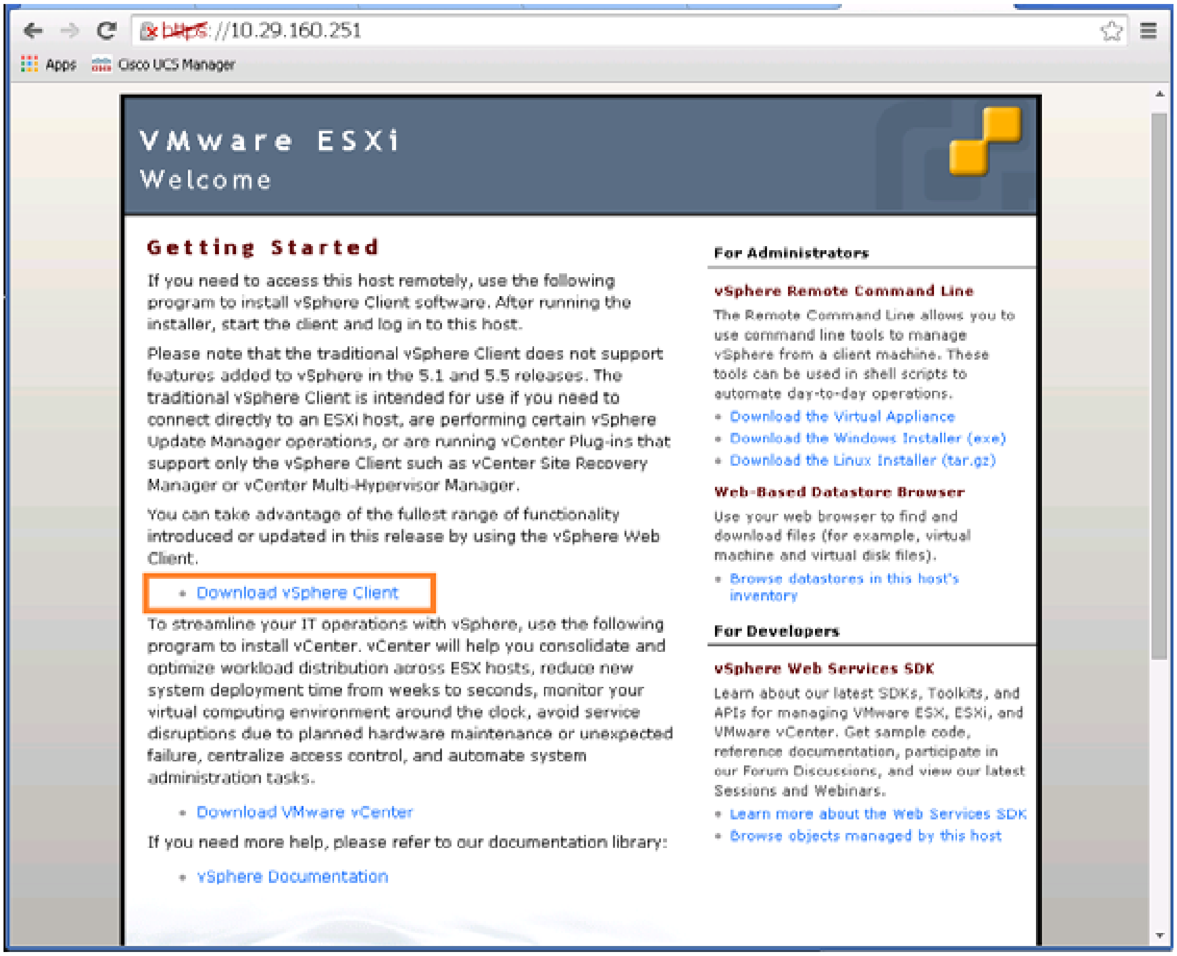


```
System Customization                  Configure Management Network

Configure Password                    Hostname:
Configure Lockdown Mode               localhost

Configure Management Network          IP Address:
Restart Management Network            10.29.160.251
Test Management Network
Network Restore Options               IPv6 Addresses:
                                      fe80::225:b5ff:feae:9f/64
Configure Keyboard
Troubleshooting Options               To view or modify this host's management network settings in
                                      detail, press <Enter>.
View System Logs

View Support Information

Reset System Configuration

                                      <Enter> More                              <Esc> Log Out
```

Installing the VMWare ESXi client software

1. Using a web browser, visit the url: https://10.29.160.251/
2. Click on Download vSphere Client.

Figure 210 Accessing the ESXi web interface



VMware ESXi
Welcome

Getting Started

If you need to access this host remotely, use the following program to install vSphere Client software. After running the installer, start the client and log in to this host.

Please note that the traditional vSphere Client does not support features added to vSphere in the 5.1 and 5.5 releases. The traditional vSphere Client is intended for use if you need to connect directly to an ESXi host, are performing certain vSphere Update Manager operations, or are running vCenter Plug-ins that support only the vSphere Client such as vCenter Site Recovery Manager or vCenter Multi-Hypervisor Manager.

You can take advantage of the fullest range of functionality introduced or updated in this release by using the vSphere Web Client.

- Download vSphere Client

To streamline your IT operations with vSphere, use the following program to install vCenter. vCenter will help you consolidate and optimize workload distribution across ESX hosts, reduce new system deployment time from weeks to seconds, monitor your virtual computing environment around the clock, avoid service disruptions due to planned hardware maintenance or unexpected failure, centralize access control, and automate system administration tasks.

- Download VMware vCenter

If you need more help, please refer to our documentation library:

- vSphere Documentation

For Administrators

vSphere Remote Command Line

The Remote Command Line allows you to use command line tools to manage vSphere from a client machine. These tools can be used in shell scripts to automate day-to-day operations.

- Download the Virtual Appliance
- Download the Windows Installer (exe)
- Download the Linux Installer (tar.gz)

Web-Based Datastore Browser

Use your web browser to find and download files (for example, virtual machine and virtual disk files).

- Browse datastores in this host's inventory

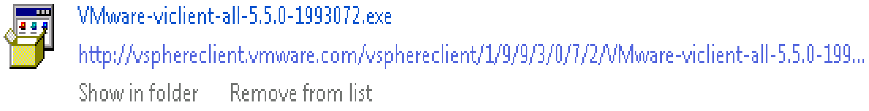
For Developers

vSphere Web Services SDK

Learn about our latest SDKs, Toolkits, and APIs for managing VMware ESX, ESXi, and VMware vCenter. Get sample code, reference documentation, participate in our Forum Discussions, and view our latest Sessions and Webinars.

- Learn more about the Web Services SDK
- Browse objects managed by this host

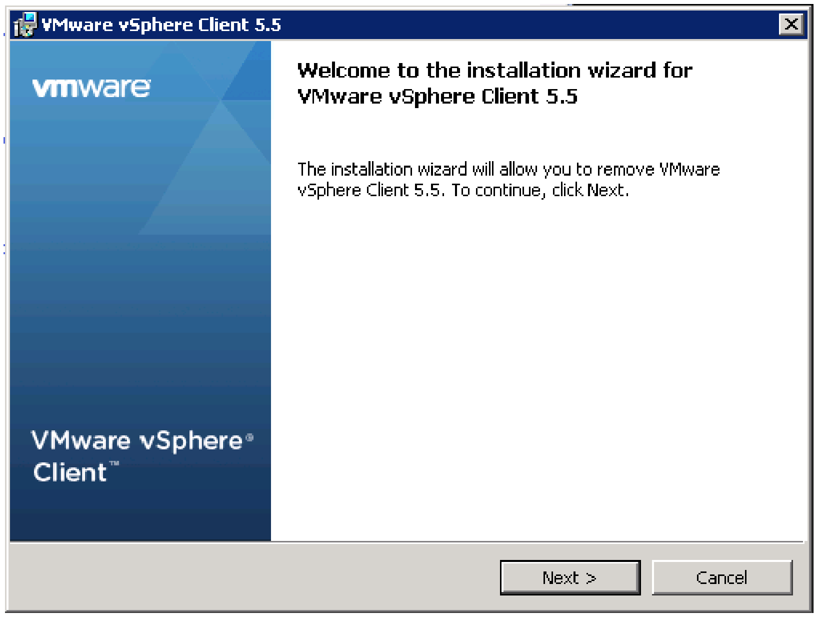
Figure 211 Download the VMWare vSphere ESXI client software



VMware-viclient-all-5.5.0-1993072.exe
http://vsphereclient.vmware.com/vsphereclient/1/9/9/3/0/7/2/VMware-viclient-all-5.5.0-199...
Show in folder Remove from list

3. Proceed to install the downloaded VMWare client software.

Figure 212 Installing the vSphere Client software



VMware vSphere Client 5.5

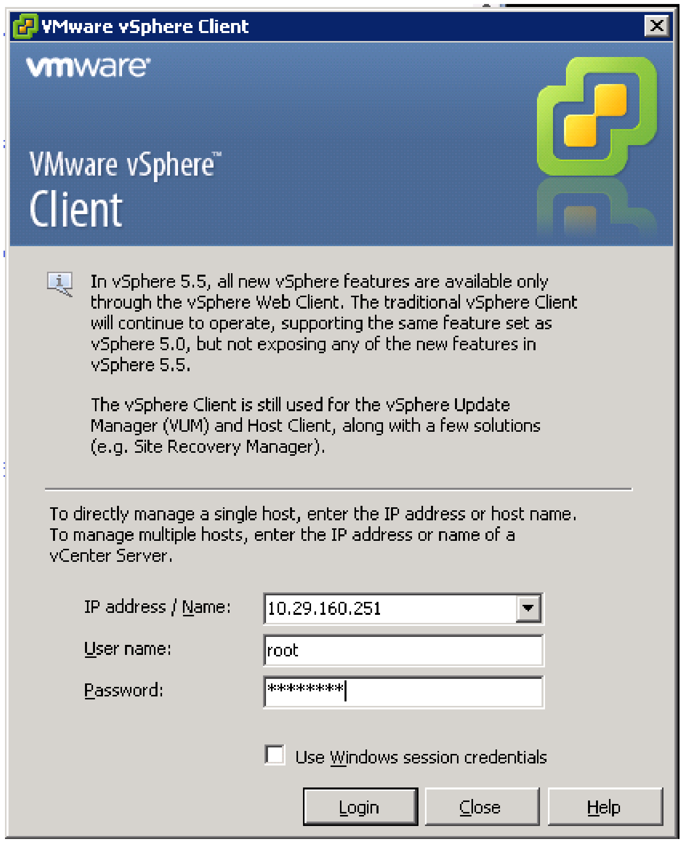
Welcome to the installation wizard for VMware vSphere Client 5.5

The installation wizard will allow you to remove VMware vSphere Client 5.5. To continue, click Next.

Configuring the vSphere ESXi hypervisor

1. After the installation is complete, launch the VMWare vSphere client.
2. Enter the chosen IP address, the username as root, and the chosen password.
3. Click on **Login** to continue.

Figure 213 Logging into the ESXi using vSphere Client



In vSphere 5.5, all new vSphere features are available only through the vSphere Web Client. The traditional vSphere Client will continue to operate, supporting the same feature set as vSphere 5.0, but not exposing any of the new features in vSphere 5.5.

The vSphere Client is still used for the vSphere Update Manager (VUM) and Host Client, along with a few solutions (e.g. Site Recovery Manager).

To directly manage a single host, enter the IP address or host name. To manage multiple hosts, enter the IP address or name of a vCenter Server.

IP address / Name: 10.29.160.251

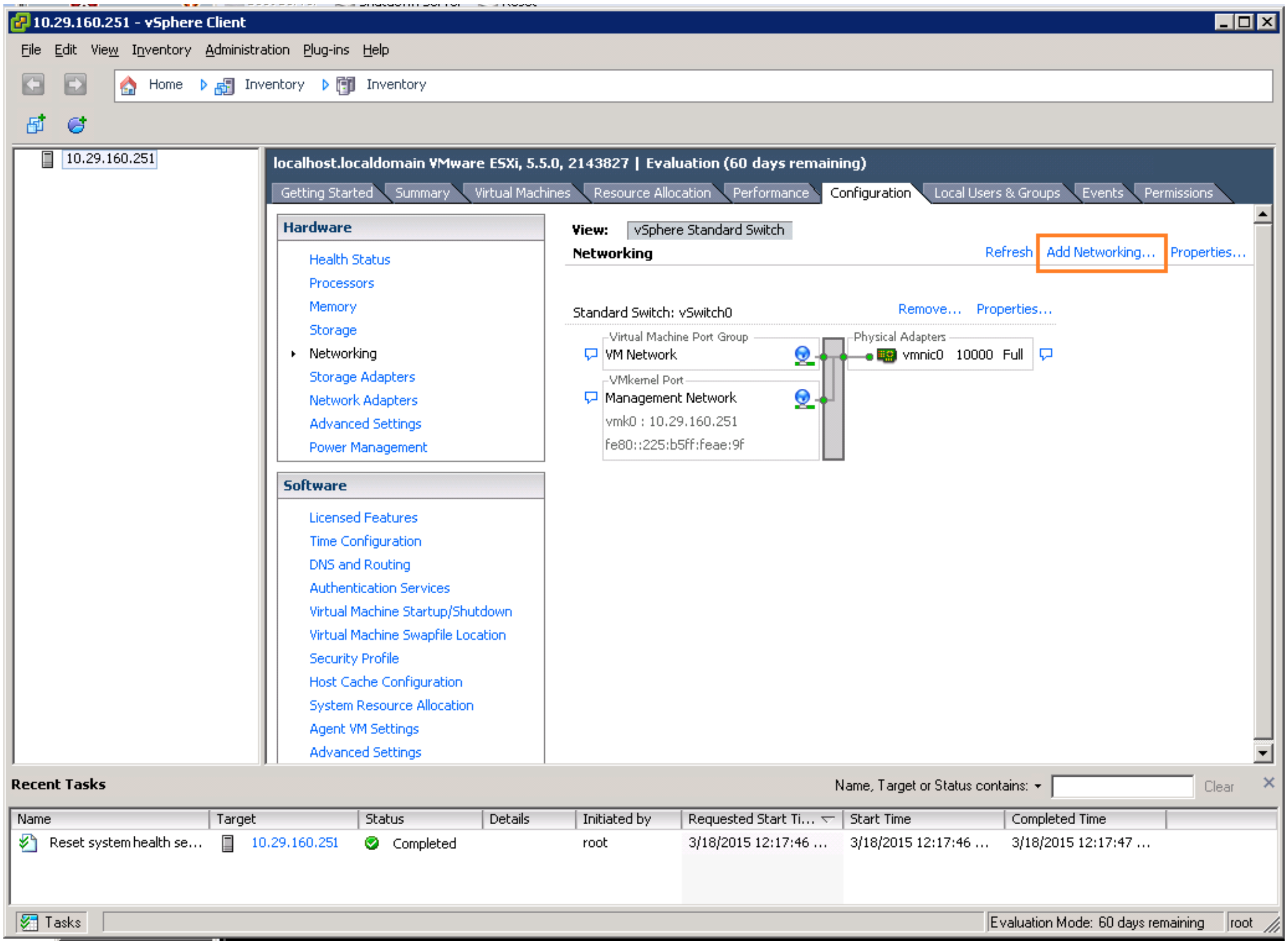
User name: root

Password: *********

□ Use Windows session credentials

4. In the vSphere Client, click on the Configuration tab on the right, and within the Hardware section, click on Networking.
5. Click on Add Networking link on the upper right hand side.

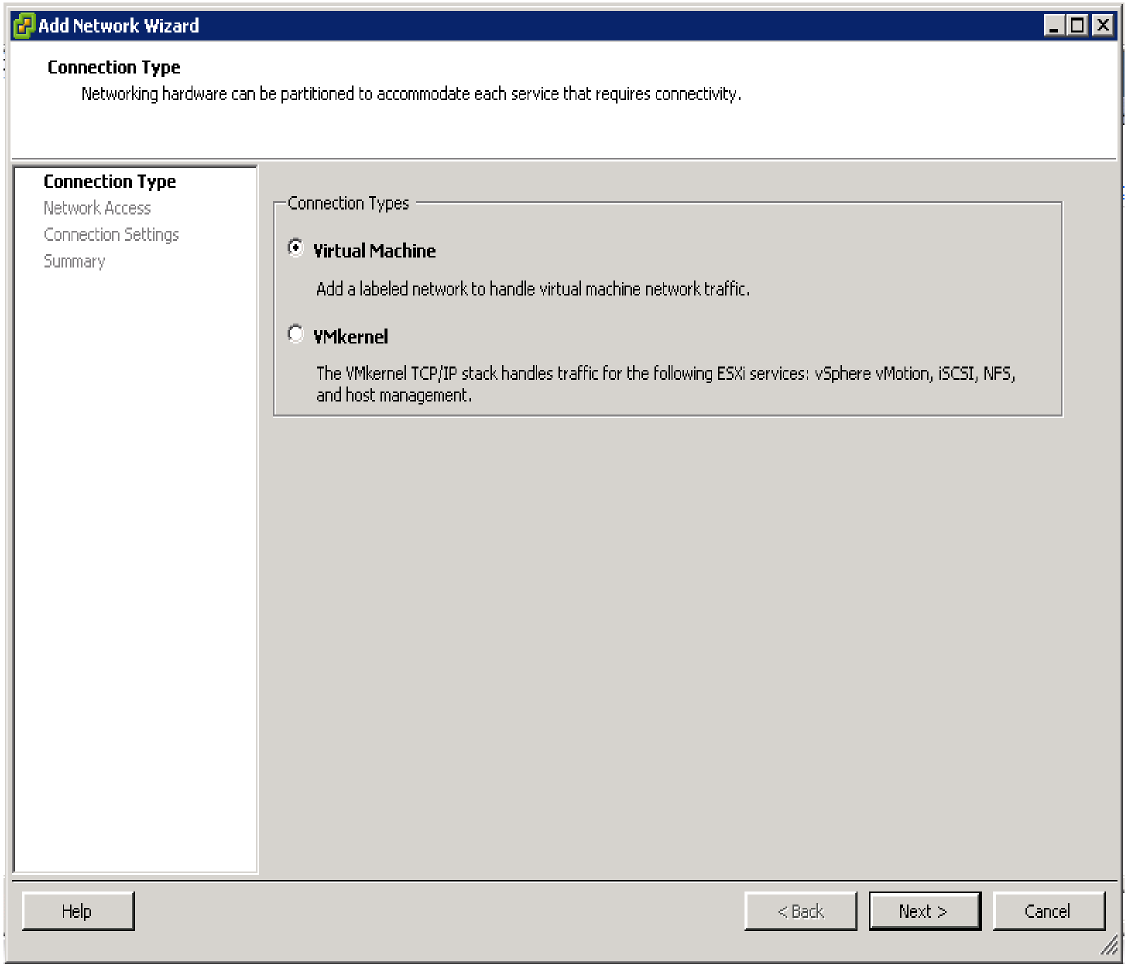
Figure 214 vSphere Client Networking screen



Name	Target	Status	Details	Initiated by	Requested Start Ti...	Start Time	Completed Time
Reset system health se...	10.29.160.251	Completed		root	3/18/2015 12:17:46 ...	3/18/2015 12:17:46 ...	3/18/2015 12:17:47 ...

6. In the Add Networking dialog box, click the **Virtual Machine** radio button and click **Next**.

Figure 215 Adding a new Virtual Machine Network



Connection Type

Networking hardware can be partitioned to accommodate each service that requires connectivity.

Connection Types

● Virtual Machine

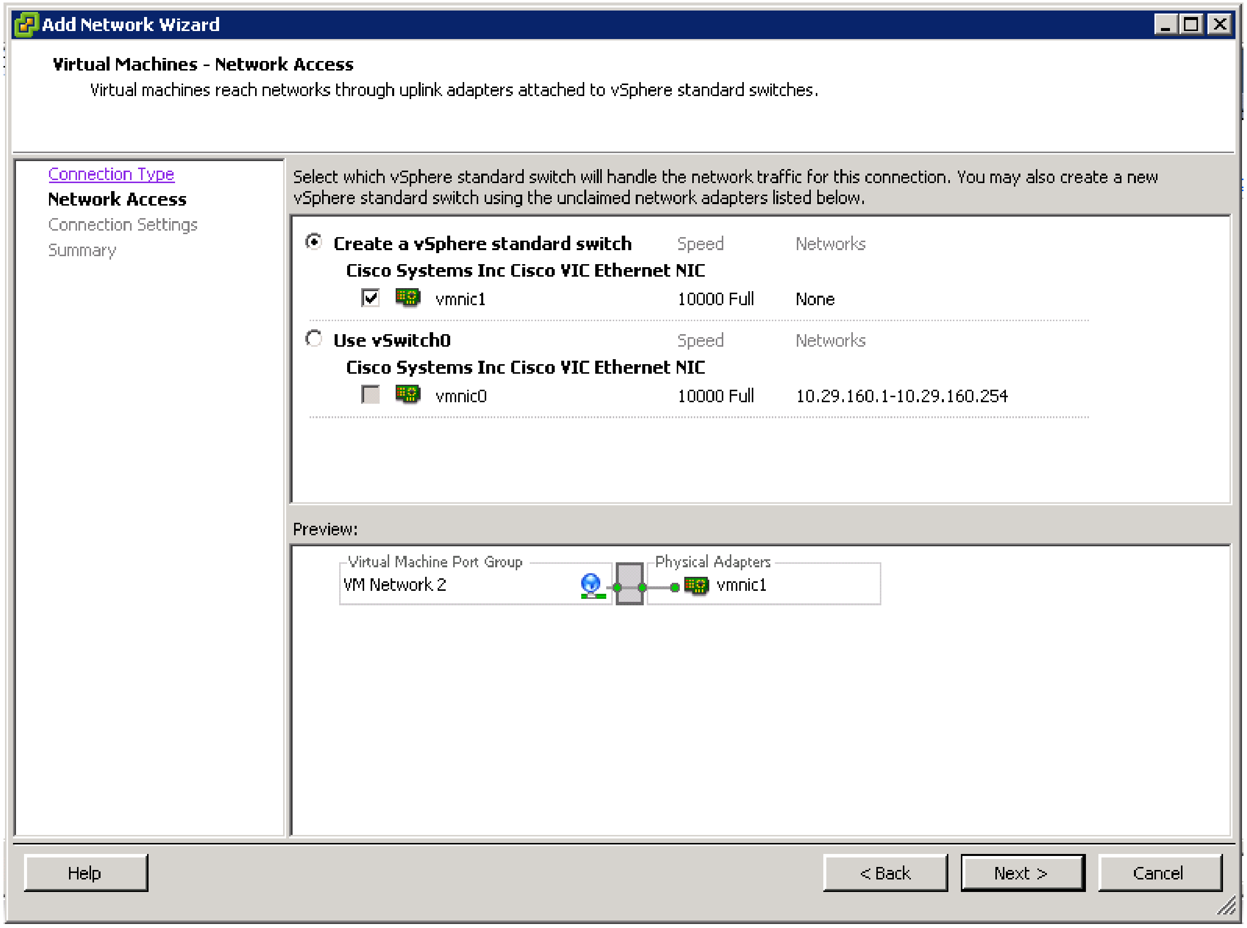
Add a labeled network to handle virtual machine network traffic.

○ VMkernel

The VMkernel TCP/IP stack handles traffic for the following ESXi services: vSphere vMotion, iSCSI, NFS, and host management.

7. Click the **Create a vSphere standard switch** radio button and make sure that the checkbox next to vmnic1 is checked.
8. Click **Next**.

Figure 216 Creating a new vSphere Standard Switch



Virtual Machines - Network Access

Virtual machines reach networks through uplink adapters attached to vSphere standard switches.

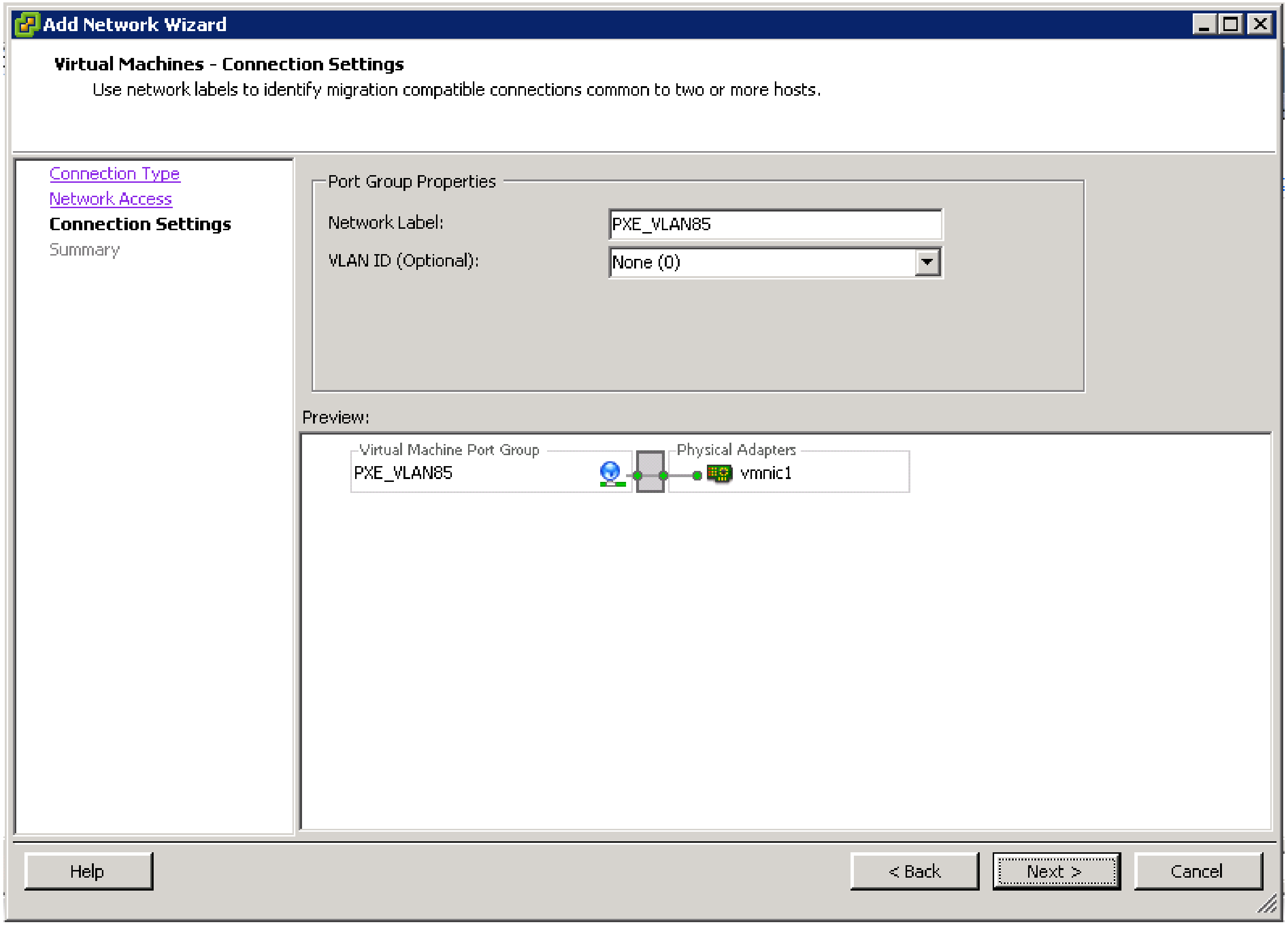
Select which vSphere standard switch will handle the network traffic for this connection. You may also create a new vSphere standard switch using the unclaimed network adapters listed below.

	Speed	Networks
● **Create a vSphere standard switch**		
Cisco Systems Inc Cisco VIC Ethernet NIC		
☑ vmnic1	10000 Full	None
○ **Use vSwitch0**		
Cisco Systems Inc Cisco VIC Ethernet NIC		
□ vmnic0	10000 Full	10.29.160.1-10.29.160.254

Preview:

9. In the Port Group Properties, change the Network Label field to PXE_VLAN85.
10. Leave the VLAN ID(Optional) field as None(0).
11. Click **Next**.

Figure 217 Creating the Port Group for the PXE VLAN



Virtual Machines - Connection Settings

Use network labels to identify migration compatible connections common to two or more hosts.

Port Group Properties

Network Label: PXE_VLAN85

VLAN ID (Optional): None (0)

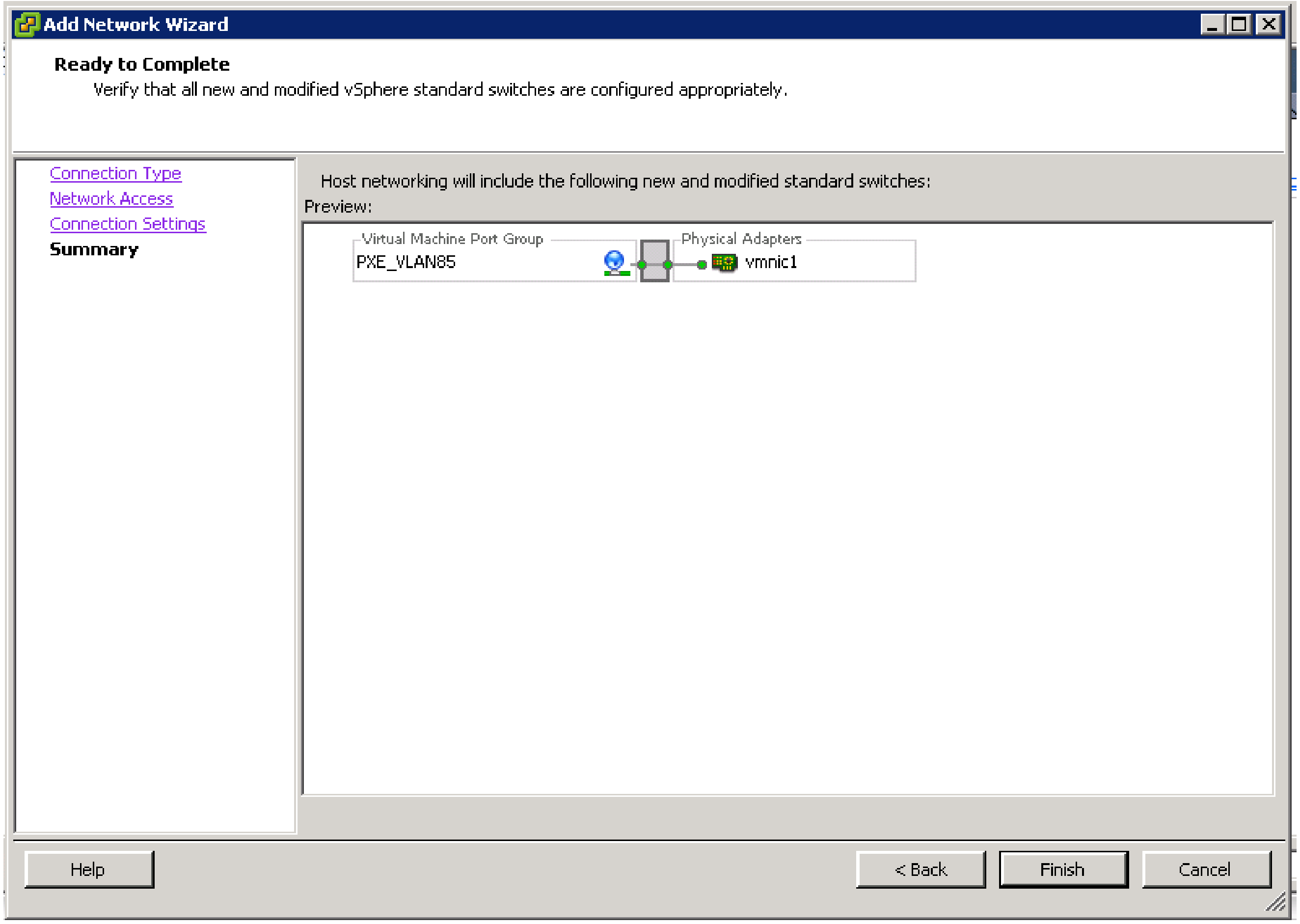
Preview:

Virtual Machine Port Group: PXE_VLAN85

Physical Adapters: vmnic1

12. Click **Finish** to complete adding the Network.

Figure 218 Verify the Created vSphere Standard Switches



Ready to Complete

Verify that all new and modified vSphere standard switches are configured appropriately.

Host networking will include the following new and modified standard switches:

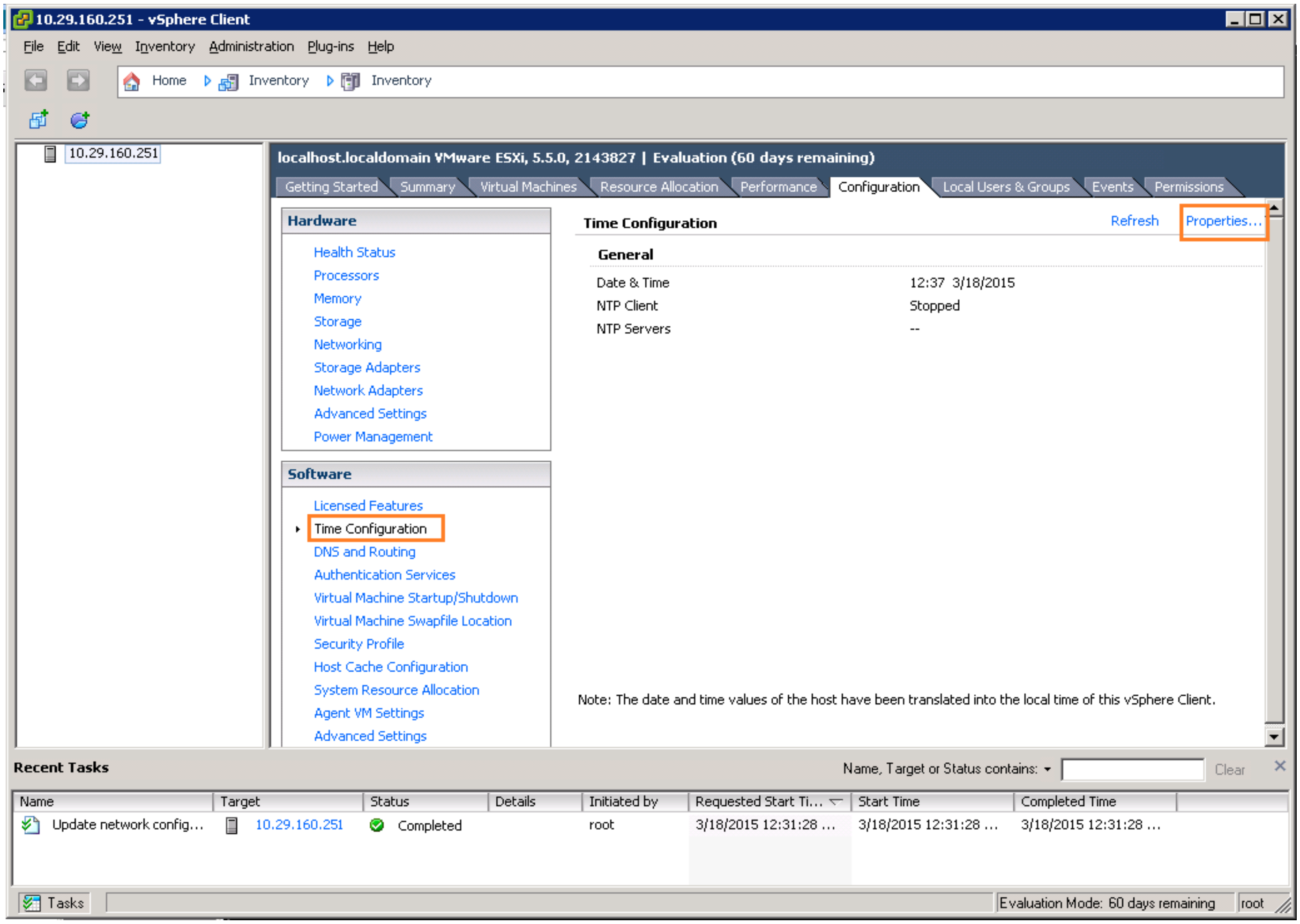
Preview:

Virtual Machine Port Group: PXE_VLAN85

Physical Adapters: vmnic1

13. Click on the **Time Configuration** under the Software section.
14. Click on **Properties** at the upper right hand corner.

Figure 219 Enabling the NTP Client on the ESXi



10.29.160.251 - vSphere Client
File Edit View Inventory Administration Plug-ins Help
Home Inventory Inventory
10.29.160.251
localhost.localdomain VMware ESXi, 5.5.0, 2143827 | Evaluation (60 days remaining)
Getting Started Summary Virtual Machines Resource Allocation Performance Configuration Local Users & Groups Events Permissions
Hardware
Health Status
Processors
Memory
Storage
Networking
Storage Adapters
Network Adapters
Advanced Settings
Power Management
Software
Licensed Features
Time Configuration
DNS and Routing
Authentication Services
Virtual Machine Startup/Shutdown
Virtual Machine Swapfile Location
Security Profile
Host Cache Configuration
System Resource Allocation
Agent VM Settings
Advanced Settings
Refresh
Properties...
Recent Tasks
Name, Target or Status contains:
Clear
Tasks
Evaluation Mode: 60 days remaining
root

Time Configuration

General

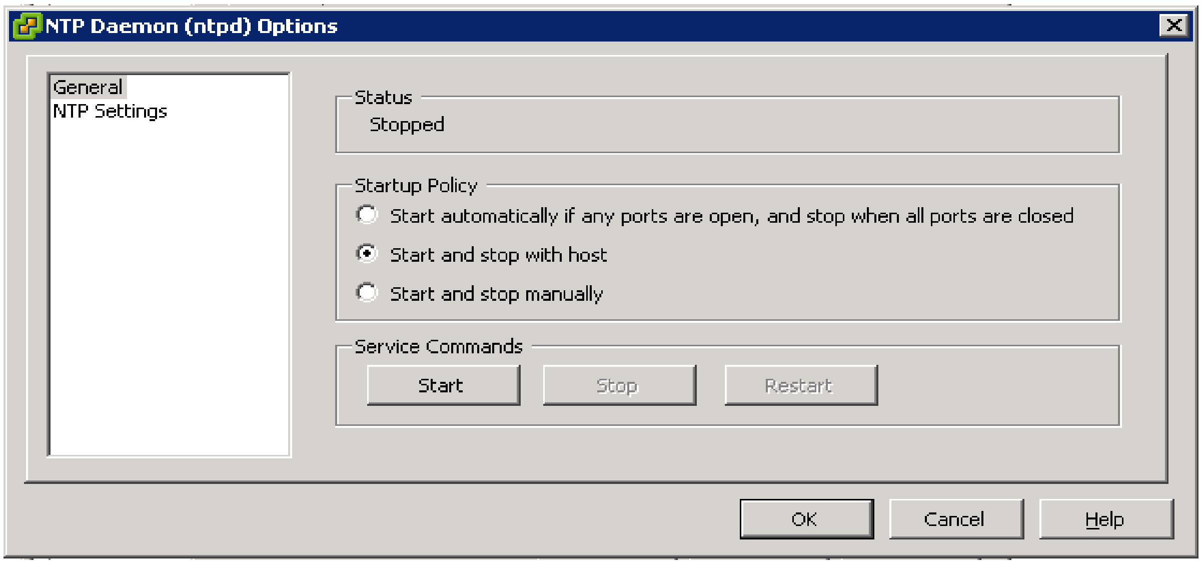
Date & Time	12:37 3/18/2015
NTP Client	Stopped
NTP Servers	--

Note: The date and time values of the host have been translated into the local time of this vSphere Client.

Name	Target	Status	Details	Initiated by	Requested Start Ti...	Start Time	Completed Time
Update network config...	10.29.160.251	Completed		root	3/18/2015 12:31:28 ...	3/18/2015 12:31:28 ...	3/18/2015 12:31:28 ...

15. In the NTP Daemon (ntpd) Options dialog box, click **Options**.
16. Click on the **General** options.
17. Click to select the start and stop with **host** radio button.

Figure 220 NTP Daemon


NTP Daemon (ntpd) Options

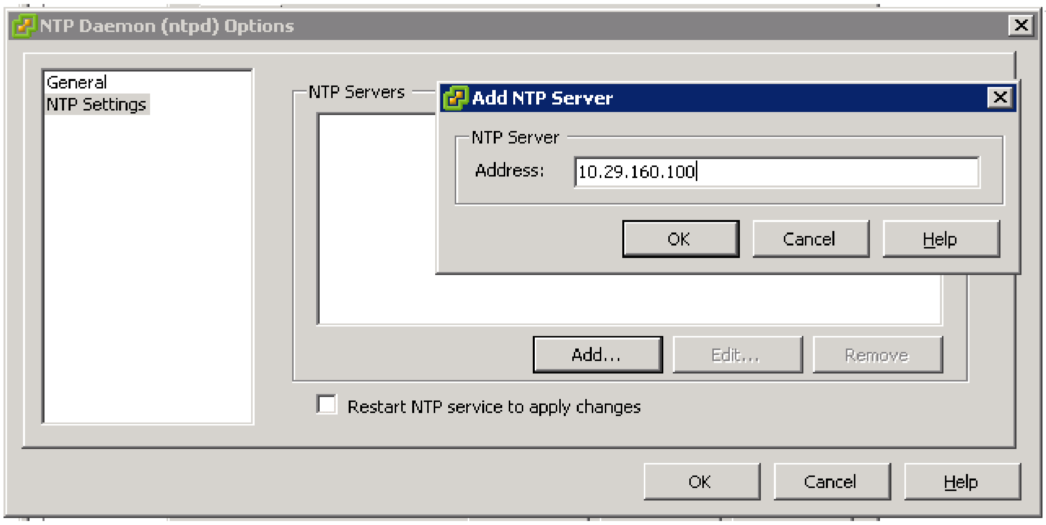
General
NTP Settings

Status
Stopped

Startup Policy
○ Start automatically if any ports are open, and stop when all ports are closed
● Start and stop with host
○ Start and stop manually

18. Click on **NTP** Settings option.
19. Click on **Add** button to add the NTP server’s IP address.
20. Press **OK** to continue.

Figure 221 Adding a new NTP Server to the ESXi NTP Settings


NTP Daemon (ntpd) Options

General
NTP Settings

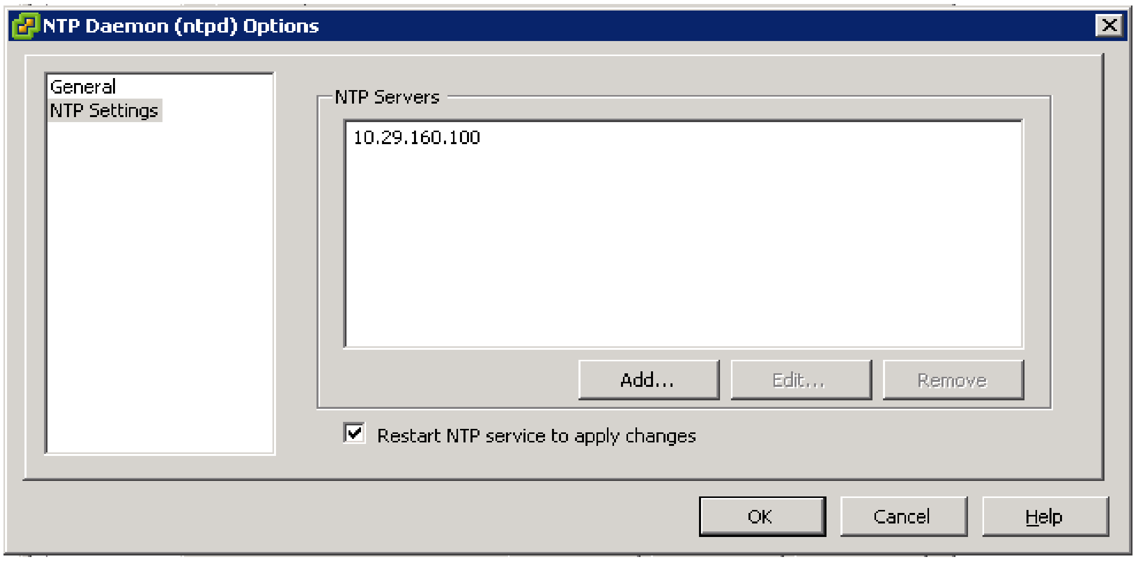
Add NTP Server

NTP Server
Address: 10.29.160.100

□ Restart NTP service to apply changes

21. In the next screen, verify the IP-address in the NTP Servers list.
22. Click on the checkbox **Restart NTP service to apply changes**.
23. Press the button **OK** twice to complete the time configurations.

Figure 222 Restart NTP Service



NTP Daemon (ntpd) Options

General
NTP Settings

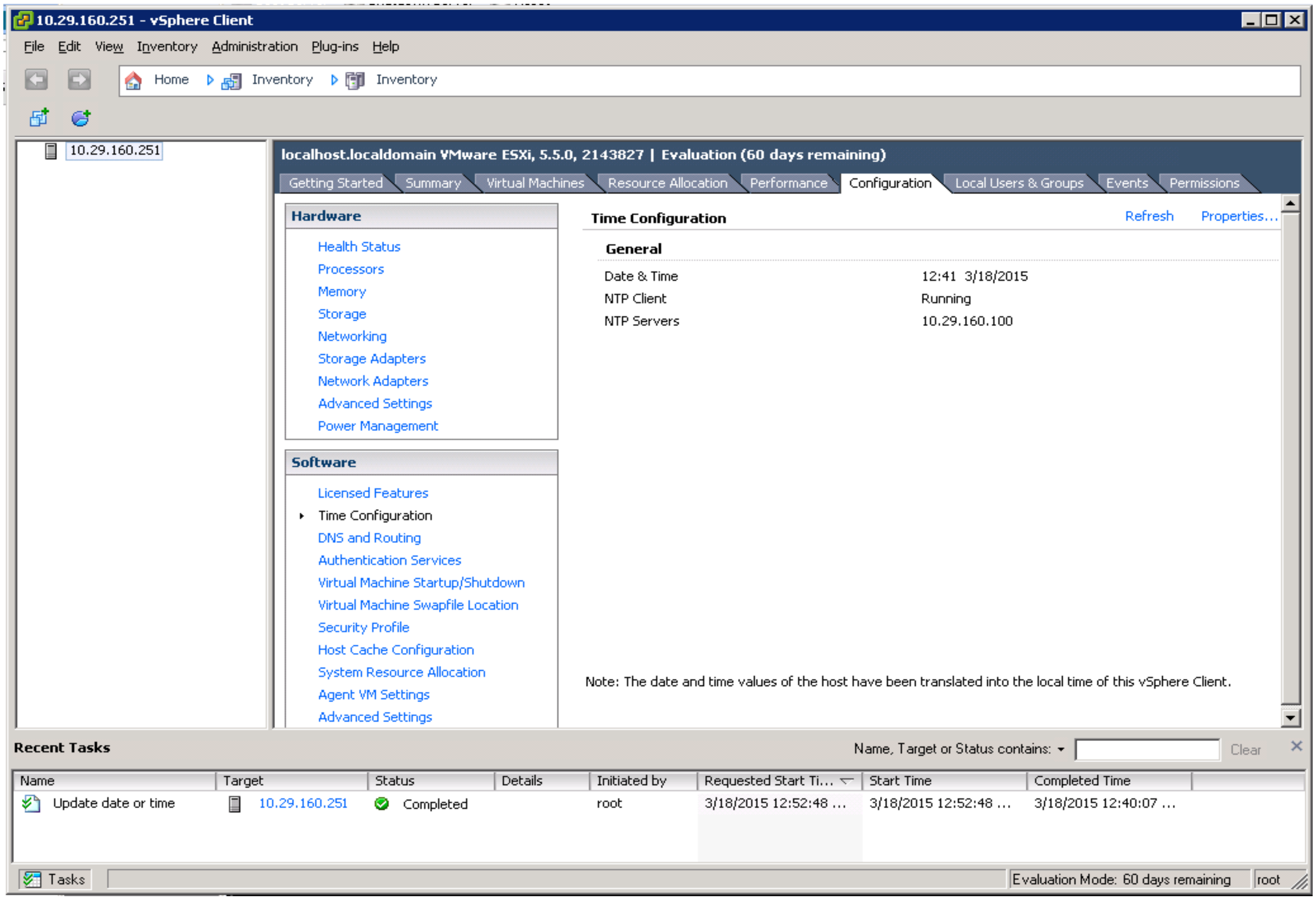
NTP Servers

10.29.160.100

☑ Restart NTP service to apply changes

24. Time configuration option would now show that the NTP client is running, along with the IP address of the NTP client.

Figure 223 Verifying the NTP Client



Time Configuration

General

Date & Time	12:41 3/18/2015
NTP Client	Running
NTP Servers	10.29.160.100

Note: The date and time values of the host have been translated into the local time of this vSphere Client.

Name	Target	Status	Details	Initiated by	Requested Start Ti...	Start Time	Completed Time
Update date or time	10.29.160.251	Completed		root	3/18/2015 12:52:48 ...	3/18/2015 12:52:48 ...	3/18/2015 12:40:07 ...

Downloading the UCS Director Express Software Components

The software components of UCS Director Express for Big Data need to be downloaded from three different locations.

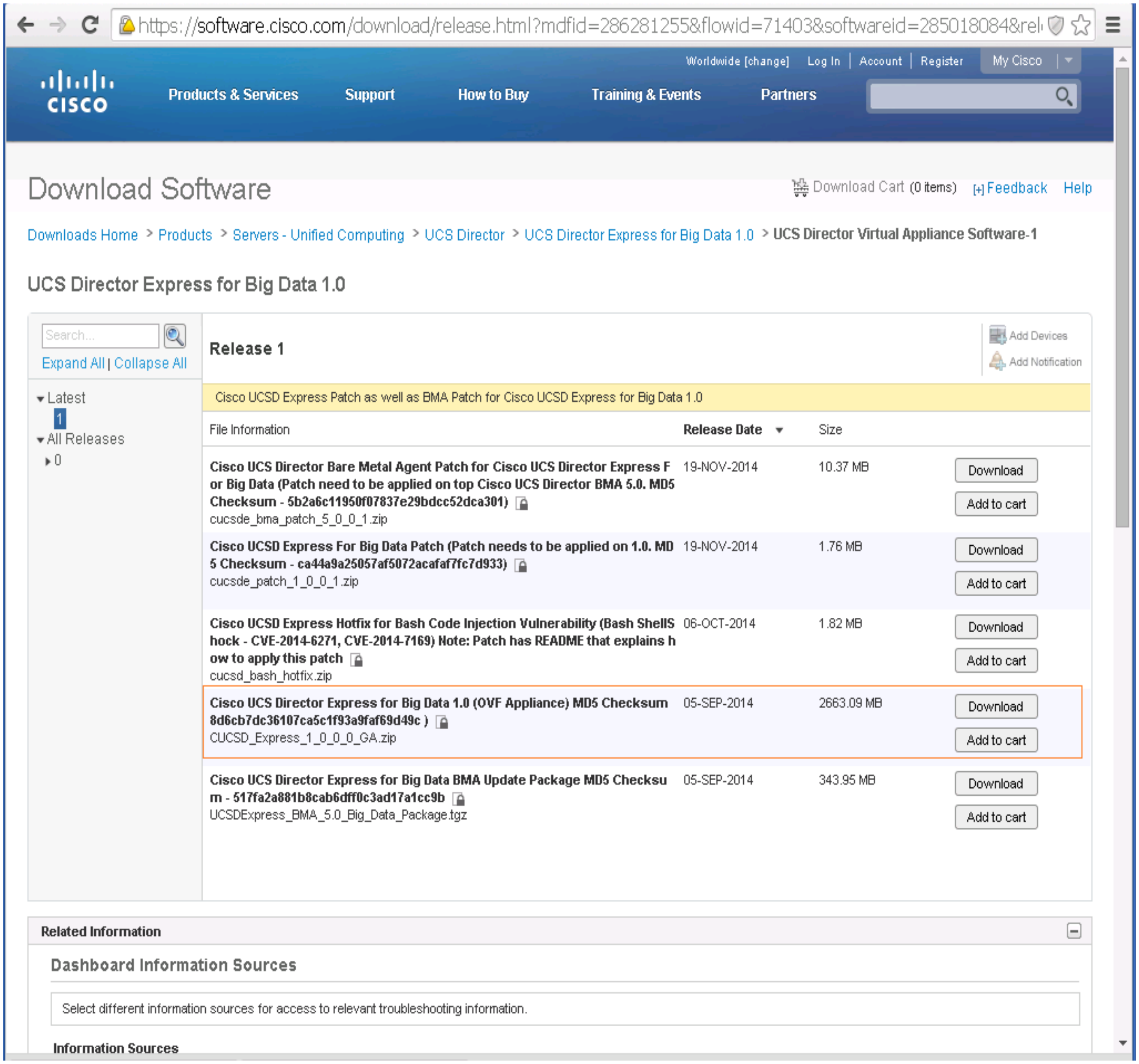
Table 20 Cisco UCS Director Express Big Data 1.1 Software Components

Software component	File Names	Link to Download
Cisco UCS Director Express 1.0 OVF	CUCSD_Express_1_0_0_0_GA.zip	https://software.cisco.com/download/release.html?mdfid=286281255&flowid=71403&softwareid=285018084&release=1&relind=AVAILABLE&rellifecycle=&reltype=latest
Cisco UCS Director 5.2.0.1 patch	cucsd_patch_5_2_0_1.zIP	https://software.cisco.com/download/release.html?mdfid=286283454&flowid=72903&softwareid=285018084&release=5&relind=AVAILABLE&rellifecycle=&reltype=latest
Cisco UCS Director Baremetal Agent 5.2 OVF	CUCSD_BMA_5_2_0_0_VMWARE_GA.zip	
Cisco UCS Director Express for Big Data 1.1 Upgrade Package	UCSDExpress_Big_Data_1.1_Upgrade_Package.zip	https://software.cisco.com/download/release.html?mdfid=286284995&flowid=73724&softwareid=285018084&release=1&relind=AVAILABLE&rellifecycle=&reltype=latest
25. Cisco UCS Director Express for Big Data BMA Update Package	UCSDExpress_BMA_Big_Data_1.1_Upgrade_Package.zip	

Download the Software Components

1. Using the links provided Table 15 above, download the Cisco UCS Director Express for Big Data 1.1 OVF Appliance zip file.

Figure 224 Cisco UCS Director Express for Big Data 1.0 Download Page



https://software.cisco.com/download/release.html?mdfid=286281255&flowid=71403&softwareid=285018084&rel

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Downloads Home > Products > Servers - Unified Computing > UCS Director > UCS Director Express for Big Data 1.0 > UCS Director Virtual Appliance Software-1

UCS Director Express for Big Data 1.0

Search...
Expand All | Collapse All
Latest
1
All Releases
0
Add Devices
Add Notification

Release 1

Cisco UCSD Express Patch as well as BMA Patch for Cisco UCSD Express for Big Data 1.0

File Information	Release Date	Size	
Cisco UCS Director Bare Metal Agent Patch for Cisco UCS Director Express For Big Data (Patch need to be applied on top Cisco UCS Director BMA 5.0. MD5 Checksum - 5b2a6c11950f07837e29bdcc52dca301) cucsde_bma_patch_5_0_0_1.zip	19-NOV-2014	10.37 MB	Download Add to cart
Cisco UCSD Express For Big Data Patch (Patch needs to be applied on 1.0. MD5 Checksum - ca44a9a25057af5072acafaf7fc7d933) cucsde_patch_1_0_0_1.zip	19-NOV-2014	1.76 MB	Download Add to cart
Cisco UCSD Express Hotfix for Bash Code Injection Vulnerability (Bash Shellshock - CVE-2014-6271, CVE-2014-7169) Note: Patch has README that explains how to apply this patch cucsd_bash_hotfix.zip	06-OCT-2014	1.82 MB	Download Add to cart
Cisco UCS Director Express for Big Data 1.0 (OVF Appliance) MD5 Checksum 8d6cb7dc36107ca5c1f93a9faf69d49c) CUCSD_Express_1_0_0_0_GA.zip	05-SEP-2014	2663.09 MB	Download Add to cart
Cisco UCS Director Express for Big Data BMA Update Package MD5 Checksum - 517fa2a881b8cab6dff0c3ad17a1cc9b UCSDExpress_BMA_5.0_Big_Data_Package.tgz	05-SEP-2014	343.95 MB	Download Add to cart

Related Information

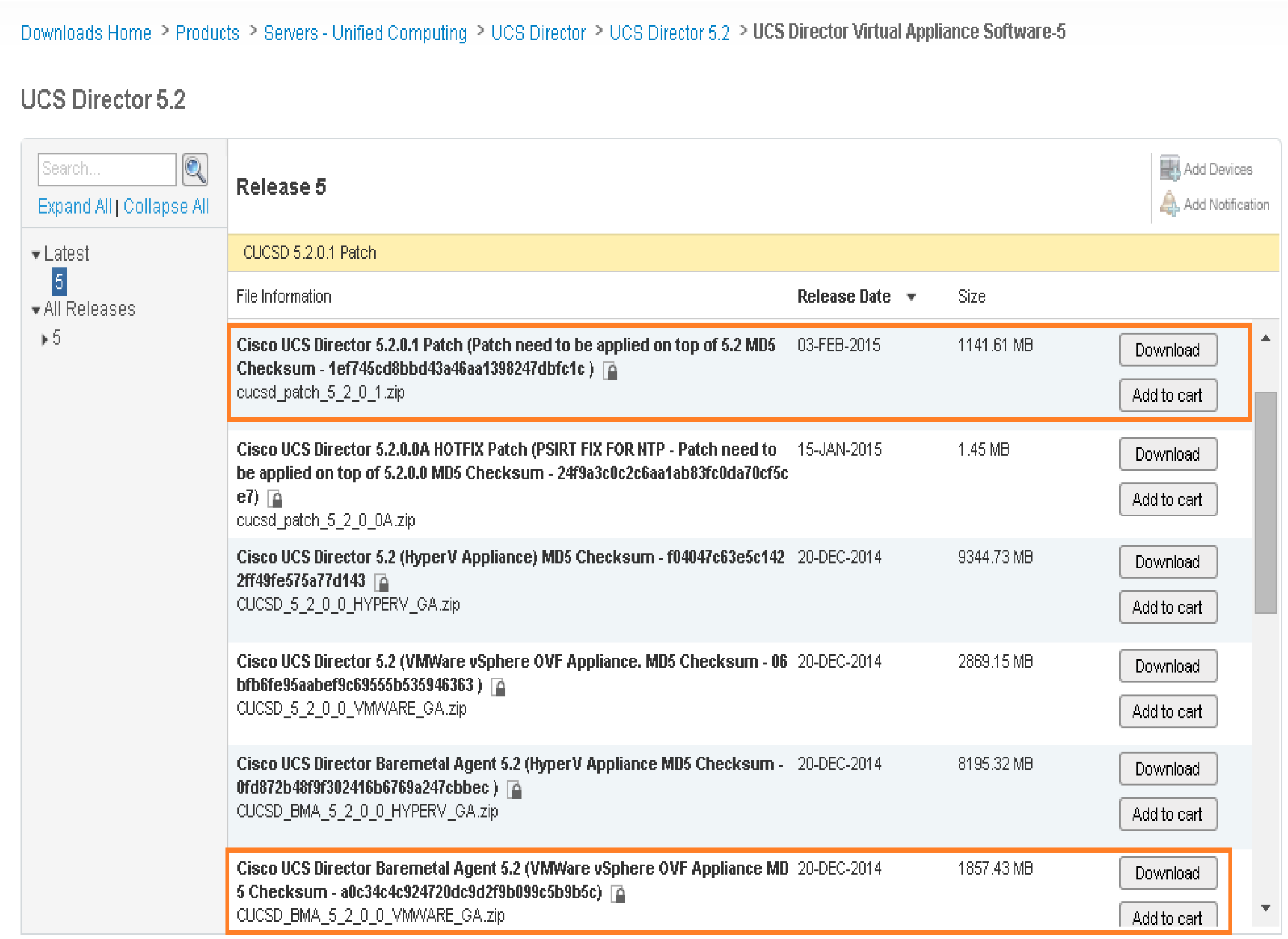
Dashboard Information Sources

Select different information sources for access to relevant troubleshooting information.

Information Sources

2. Using the links provided Table 15 above; download the Cisco UCS Director 5.2.0.1 Patch zip file, and Cisco UCS Director Baremetal Agent 5.2 VMware vSphere OVF Appliance zip file.

Figure 225 Cisco UCS Director 5.2 Download Page



Downloads Home > Products > Servers - Unified Computing > UCS Director > UCS Director 5.2 > UCS Director Virtual Appliance Software-5

UCS Director 5.2

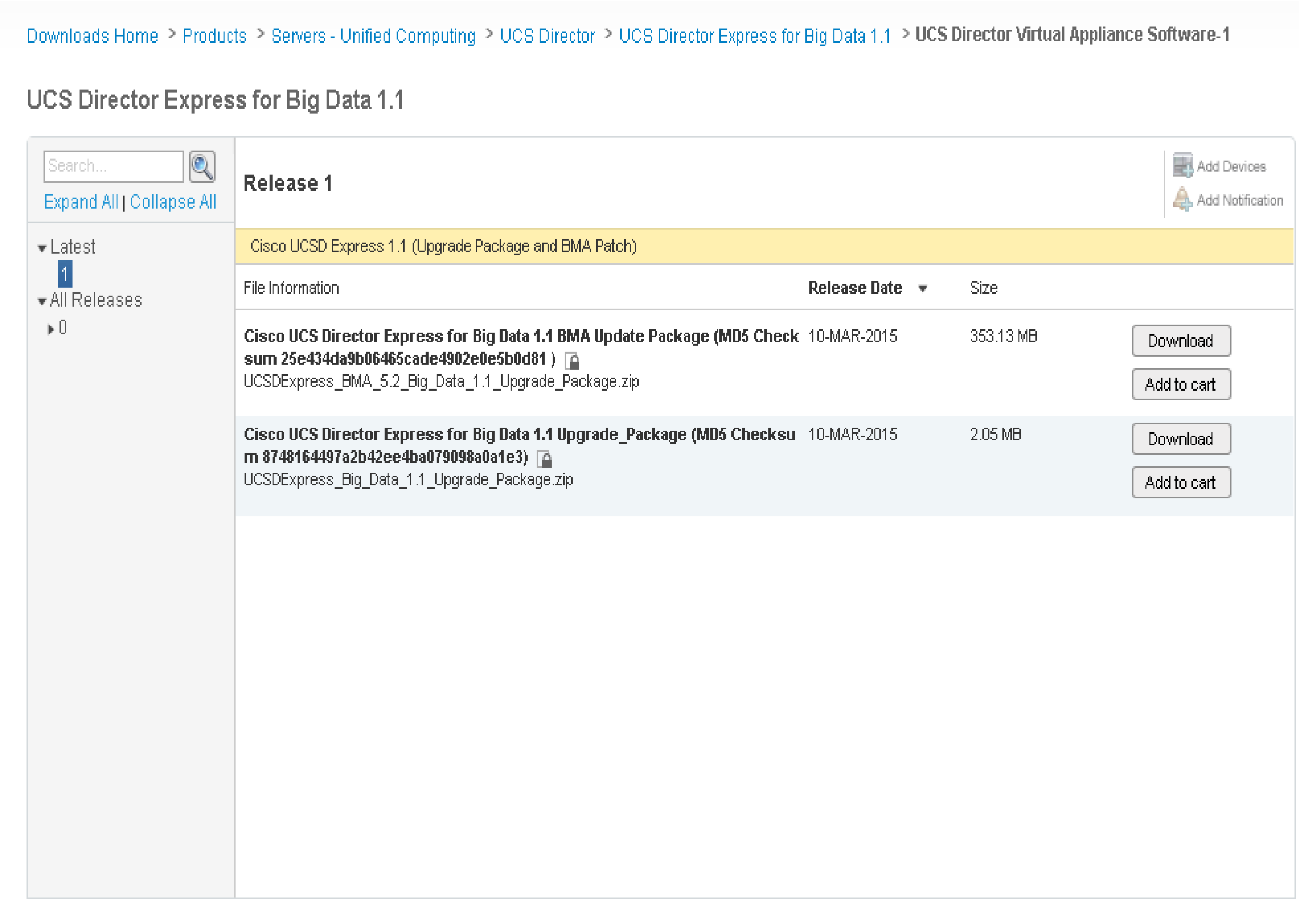
Release 5

CUCSD 5.2.0.1 Patch

File Information	Release Date	Size	
Cisco UCS Director 5.2.0.1 Patch (Patch need to be applied on top of 5.2 MD5 Checksum - 1ef745cd8bbd43a46aa1398247dbfc1c) cucsd_patch_5_2_0_1.zip	03-FEB-2015	1141.61 MB	Download Add to cart
Cisco UCS Director 5.2.0.0A HOTFIX Patch (PSIRT FIX FOR NTP - Patch need to be applied on top of 5.2.0.0 MD5 Checksum - 24f9a3c0c2c6aa1ab83fc0da70cf5ce7) cucsd_patch_5_2_0_0A.zip	15-JAN-2015	1.45 MB	Download Add to cart
Cisco UCS Director 5.2 (HyperV Appliance) MD5 Checksum - f04047c63e5c1422ff49fe575a77d143 CUCSD_5_2_0_0_HYPERV_GA.zip	20-DEC-2014	9344.73 MB	Download Add to cart
Cisco UCS Director 5.2 (VMWare vSphere OVF Appliance. MD5 Checksum - 06bfb6fe95aabef9c69555b535946363) CUCSD_5_2_0_0_VMWARE_GA.zip	20-DEC-2014	2869.15 MB	Download Add to cart
Cisco UCS Director Baremetal Agent 5.2 (HyperV Appliance MD5 Checksum - 0fd872b48f9f302416b6769a247cbbec) CUCSD_BMA_5_2_0_0_HYPERV_GA.zip	20-DEC-2014	8195.32 MB	Download Add to cart
Cisco UCS Director Baremetal Agent 5.2 (VMWare vSphere OVF Appliance MD5 Checksum - a0c34c4c924720dc9d2f9b099c5b9b5c) CUCSD_BMA_5_2_0_0_VMWARE_GA.zip	20-DEC-2014	1857.43 MB	Download Add to cart

3. Using the links provided Table 21 above; download the Cisco UCS Director 5.2.0.1 Patch zip file, and the Cisco UCS Director Baremetal Agent 5.2 VMWare vSphere OVF Appliance zip file.

Figure 226 Cisco UCS Director Express for Big Data 1.1 Download Page


Downloads Home > Products > Servers - Unified Computing > UCS Director > UCS Director Express for Big Data 1.1 > UCS Director Virtual Appliance Software-1
UCS Director Express for Big Data 1.1
Search...
Expand All | Collapse All
Latest
1
All Releases
0
Release 1
Add Devices
Add Notification

Cisco UCSD Express 1.1 (Upgrade Package and BMA Patch)

File Information	Release Date	Size	
Cisco UCS Director Express for Big Data 1.1 BMA Update Package (MD5 Checksum 25e434da9b06465cade4902e0e5b0d81) UCSDExpress_BMA_5.2_Big_Data_1.1_Upgrade_Package.zip	10-MAR-2015	353.13 MB	Download Add to cart
Cisco UCS Director Express for Big Data 1.1 Upgrade_Package (MD5 Checksum 8748164497a2b42ee4ba079098a0a1e3) UCSDExpress_Big_Data_1.1_Upgrade_Package.zip	10-MAR-2015	2.05 MB	Download Add to cart

4. Please all the files in a directory in the client windows workstation.
5. Unzip the contents of the CUCSD_Express_1_0_0_0_GA.zip and CUCSD_BMA_5_2_0_0_VMWARE_GA.zip.

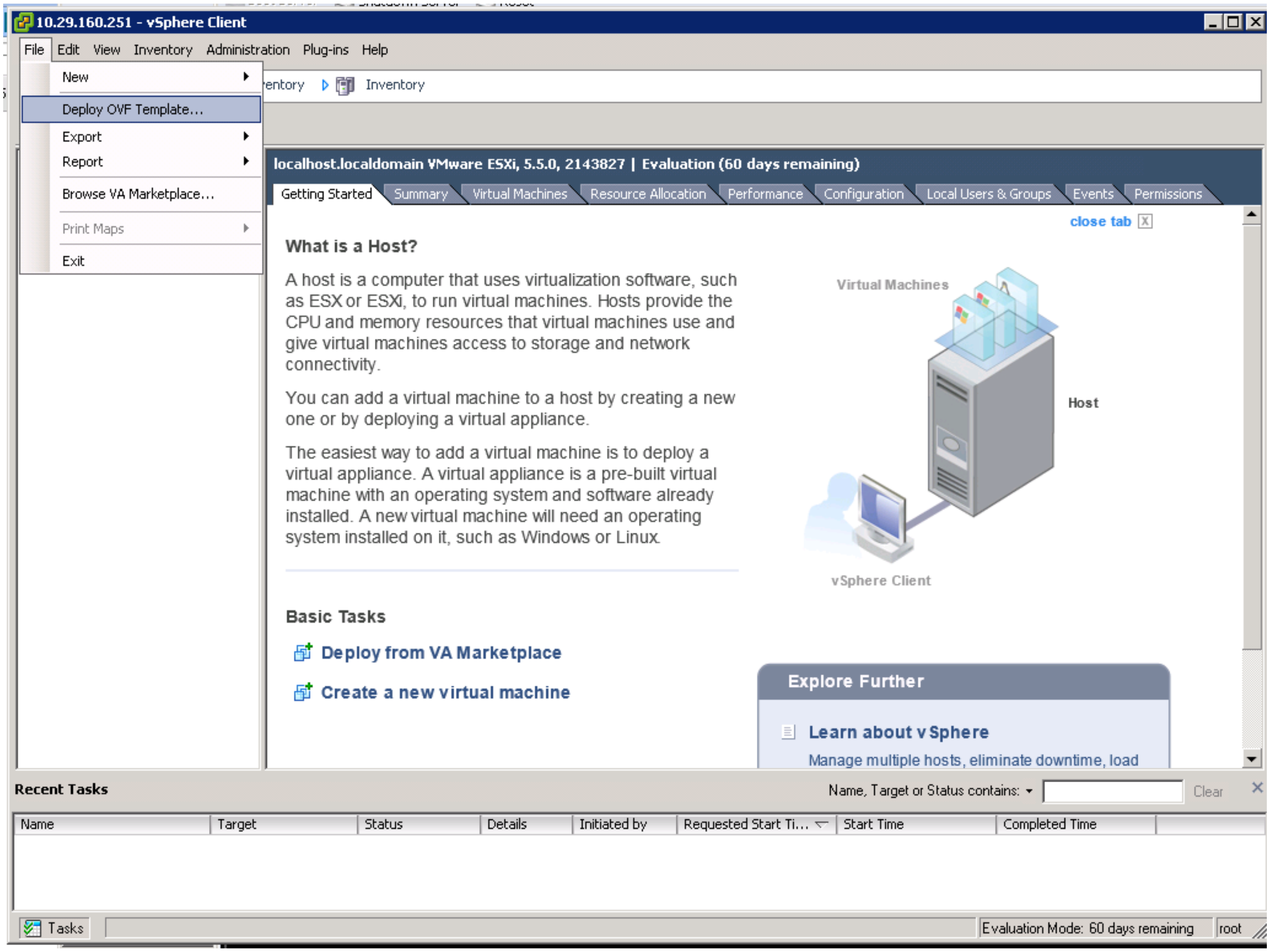
Installing Cisco UCS Director Express for Big Data

The Cisco UCS Director Express for Big Data shall be installed on the VMWare vSphere hypervisor using the vSphere Client software.

Deploying the Cisco UCS Director Baremetal Agent OVF

1. Launch the VMWare vSphere client software
2. Enter the chosen IP address, the username as root, and the chosen password.
3. Click on **Login** to continue.
4. From the **File** menu, Select **Deploy OVF Template**.

Figure 227 Deploy OVF in the vSphere Client



What is a Host?

A host is a computer that uses virtualization software, such as ESX or ESXi, to run virtual machines. Hosts provide the CPU and memory resources that virtual machines use and give virtual machines access to storage and network connectivity.

You can add a virtual machine to a host by creating a new one or by deploying a virtual appliance.

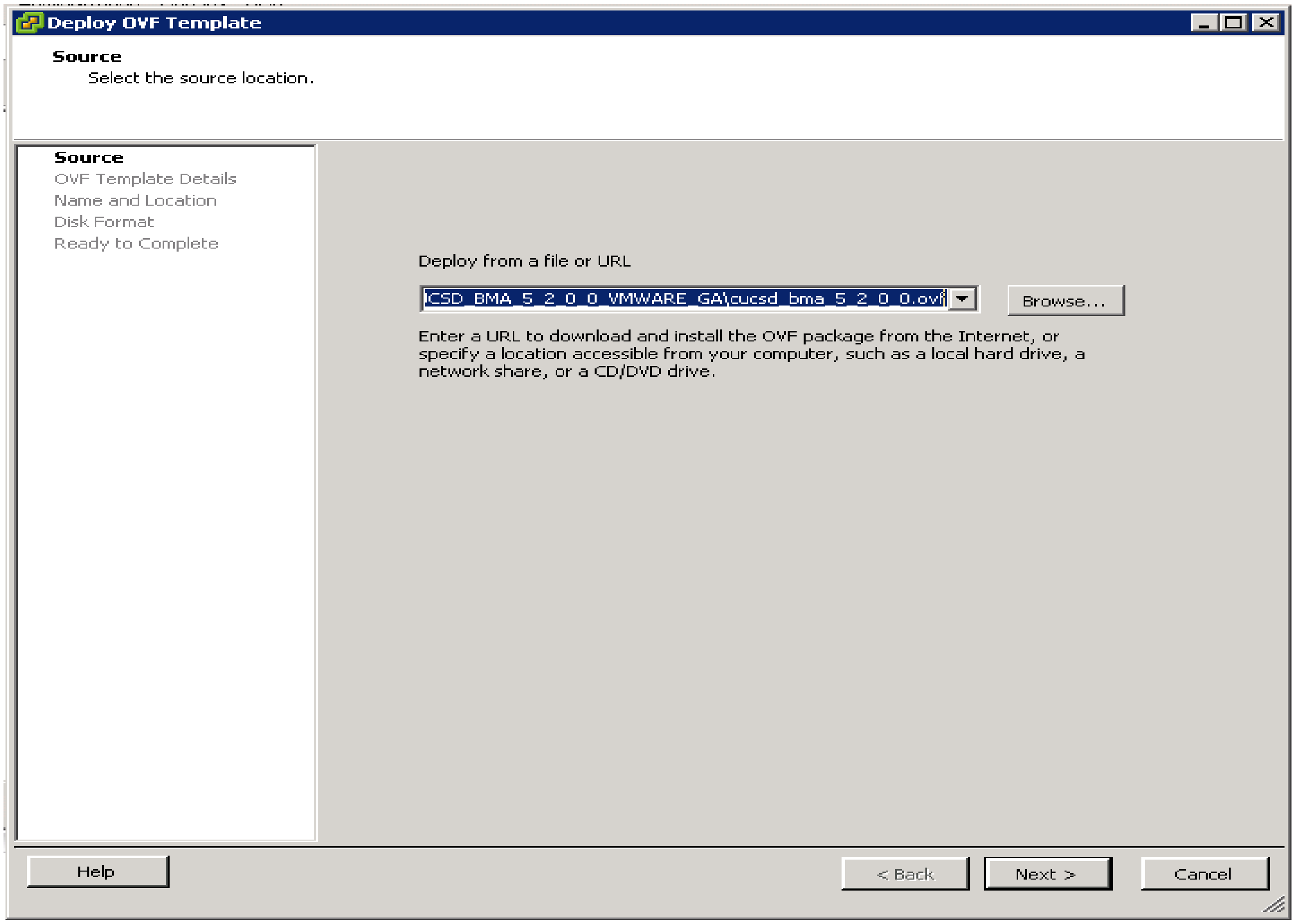
The easiest way to add a virtual machine is to deploy a virtual appliance. A virtual appliance is a pre-built virtual machine with an operating system and software already installed. A new virtual machine will need an operating system installed on it, such as Windows or Linux.

Basic Tasks

Manage multiple hosts, eliminate downtime, load

5. Choose the Cisco UCS Director Baremetal Agent 5.2.0.0 OVF template. Click **Open**.
6. Click **Next** to continue.

Figure 228 Select the Cisco UCS Director Baremetal Agent OVF file



Deploy from a file or URL

ICSD_BMA_5_2_0_0_VMWARE_GA\cucsd_bma_5_2_0_0.ovf

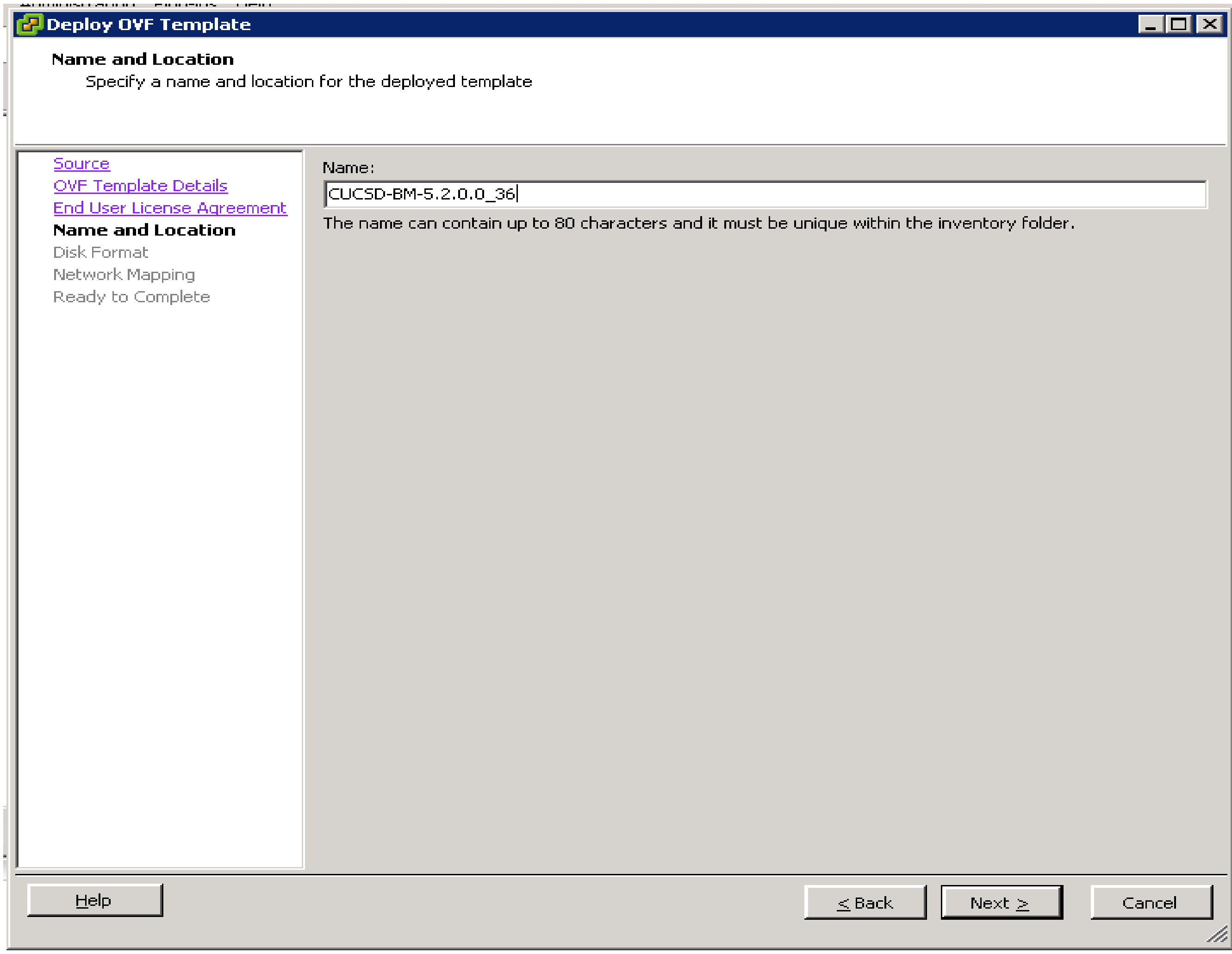
Enter a URL to download and install the OVF package from the Internet, or specify a location accessible from your computer, such as a local hard drive, a network share, or a CD/DVD drive.

7. Review the details of the OVF template, Click **Next**.

8. Accept the End User License Agreement. Click **Next** to continue.

9. In the **Name and Location** option, Enter the name of the VM. Click **Next** to continue.

Figure 229 Enter Cisco UCS Director Baremetal Agent VM Name



Deploy OVF Template

Name and Location

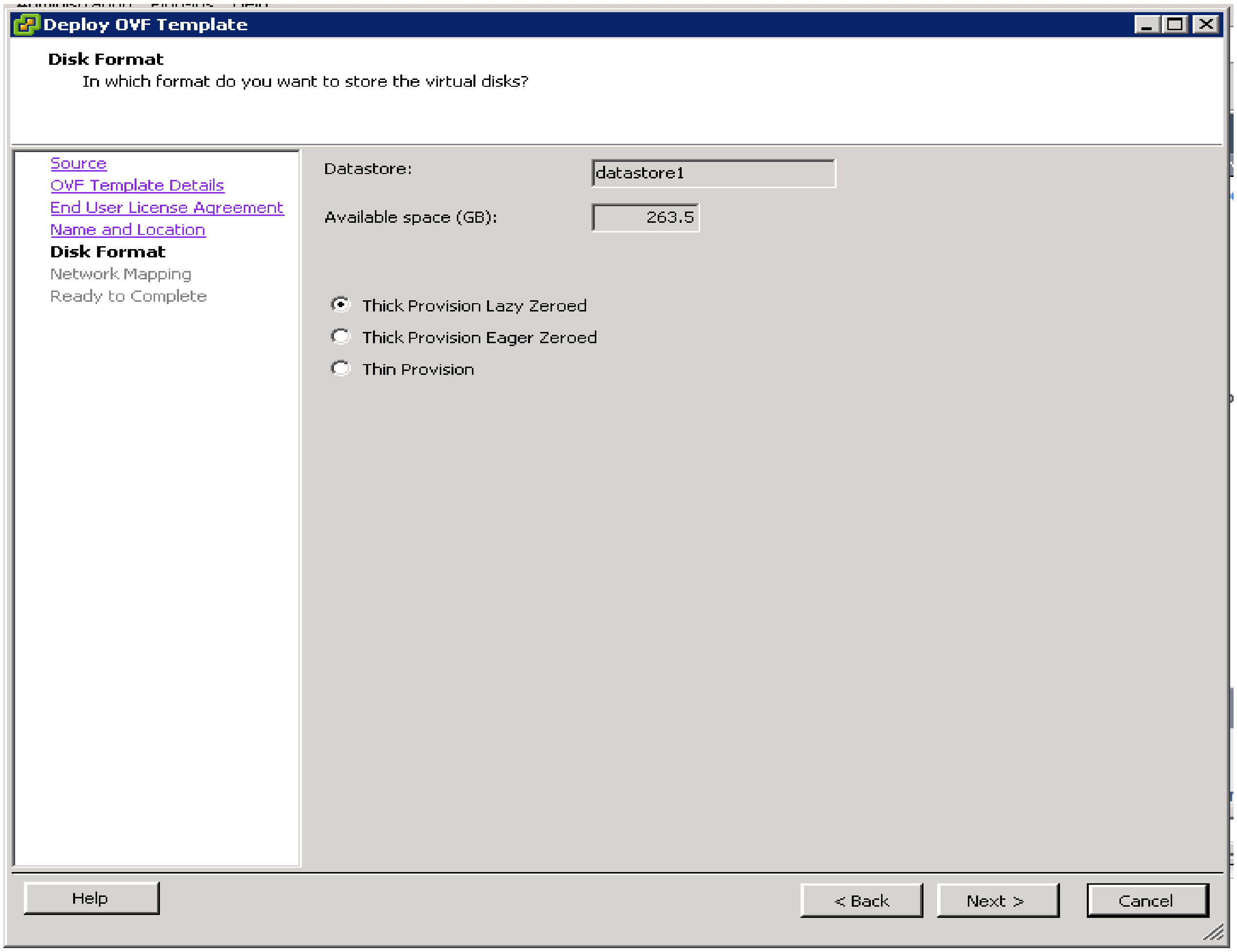
Specify a name and location for the deployed template

Name: CUCSD-BM-5.2.0.0_36

The name can contain up to 80 characters and it must be unique within the inventory folder.

10. In the Disk Format option, click the **Thick Provision Lazy Zeroed** radio button. Click **Next** to continue.

Figure 230 Select the Disk Format for the VM



Deploy OVF Template

Disk Format

In which format do you want to store the virtual disks?

Datastore: datastore1

Available space (GB): 263.5

● Thick Provision Lazy Zeroed

○ Thick Provision Eager Zeroed

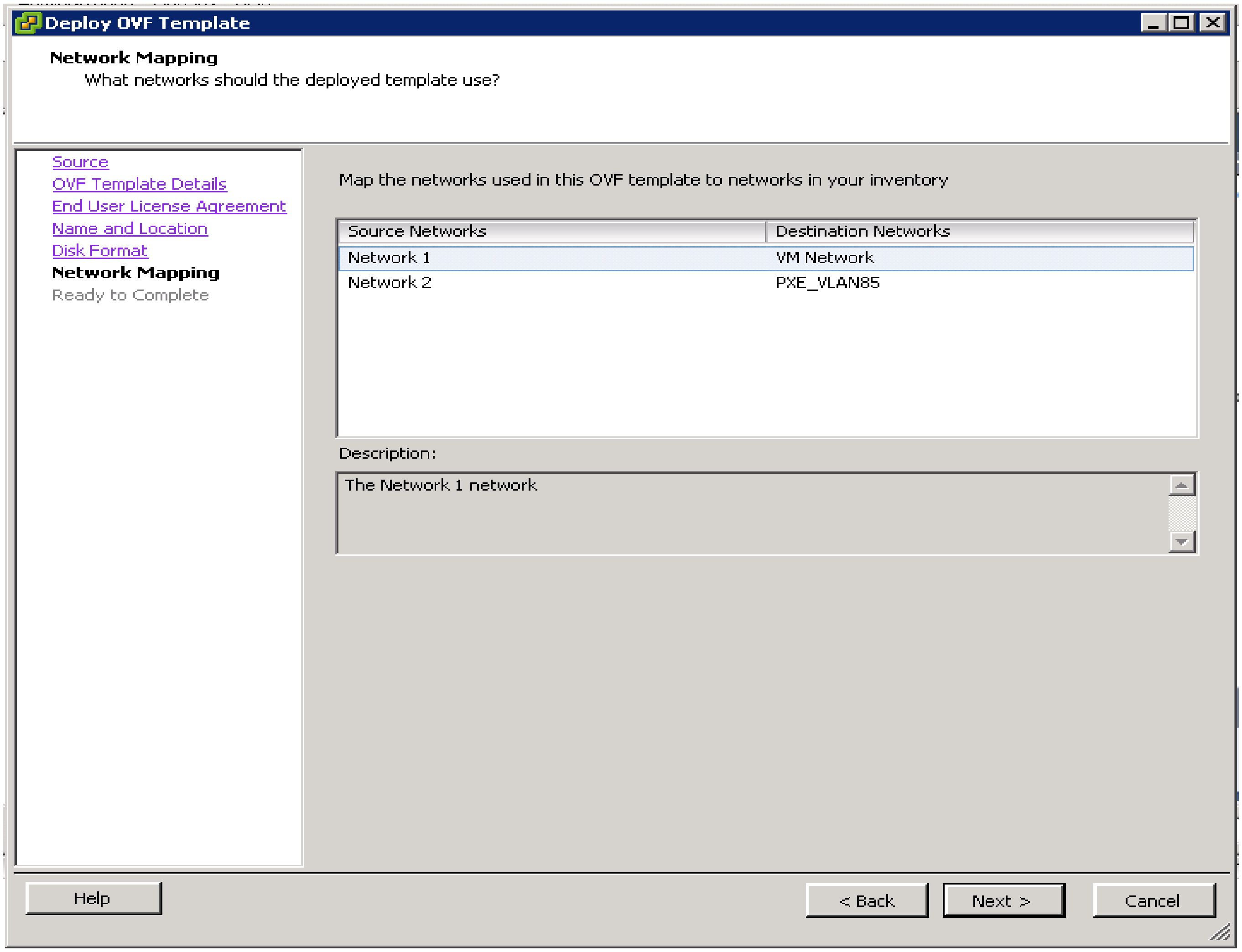
○ Thin Provision

11. In the Network Mapping option,

- Choose **VM Network** as the destination network for source Network 1.
- Choose **PXE_VLAN85** as the destination network for source Network 2.

12. Click **Next** to continue.

Figure 231 Network Mapping for Deployed Template



Network Mapping

What networks should the deployed template use?

Map the networks used in this OVF template to networks in your inventory

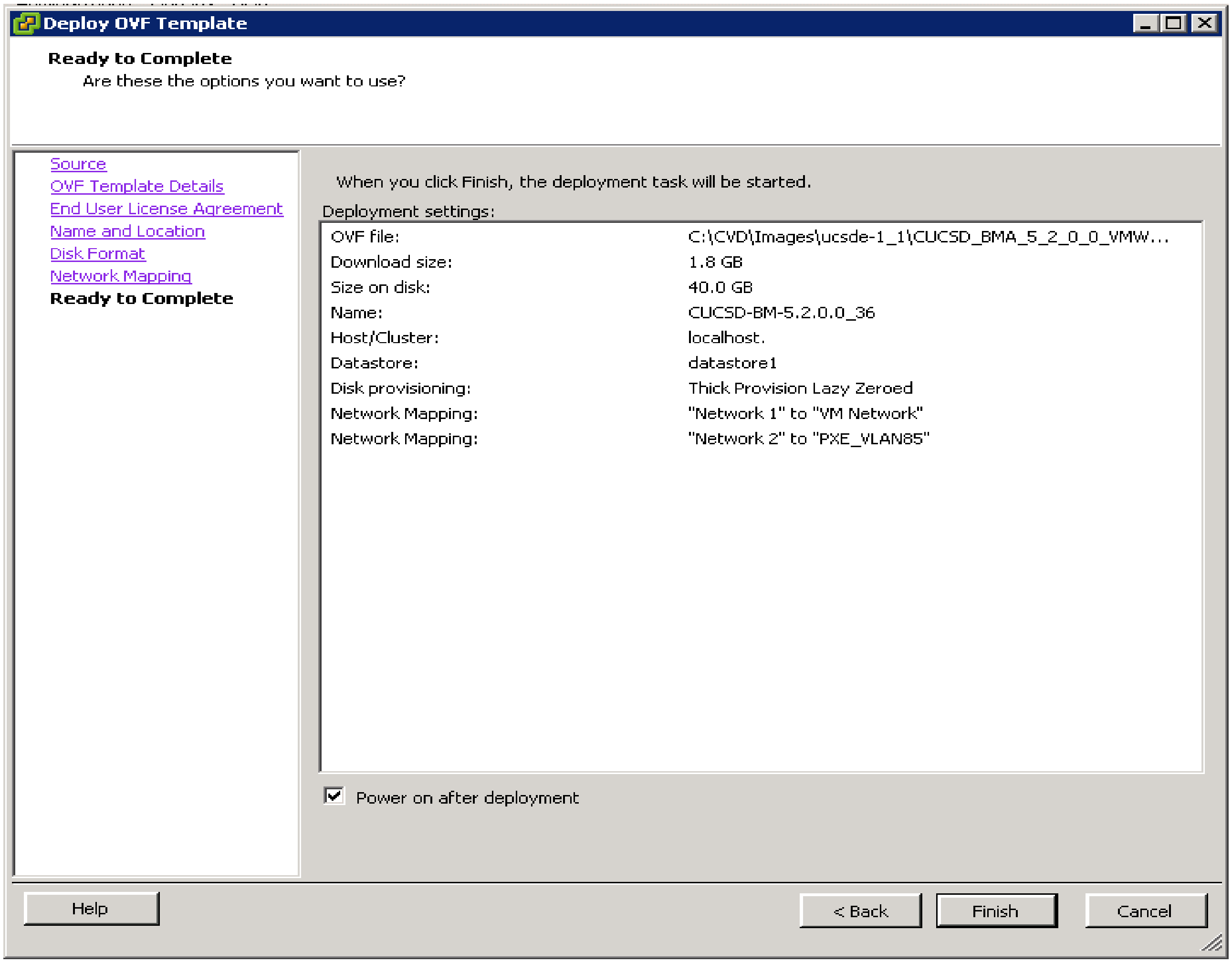
Source Networks	Destination Networks
Network 1	VM Network
Network 2	PXE_VLAN85

Description:

The Network 1 network

13. Review the details of the VM, click the check box **Power on after deployment** and click **Finish** to proceed with the VM deployment.

Figure 232 Deploy the Cisco UCS Director Baremetal Agent VM



Ready to Complete

Are these the options you want to use?

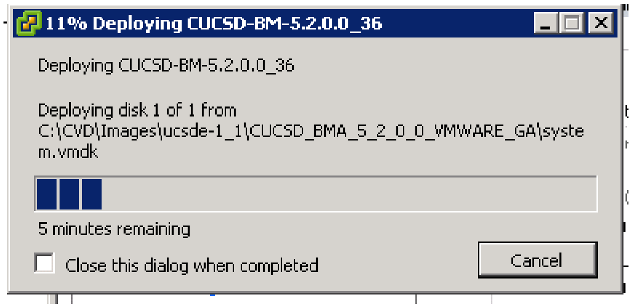
When you click Finish, the deployment task will be started.

Deployment settings:

OVF file:	C:\CVD\Images\ucsde-1_1\CUCSD_BMA_5_2_0_0_VMW...
Download size:	1.8 GB
Size on disk:	40.0 GB
Name:	CUCSD-BM-5.2.0.0_36
Host/Cluster:	localhost.
Datastore:	datastore1
Disk provisioning:	Thick Provision Lazy Zeroed
Network Mapping:	"Network 1" to "VM Network"
Network Mapping:	"Network 2" to "PXE_VLAN85"

☑ Power on after deployment

Figure 233 Cisco UCS Director Baremetal Agent VM Deployment in Progress



Deploying CUCSD-BM-5.2.0.0_36

Deploying disk 1 of 1 from C:\CVD\Images\ucsde-1_1\CUCSD_BMA_5_2_0_0_VMWARE_GA\system.vmdk

5 minutes remaining

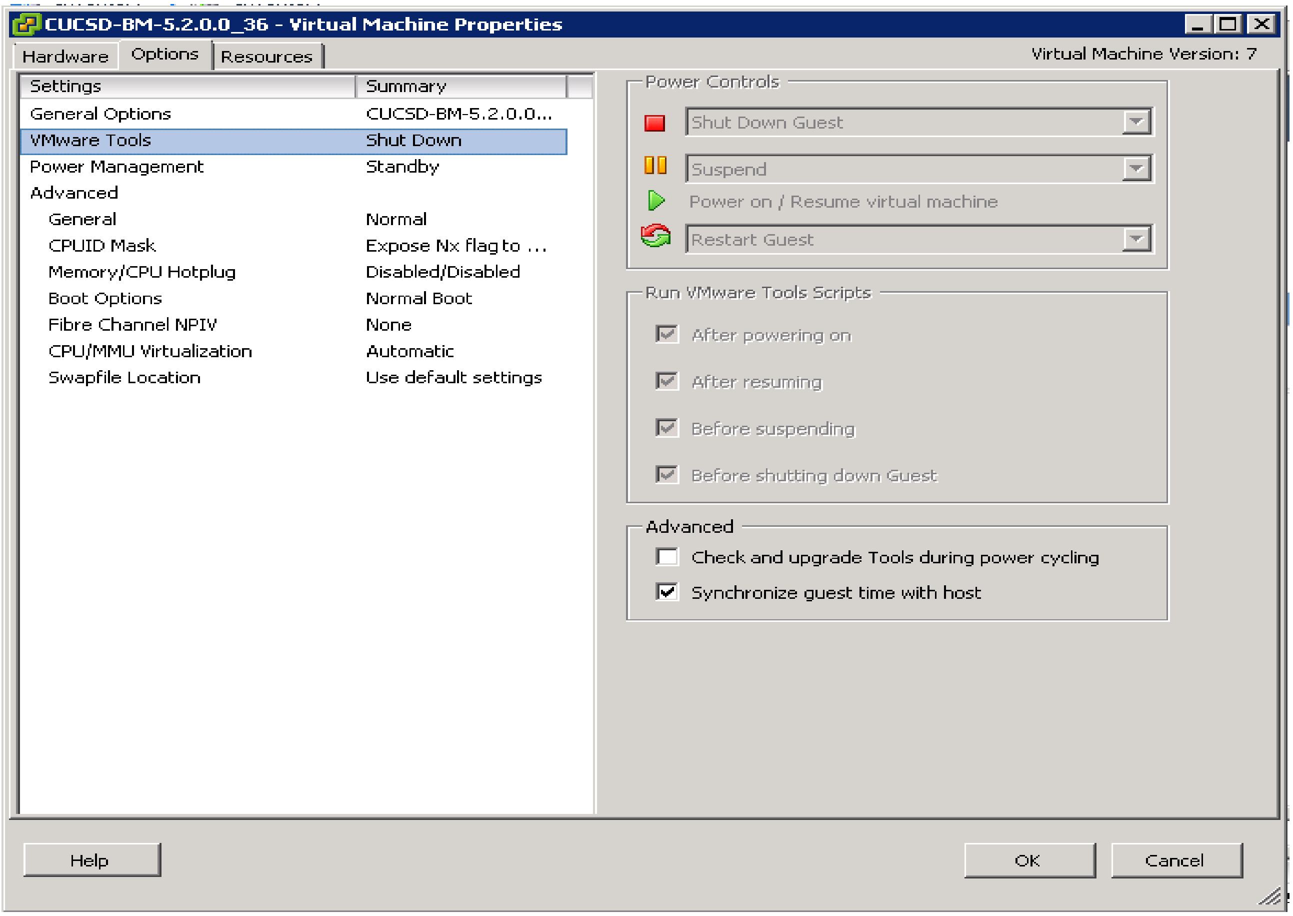
□ Close this dialog when completed

Configuring the Cisco UCS Director Baremetal Agent VM (BMA-VM)

The Cisco UCS Director Baremetal Agent VM named as CUCSD-BM-5.2.0.0_36 shall be known as BMA-VM here onwards.

1. Right click on the BMA-VM, and select **Edit Settings**.
2. In the Virtual Machine Properties dialog box, click on the Options Tab.
3. Click on the VMWare **Tools**, Click on the **Synchronize guest time with host** option in the Advanced **section**.
4. Click on **OK** button to accept the changes.

Figure 234 Edit VM Settings to Synchronize the Guest Time with the ESXi Host



CUCSD-BM-5.2.0.0_36 - Virtual Machine Properties

Virtual Machine Version: 7

Settings	Summary
General Options	CUCSD-BM-5.2.0.0...
VMware Tools	Shut Down
Power Management	Standby
Advanced	
General	Normal
CPUID Mask	Expose Nx flag to ...
Memory/CPU Hotplug	Disabled/Disabled
Boot Options	Normal Boot
Fibre Channel NPIV	None
CPU/MMU Virtualization	Automatic
Swapfile Location	Use default settings

Power Controls

Shut Down Guest

Suspend

Power on / Resume virtual machine

Restart Guest

Run VMware Tools Scripts

☑ After powering on

☑ After resuming

☑ Before suspending

☑ Before shutting down Guest

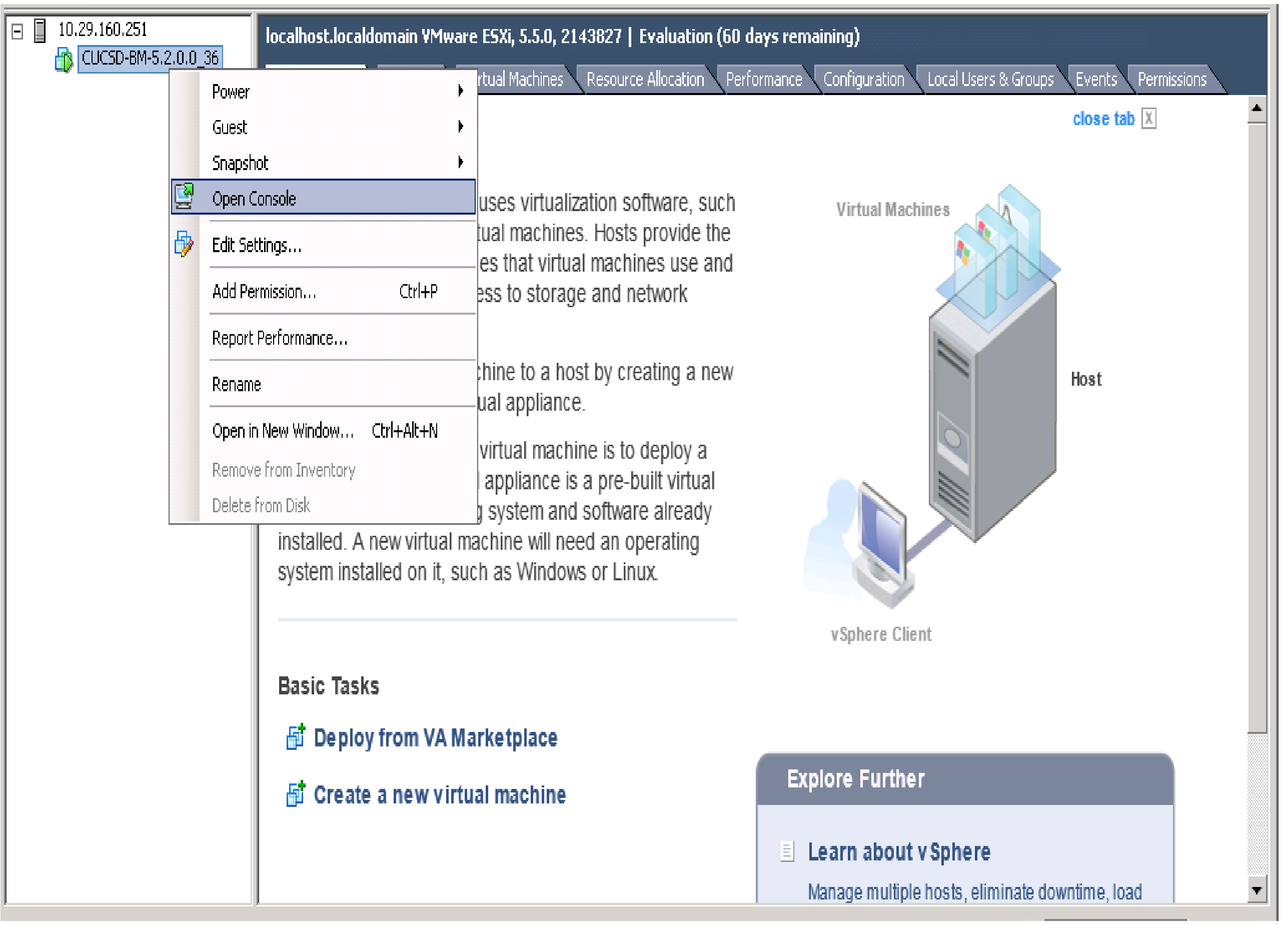
Advanced

□ Check and upgrade Tools during power cycling

☑ Synchronize guest time with host

5. Right click on the BMA-VM, and select **Open Console**.

Figure 235 Access the VM Console of the BMA-VM



uses virtualization software, such tual machines. Hosts provide the es that virtual machines use and ess to storage and network

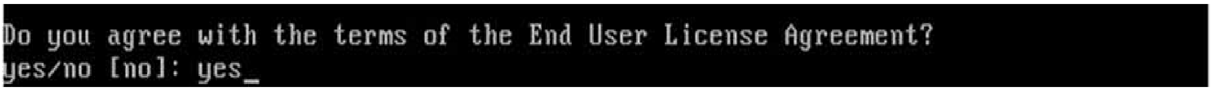
hine to a host by creating a new ual appliance.

virtual machine is to deploy a appliance is a pre-built virtual g system and software already installed. A new virtual machine will need an operating system installed on it, such as Windows or Linux.

Manage multiple hosts, eliminate downtime, load

6. In the console accept the End User License Agreement by typing **yes** and press **ENTER**.

Figure 236 Accept the EULA



```
Do you agree with the terms of the End User License Agreement?
yes/no [no]: yes_
```

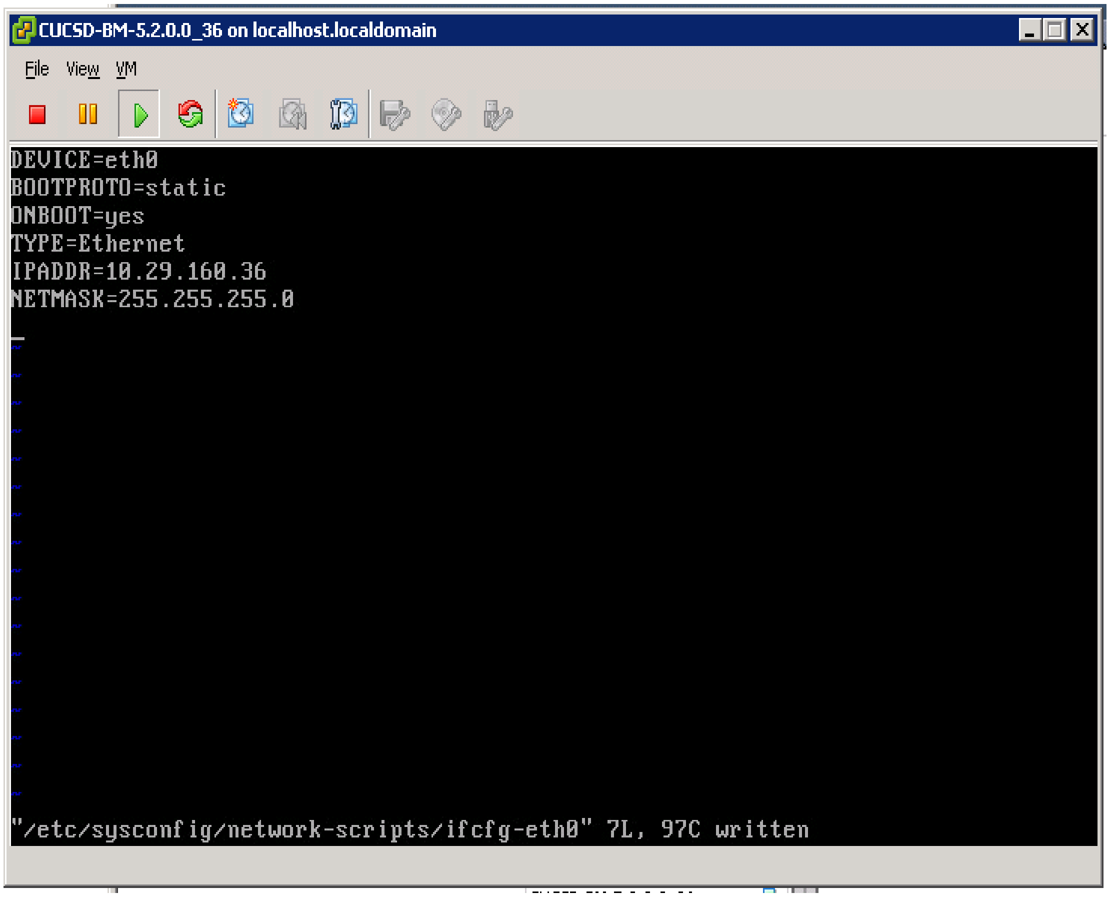
7. Login as **root** user using the default password **pxeboot**.
8. Configure the network interfaces by editing the ifcfg-eth0 and ifcfg-eth1 files located at **/etc/sysconfig/network-scripts/** directory, as follows:

Table 21 BMA-VM network configurations

Network Interface	Configuration
eth0	IP Address: 10.29.160.36, Subnet Mask: 255.255.255.0

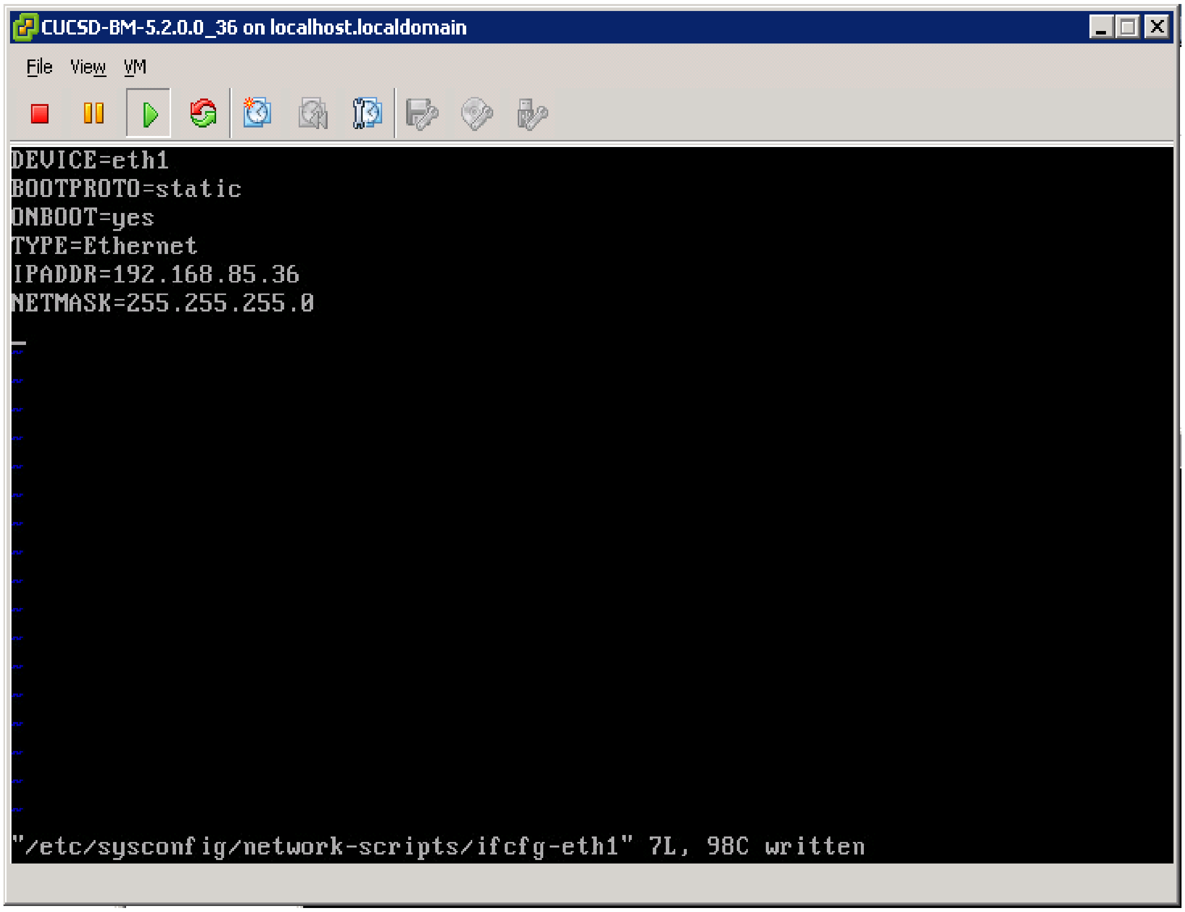
eth1	IP Address: 192.168.85.36, Subnet Mask: 255.255.255.0

Figure 237 Editing the BMA-VM NIC eth0



```
DEVICE=eth0
BOOTPROTO=static
ONBOOT=yes
TYPE=Ethernet
IPADDR=10.29.160.36
NETMASK=255.255.255.0
_
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
"/etc/sysconfig/network-scripts/ifcfg-eth0" 7L, 97C written
```

Figure 238 Editing the BMA-VM NIC eth1

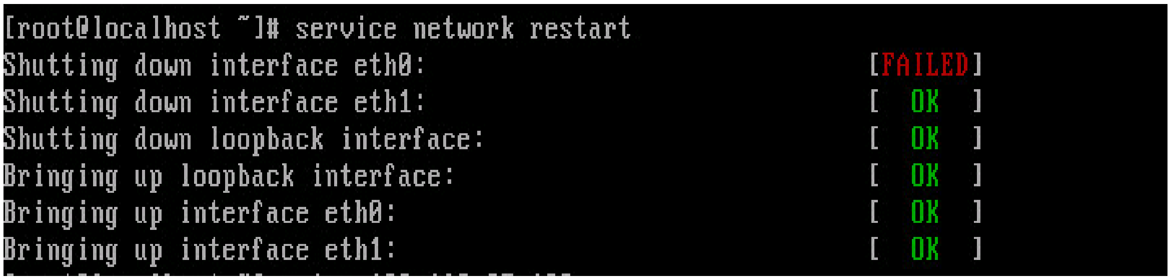


```
DEVICE=eth1
BOOTPROTO=static
ONBOOT=yes
TYPE=Ethernet
IPADDR=192.168.85.36
NETMASK=255.255.255.0

~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
~
"/etc/sysconfig/network-scripts/ifcfg-eth1" 7L, 98C written
```

9. Restart the network service by using the service command.

service network restart

Figure 239 Restart the network



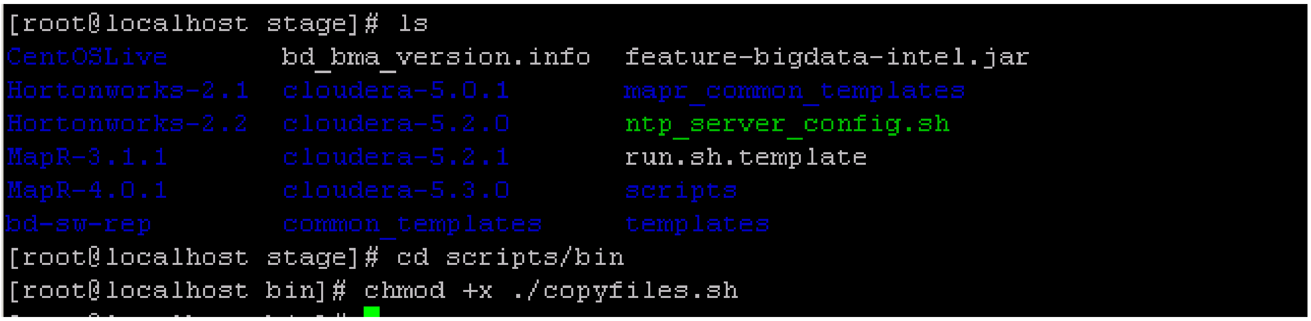
```
[root@localhost ~]# service network restart
Shutting down interface eth0:                              [FAILED]
Shutting down interface eth1:                              [  OK  ]
Shutting down loopback interface:                          [  OK  ]
Bringing up loopback interface:                            [  OK  ]
Bringing up interface eth0:                                [  OK  ]
Bringing up interface eth1:                                [  OK  ]
```

Installing the Cisco UCS Director Express Big Data Upgrade Package

1. Copy over the **UCSDExpress_BMA_5.2_Big_Data_1.1_Upgrade_Package.zip** that was downloaded from cisco.com to this VM, by using a secure shell FTP session.
2. Unzip the contents in a temporary staging directory.
3. Change directory into the scripts/bin directory.
4. Change the permissions to add execute permissions to the copyfiles.sh script file and execute it.

chmod +x copyfiles.sh

Figure 240 Install the Cisco UCS Director Express Big Data Upgrade Package



```
[root@localhost stage]# ls
CentOSLive        bd_bma_version.info  feature-bigdata-intel.jar
Hortonworks-2.1   cloudera-5.0.1       mapr_common_templates
Hortonworks-2.2   cloudera-5.2.0       ntp_server_config.sh
MapR-3.1.1        cloudera-5.2.1       run.sh.template
MapR-4.0.1        cloudera-5.3.0       scripts
bd-sw-rep         common_templates     templates
[root@localhost stage]# cd scripts/bin
[root@localhost bin]# chmod +x ./copyfiles.sh
```

5. Execute the copyfiles.sh script.

./copyfiles.sh

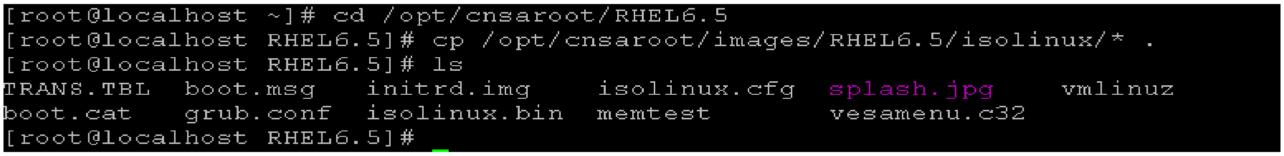
This script copies the number of software modules such as CentOSLive image into the BMA-VM and creates a new repository directory by name **bd-sw-rep** under the **/opt/cnsaroot** directory. This new directory acts as the repository of all the Big Data specific 3rd party hadoop distribution directories.

Configuring the Big Data software repositories

Copy the Contents of RHEL6.5 ISO into the BMA-VM

1. Copy over the contents of the RHEL6.5 ISO into the directory **/opt/cnsaroot/images/RHEL6.5** on the BMA-VM.
2. Copy the contents of the directory **/opt/cnsaroot/images/RHEL6.5/isolinux** into the directory **/opt/cnsaroot/RHEL6.5**.

Figure 241 Copy the Contents of RHEL6.5 ISO into the BMA-VM



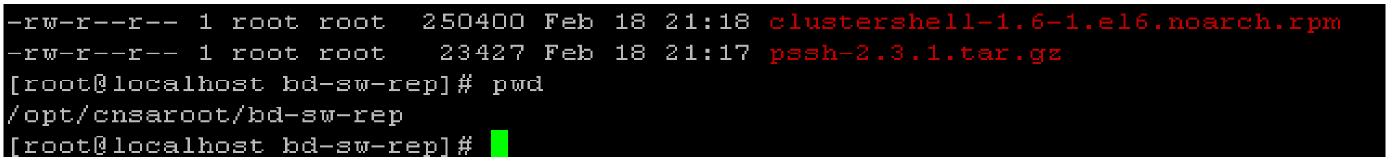
```
[root@localhost ~]# cd /opt/cnsaroot/RHEL6.5
[root@localhost RHEL6.5]# cp /opt/cnsaroot/images/RHEL6.5/isolinux/* .
[root@localhost RHEL6.5]# ls
TRANS.TBL  boot.msg   initrd.img    isolinux.cfg   splash.jpg    vmlinuz
boot.cat   grub.conf  isolinux.bin  memtest        vesamenu.c32
[root@localhost RHEL6.5]#
```

Download and Place the Common Utility files in BMA-VM

3. From a host connected to the Internet, download the Parallel-SSH and Cluster-Shell utility tools and copy them over to the **/opt/cnsaroot/bd-sw-rep** directory.

- Download Parallel SSH archive from https://pypi.python.org/packages/source/p/pssh/pssh-2.3.1.tar.gz
- Download Cluster-Shell RPM package from http://dl.fedoraproject.org/pub/epel/6/x86_64/clustershell-1.6-1.el6.noarch.rpm

Figure 242 Copy the Cluster-Shell and Passwordless-SSH Utilities



```
-rw-r--r-- 1 root root  250400 Feb 18 21:18 clustershell-1.6-1.el6.noarch.rpm
-rw-r--r-- 1 root root   23427 Feb 18 21:17 pssh-2.3.1.tar.gz
[root@localhost bd-sw-rep]# pwd
/opt/cnsaroot/bd-sw-rep
[root@localhost bd-sw-rep]#
```

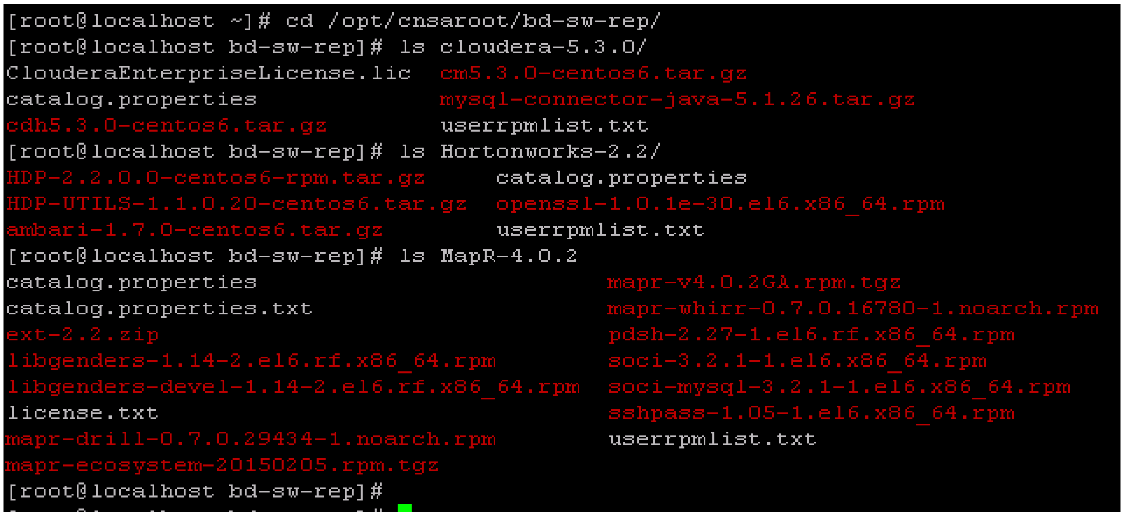
4. By following the instructions on this page of the BMA-Install guide, download and copy over the Hadoop Distro RPMs into their respective directories under **/opt/cnsaroot/bd-sw-rep**. http://www.cisco.com/c/en/us/td/docs/unified_computing/ucs/ucs-director-express/bma-install-config/1-1/b_ucsd_express_bma_install_config_guide_1-1/b_ucsd_express_bma_install_config_guide_chapter_0101.html#reference_F3FE769E6A114DAD8CD5E3296556B70E

5. Upload the appropriate License files to the Hadoop distribution directories

- Place the Cloudera License in a file called ClouderaEnterpriseLicense.lic and place it under the **/opt/cnsaroot/bd-sw-rep/cloudera05.x.y**.
- Place the MapR license in a file called license.txt MapR License and place it under the directory **/opt/cnsaroot/bd-sw-rep/MapR-X.Y.Z**.

Note Hortonworks distribution does not require any license file.

Figure 243 Copy the RPM Packages for the Hadoop Distributions



```
[root@localhost ~]# cd /opt/cnsaroot/bd-sw-rep/
[root@localhost bd-sw-rep]# ls cloudera-5.3.0/
ClouderaEnterpriseLicense.lic  cm5.3.0-centos6.tar.gz
catalog.properties             mysql-connector-java-5.1.26.tar.gz
cdh5.3.0-centos6.tar.gz        userrpmlist.txt
[root@localhost bd-sw-rep]# ls Hortonworks-2.2/
HDP-2.2.0.0-centos6-rpm.tar.gz     catalog.properties
HDP-UTILS-1.1.0.20-centos6.tar.gz  openssl-1.0.1e-30.el6.x86_64.rpm
ambari-1.7.0-centos6.tar.gz        userrpmlist.txt
[root@localhost bd-sw-rep]# ls MapR-4.0.2
catalog.properties                      mapr-v4.0.2GA.rpm.tgz
catalog.properties.txt                  mapr-whirr-0.7.0.16780-1.noarch.rpm
ext-2.2.zip                             pdsh-2.27-1.el6.rf.x86_64.rpm
libgenders-1.14-2.el6.rf.x86_64.rpm     soci-3.2.1-1.el6.x86_64.rpm
libgenders-devel-1.14-2.el6.rf.x86_64.rpm  soci-mysql-3.2.1-1.el6.x86_64.rpm
license.txt                             sshpass-1.05-1.el6.x86_64.rpm
mapr-drill-0.7.0.29434-1.noarch.rpm     userrpmlist.txt
mapr-ecosystem-20150205.rpm.tgz
[root@localhost bd-sw-rep]#
```

Setup a UCSD Patch Directory in the BMA-VM

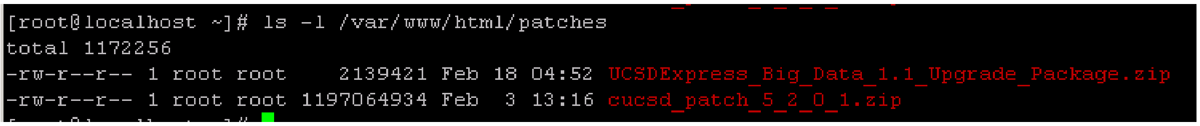
Cisco UCS Director Express for Big Data VM which will be installed in the next section, requires the patches to be kept in a web server. The BMA-VM comes pre-configured with a web-server used during PXE booting process. This section walks through the steps to create a directory to hold these patches in the BMA-VM.

1. In BMA-VM, create a directory by name patches under /var/www/html.

mkdir /var/www/html/patches

2. Copy over the Cisco UCS Director Express for Big Data 1.1 specific patch files (See Table 3) to this patch directory.

Figure 244 Setup a UCSD Patch Directory in the HTTP Root Path

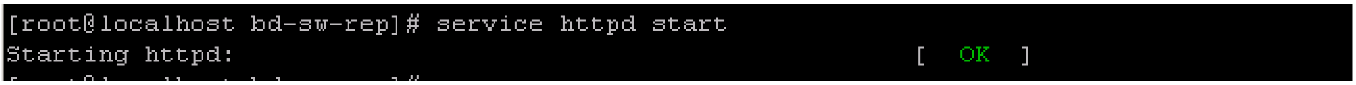


```
[root@localhost ~]# ls -l /var/www/html/patches
total 1172256
-rw-r--r-- 1 root root    2139421 Feb 18 04:52 UCSDExpress_Big_Data_1.1_Upgrade_Package.zip
-rw-r--r-- 1 root root 1197064934 Feb  3 13:16 cucsd_patch_5_2_0_1.zip
```

3. Start the HTTPD server in the BMA-VM.

service httpd start

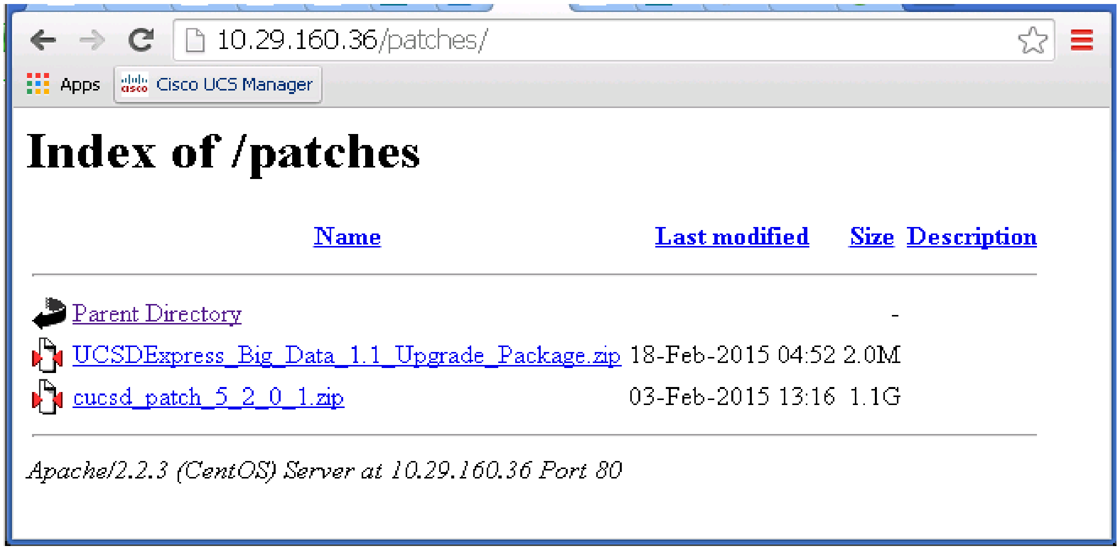
Figure 245 Start the HTTPD



```
[root@localhost bd-sw-rep]# service httpd start
Starting httpd:                                            [  OK  ]
```

4. Verify if these files are accessible by visiting the URL **http://<BMA-VM's >IP address/patches/**.

Figure 246 Verify the Accessibility of the Cisco UCS Director Express Patches



Index of /patches

Name	Last modified	Size	Description
Parent Directory		-	
UCSDExpress_Big_Data_1.1_Upgrade_Package.zip	18-Feb-2015 04:52	2.0M	
cucsd_patch_5_2_0_1.zip	03-Feb-2015 13:16	1.1G	

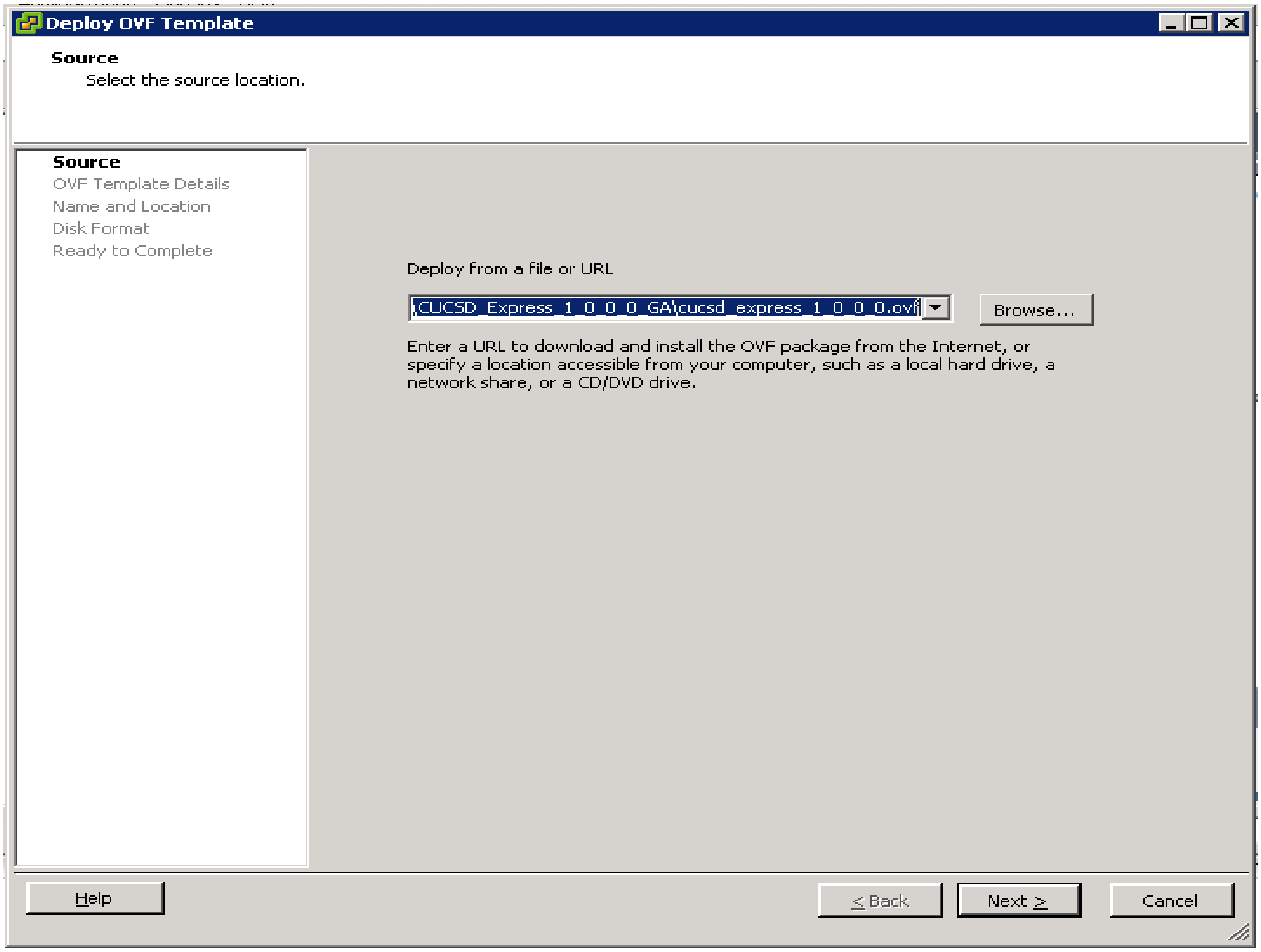
Apache/2.2.3 (CentOS) Server at 10.29.160.36 Port 80

BMA-VM configurations are complete.

Deploying the Cisco UCS Director Express OVF

1. Launch the VMWare vSphere client software
2. Enter the chosen IP address, the username as root, and the chosen password.
3. Click **Login** to continue.
4. From the **File** menu, Select **Deploy OVF Template**.
5. Choose the Cisco UCS Director Express for Big Data 1.0 OVF template. Click **Open**.

Figure 247 Deploy the Cisco UCSD Express 1.0 OVF



Deploy OVF Template

Source

Select the source location.

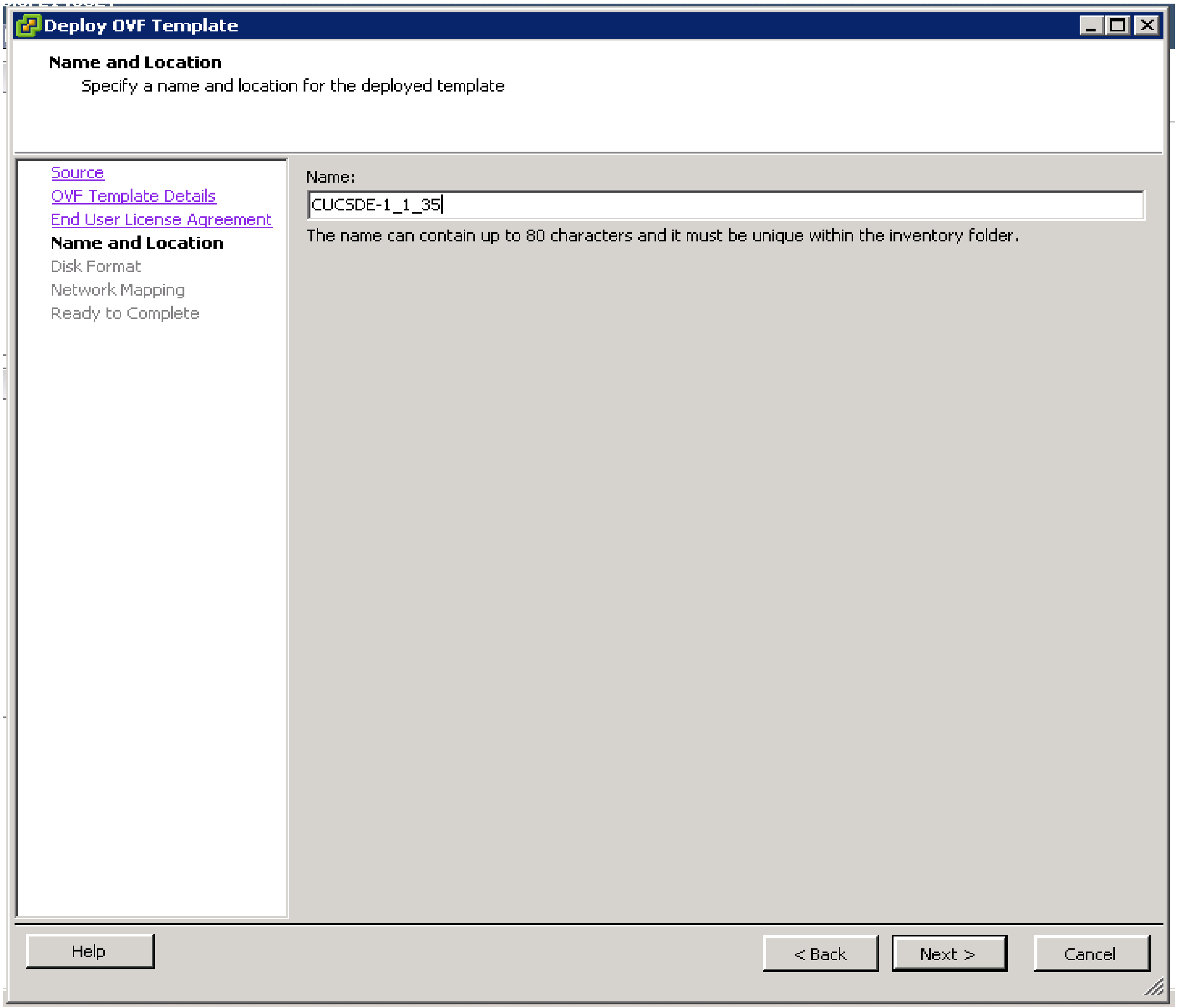
Deploy from a file or URL

\CUCSD_Express_1_0_0_0_GA\cucsd_express_1_0_0_0.ovf

Enter a URL to download and install the OVF package from the Internet, or specify a location accessible from your computer, such as a local hard drive, a network share, or a CD/DVD drive.

6. Review the details of the OVF, and Click **Next** to continue.
7. Accept the EULA, Click **Next** to continue.
8. Name the VM, Click **Next** to continue.

Figure 248 Name the Cisco UCS Director Express VM



Name and Location

Specify a name and location for the deployed template

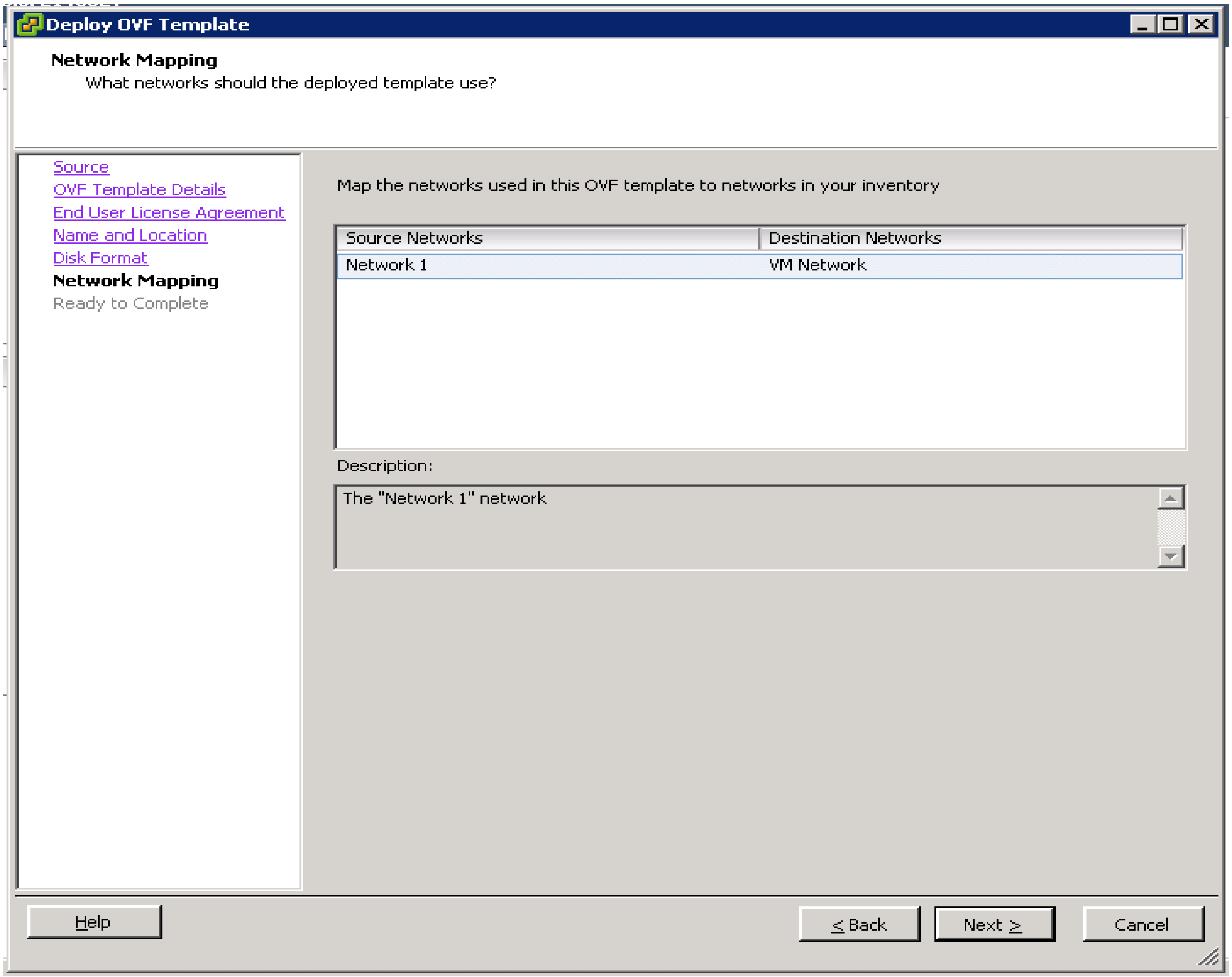
Name:

CUCSDE-1_1_35

The name can contain up to 80 characters and it must be unique within the inventory folder.

9. Choose the destination network **VM Network** for the source network **Network 1**. Click **Next** to continue.

Figure 249 Cisco UCS Director Express VM Network Configuration



Network Mapping

What networks should the deployed template use?

Map the networks used in this OVF template to networks in your inventory

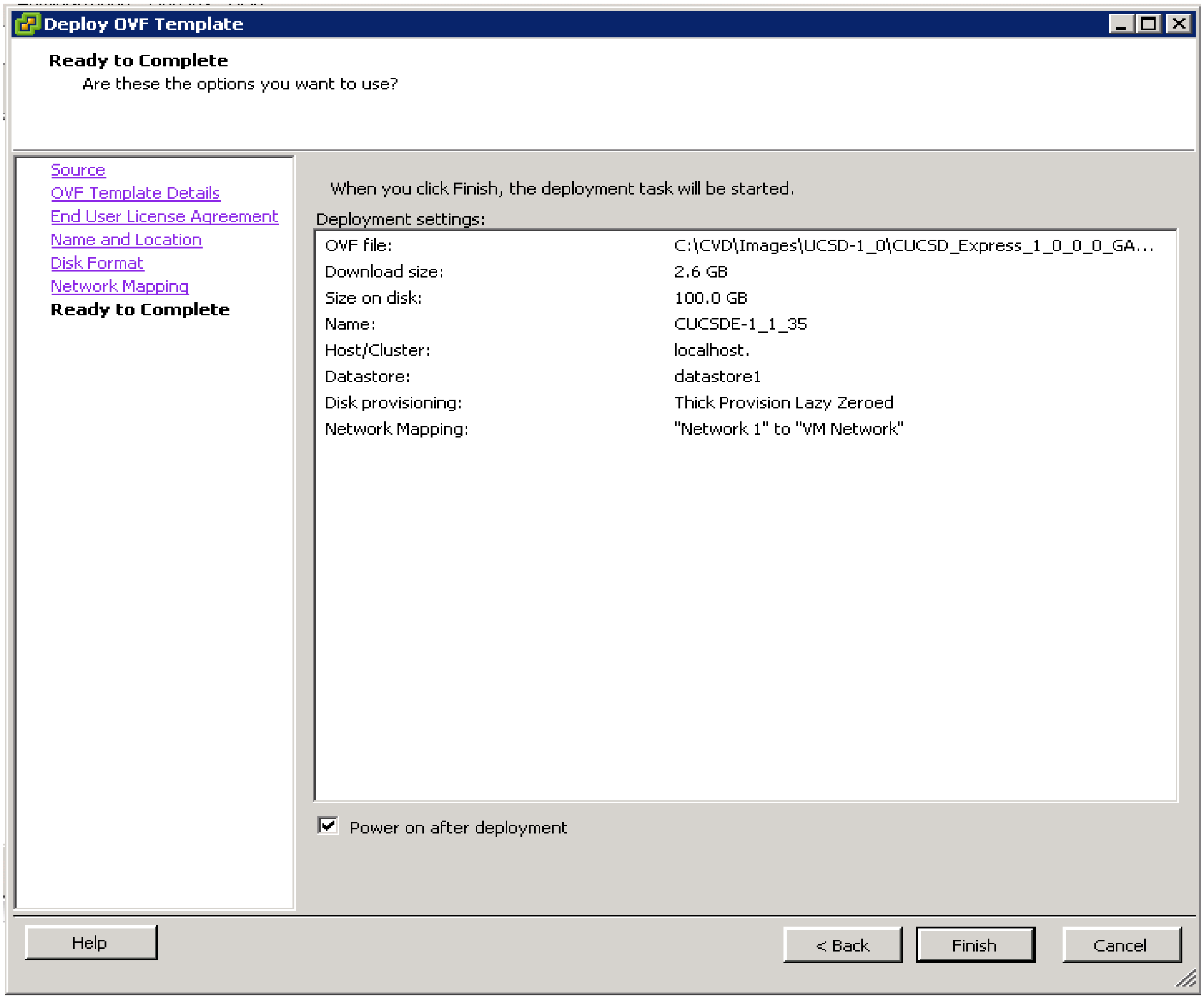
Source Networks	Destination Networks
Network 1	VM Network

Description:

The "Network 1" network

10. In the Disk Format option, click the **Thick Provision Lazy Zeroed** radio button. Click **Next** to continue.
11. Review the details of the VM, Check the checkbox **Power On after deployment**.
12. Click **Finish** to proceed with deployment.

Figure 250 Deploy the Cisco UCS Director Express VM



Ready to Complete

Are these the options you want to use?

When you click Finish, the deployment task will be started.

Deployment settings:

OVF file:	C:\CVD\Images\UCSD-1_0\CUCSD_Express_1_0_0_0_GA...
Download size:	2.6 GB
Size on disk:	100.0 GB
Name:	CUCSDE-1_1_35
Host/Cluster:	localhost.
Datastore:	datastore1
Disk provisioning:	Thick Provision Lazy Zeroed
Network Mapping:	"Network 1" to "VM Network"

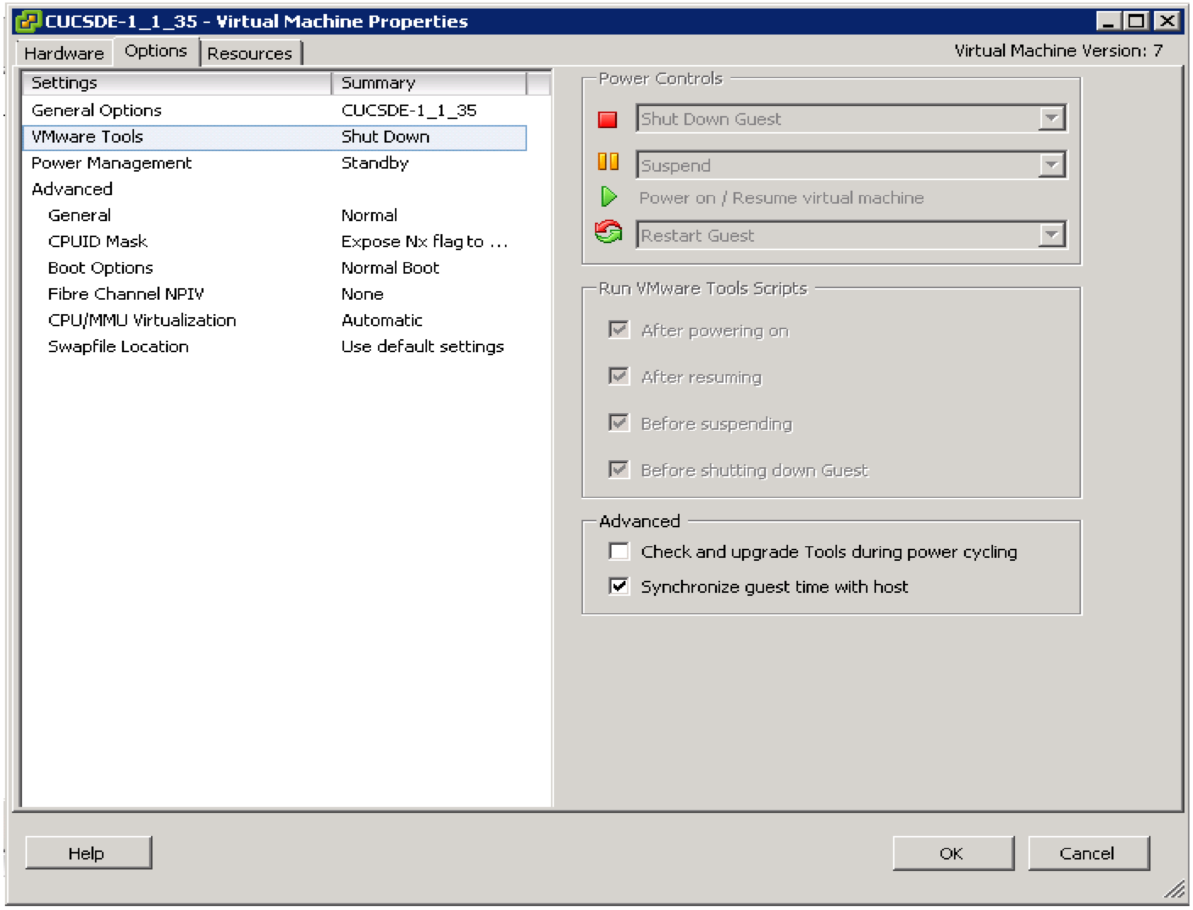
☑ Power on after deployment

Configuring the Cisco UCS Director Express VM (UCSD-VM)

The Cisco UCS Director Express VM named as CUCSDE-1_1_35 shall be known as UCSD-VM here onwards.

1. Right click on the UCSD-VM, and select **Edit** Settings.
2. In the Virtual Machine Properties dialog box, click on the **Options** tab.
3. Click on the **VMware** Tools, Click on the **Synchronize guest time with host** option in the **Advanced** section.
4. Click on **OK** button to accept the changes.

Figure 251 Edit VM Settings to Synchronize the Guest Time with the ESXi Host



CUCSDE-1_1_35 - Virtual Machine Properties

Virtual Machine Version: 7

Settings	Summary
General Options	CUCSDE-1_1_35
VMware Tools	Shut Down
Power Management	Standby
Advanced	
General	Normal
CPUID Mask	Expose Nx flag to ...
Boot Options	Normal Boot
Fibre Channel NPIV	None
CPU/MMU Virtualization	Automatic
Swapfile Location	Use default settings

Power Controls

- Shut Down Guest
- Suspend
- Power on / Resume virtual machine
- Restart Guest

Run VMware Tools Scripts

☑ After powering on

☑ After resuming

☑ Before suspending

☑ Before shutting down Guest

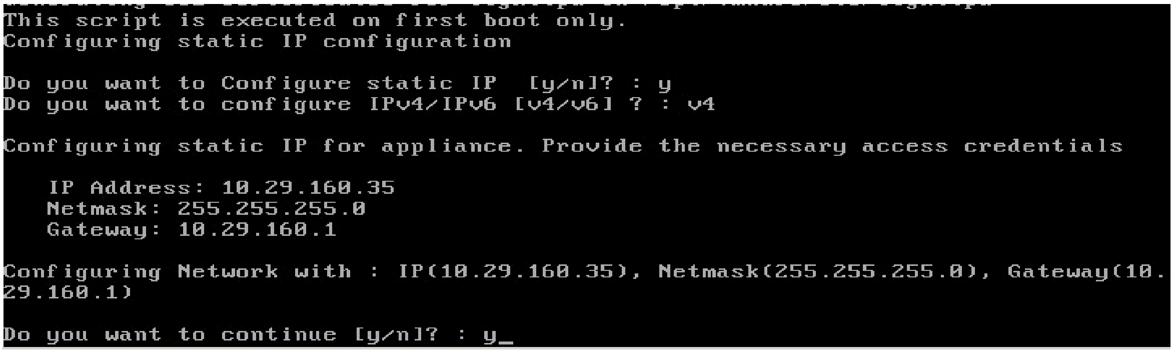
Advanced

□ Check and upgrade Tools during power cycling

☑ Synchronize guest time with host

5. Right-click on the UCSD-VM and select **Open Console**.
6. Accept the End User License Agreement by typing **yes** and press the **ENTER**.
7. In the prompt to configure the static IP for the network interface, enter the IP address, Netmask and Gateway information.
8. Enter **y** to continue with the network configuration.

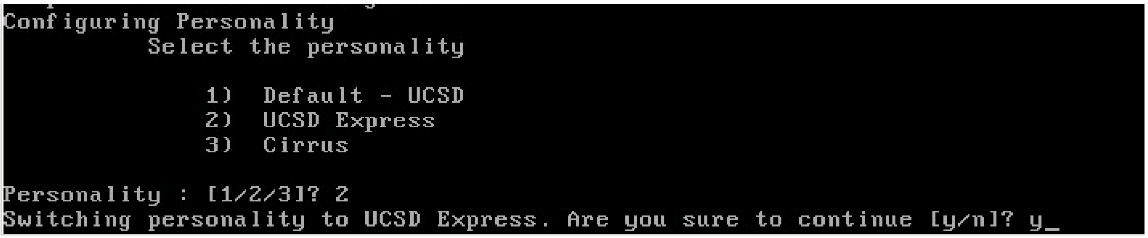
Figure 252 Assigning the Static IP Address to the UCSD-VM eth0



```
This script is executed on first boot only.
Configuring static IP configuration

Do you want to Configure static IP  [y/n]? : y
Do you want to configure IPv4/IPv6 [v4/v6] ? : v4

Configuring static IP for appliance. Provide the necessary access credentials

   IP Address: 10.29.160.35
   Netmask: 255.255.255.0
   Gateway: 10.29.160.1

Configuring Network with : IP(10.29.160.35), Netmask(255.255.255.0), Gateway(10.
29.160.1)

Do you want to continue [y/n]? : y_
```

9. Configure the UCSD Express as the personality by entering the number 2.
10. **At the prompt Switching personality to UCSD Express, Are you sure to continue [y/n]?** Type **y** and hit **ENTER**.

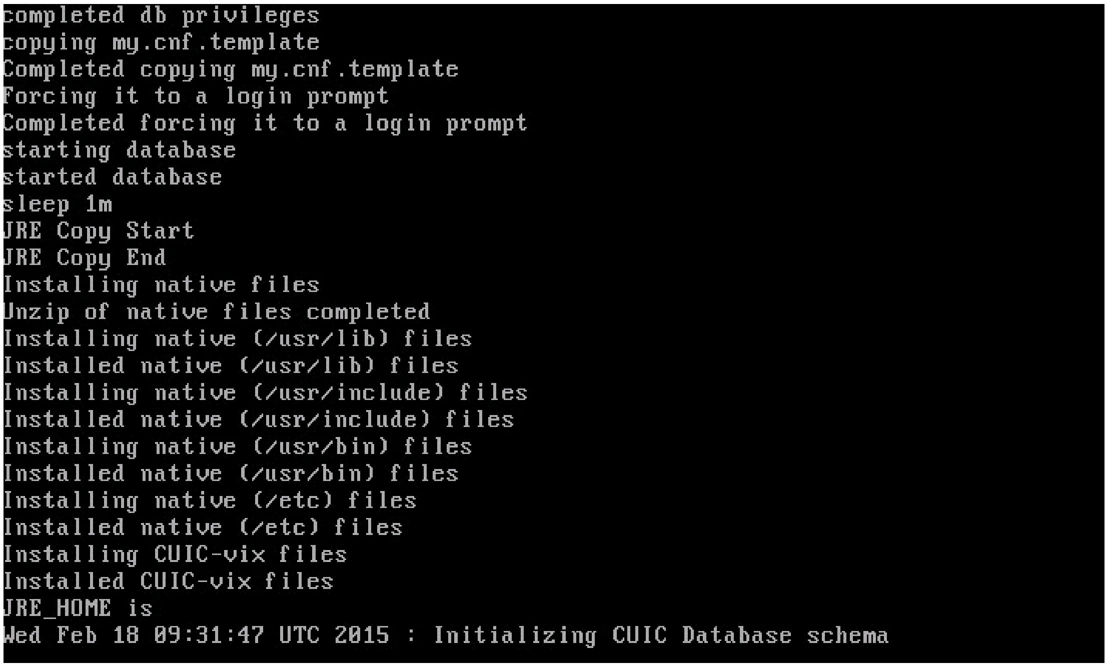
Figure 253 Choose the UCSD Express Personality



```
Configuring Personality
          Select the personality

              1)  Default - UCSD
              2)  UCSD Express
              3)  Cirrus

Personality : [1/2/3]? 2
Switching personality to UCSD Express. Are you sure to continue [y/n]? y_
```

11. The UCSD-VM goes through a personality change configuration as shown below.

Figure 254 UCSD-VM First-Boot Initializations



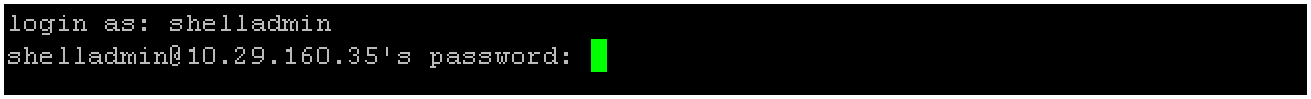
```
completed db privileges
copying my.cnf.template
Completed copying my.cnf.template
Forcing it to a login prompt
Completed forcing it to a login prompt
starting database
started database
sleep 1m
JRE Copy Start
JRE Copy End
Installing native files
Unzip of native files completed
Installing native (/usr/lib) files
Installed native (/usr/lib) files
Installing native (/usr/include) files
Installed native (/usr/include) files
Installing native (/usr/bin) files
Installed native (/usr/bin) files
Installing native (/etc) files
Installed native (/etc) files
Installing CUIC-vix files
Installed CUIC-vix files
JRE_HOME is
Wed Feb 18 09:31:47 UTC 2015 : Initializing CUIC Database schema
```

Note This step takes about 10-15 minutes to complete.

Applying the Upgrade Patches

1. Open a SSH/Putty session to the UCSD-VM.
2. Login as the user **shelladmin** with password **changeme**.

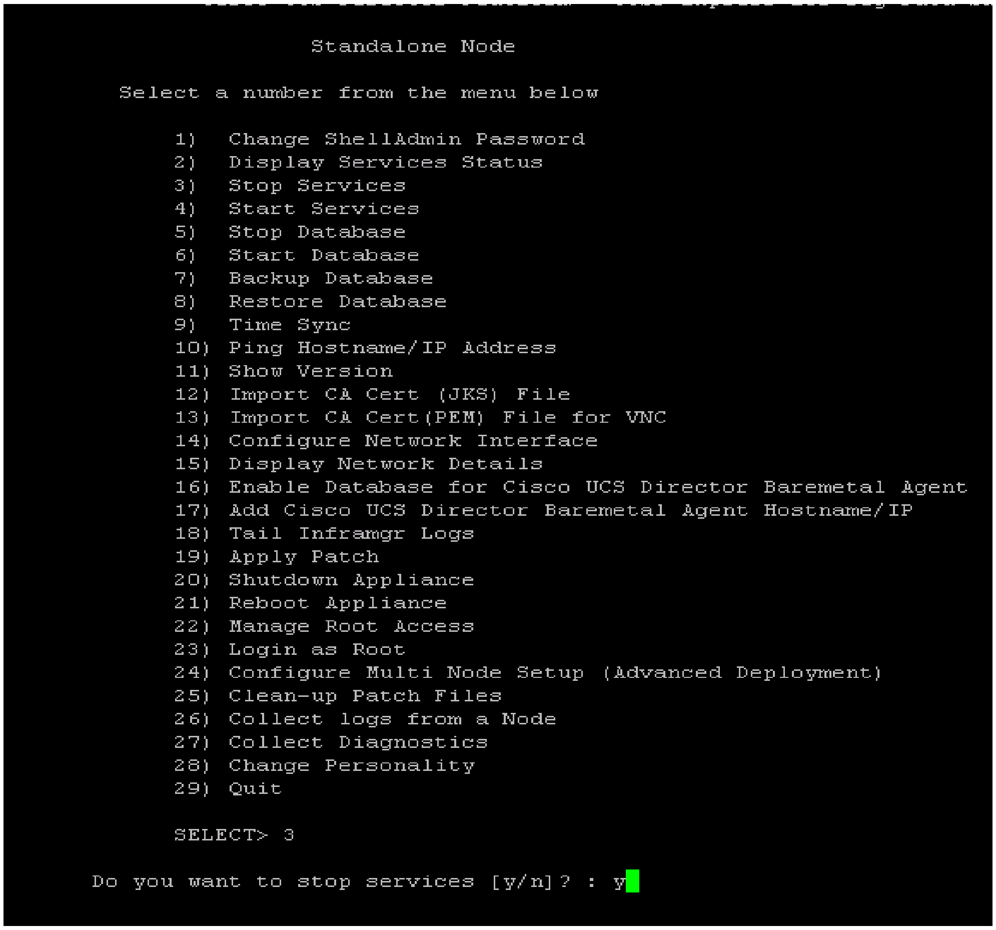
Figure 255 Logging onto the UCSD-VM Shell Administration Tool



```
login as: shelladmin
shelladmin@10.29.160.35's password:
```

3. In the Shell Admin Menu, enter 3 to stop the services.
4. At the prompt, **Do you want to stop services [y/n]?** Type **y** to confirm and hit **ENTER** to continue.

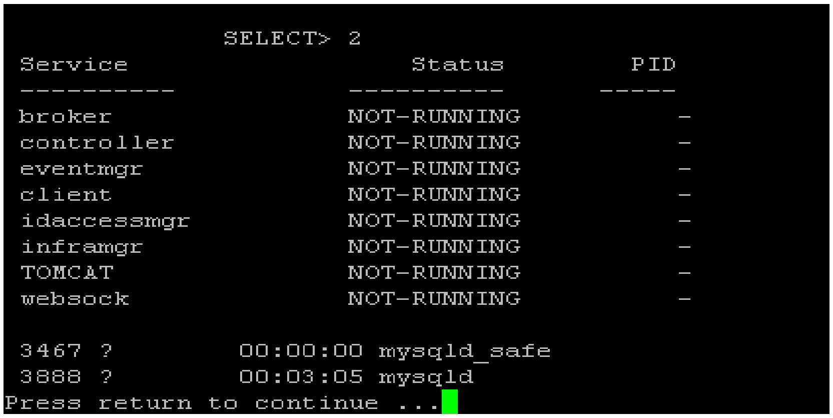
Figure 256 Issuing the Command to Stop all the Services Via Shell Administration Tool.



```
                      Standalone Node

        Select a number from the menu below

            1)  Change ShellAdmin Password
            2)  Display Services Status
            3)  Stop Services
            4)  Start Services
            5)  Stop Database
            6)  Start Database
            7)  Backup Database
            8)  Restore Database
            9)  Time Sync
            10) Ping Hostname/IP Address
            11) Show Version
            12) Import CA Cert (JKS) File
            13) Import CA Cert(PEM) File for VNC
            14) Configure Network Interface
            15) Display Network Details
            16) Enable Database for Cisco UCS Director Baremetal Agent
            17) Add Cisco UCS Director Baremetal Agent Hostname/IP
            18) Tail Inframgr Logs
            19) Apply Patch
            20) Shutdown Appliance
            21) Reboot Appliance
            22) Manage Root Access
            23) Login as Root
            24) Configure Multi Node Setup (Advanced Deployment)
            25) Clean-up Patch Files
            26) Collect logs from a Node
            27) Collect Diagnostics
            28) Change Personality
            29) Quit

            SELECT> 3

      Do you want to stop services [y/n]? : y
```

5. In the Shell Admin menu, type 2 to view the status of the services. They all should be **NOT-RUNNING** as shown below.

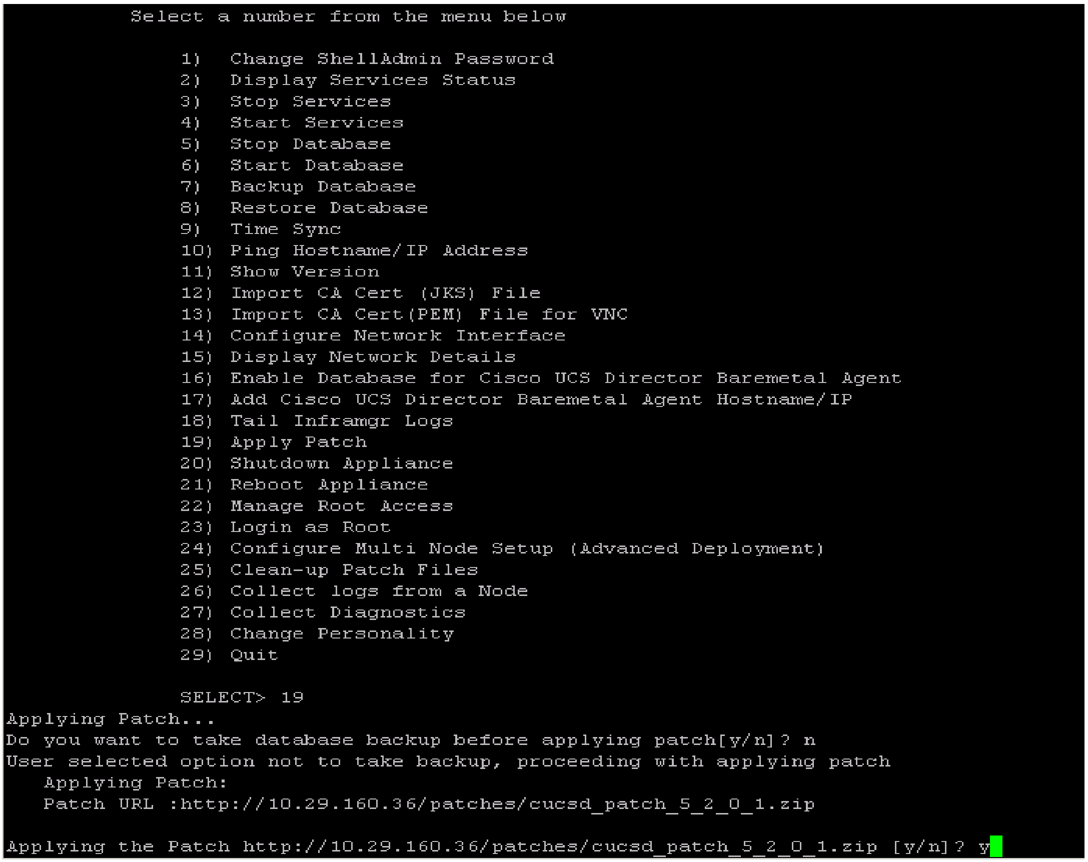
Figure 257 Verifying the Status of the UCSD-VM Services



```
                SELECT> 2
 Service                     Status         PID
 ----------             ----------      -----
 broker                 NOT-RUNNING          -
 controller             NOT-RUNNING          -
 eventmgr               NOT-RUNNING          -
 client                 NOT-RUNNING          -
 idaccessmgr            NOT-RUNNING          -
 inframgr               NOT-RUNNING          -
 TOMCAT                 NOT-RUNNING          -
 websock                NOT-RUNNING          -

 3467 ?         00:00:00 mysqld_safe
 3888 ?         00:03:05 mysqld
Press return to continue ...
```

6. In the Shell Admin menu, type **19** and **ENTER** to start the patching process.
7. Type **n** to the prompt **Do you want to take database backup before applying patch[y/n]?**.
8. At the prompt, Patch URL: **enter http://<BMA_IP>/patches/cucsd_patch_5_2_0_1.zip**
9. Hit **ENTER** to continue.

Figure 258 Cisco UCS Director 5.2.0.1 Patch Application Process

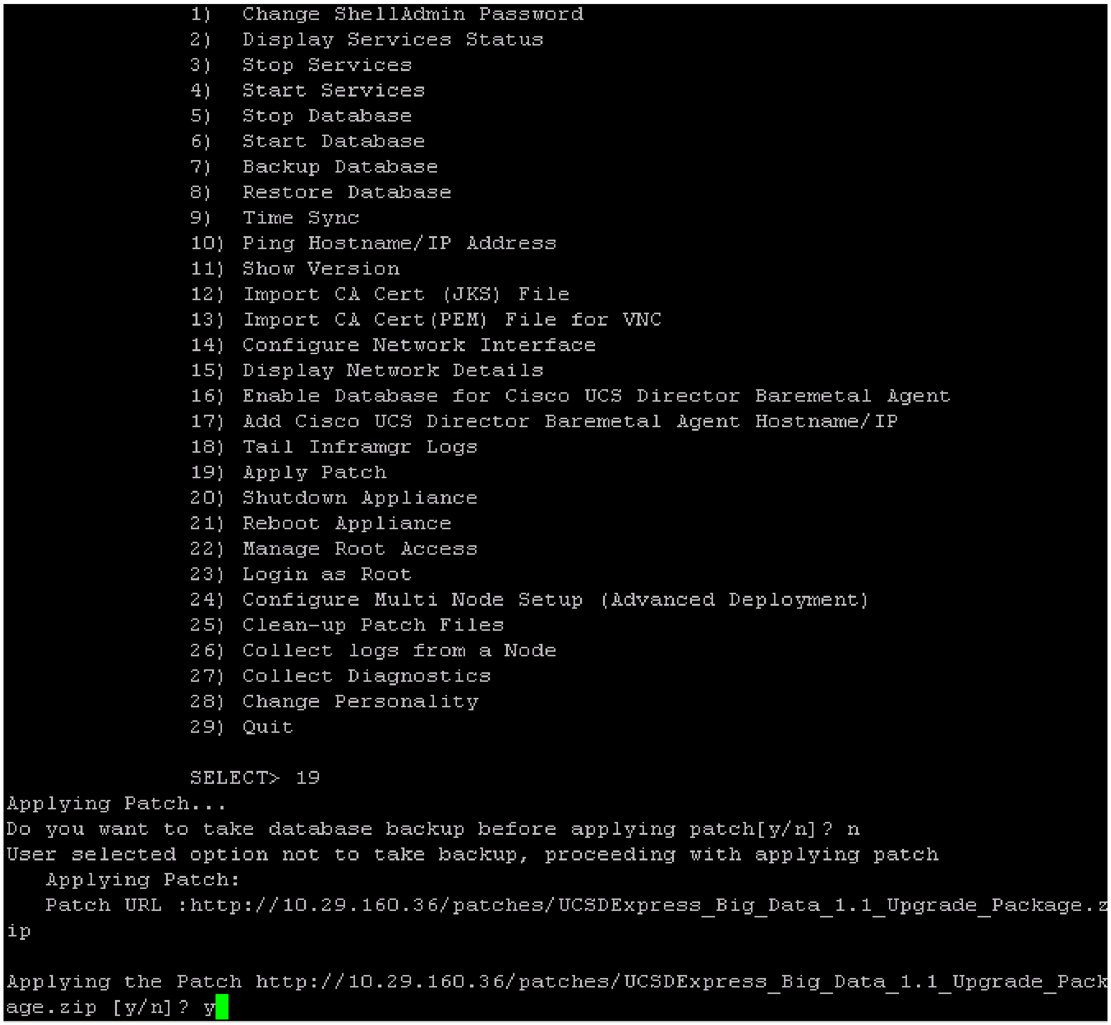


```
          Select a number from the menu below

              1)  Change ShellAdmin Password
              2)  Display Services Status
              3)  Stop Services
              4)  Start Services
              5)  Stop Database
              6)  Start Database
              7)  Backup Database
              8)  Restore Database
              9)  Time Sync
              10) Ping Hostname/IP Address
              11) Show Version
              12) Import CA Cert (JKS) File
              13) Import CA Cert(PEM) File for VNC
              14) Configure Network Interface
              15) Display Network Details
              16) Enable Database for Cisco UCS Director Baremetal Agent
              17) Add Cisco UCS Director Baremetal Agent Hostname/IP
              18) Tail Inframgr Logs
              19) Apply Patch
              20) Shutdown Appliance
              21) Reboot Appliance
              22) Manage Root Access
              23) Login as Root
              24) Configure Multi Node Setup (Advanced Deployment)
              25) Clean-up Patch Files
              26) Collect logs from a Node
              27) Collect Diagnostics
              28) Change Personality
              29) Quit

              SELECT> 19
Applying Patch...
Do you want to take database backup before applying patch[y/n]? n
User selected option not to take backup, proceeding with applying patch
   Applying Patch:
   Patch URL :http://10.29.160.36/patches/cucsd_patch_5_2_0_1.zip

Applying the Patch http://10.29.160.36/patches/cucsd_patch_5_2_0_1.zip [y/n]? y
```

This 5.2.0.1 patch that is being applied to the UCSD-VM's, upgrades all the core application software to the latest Cisco UCS Director's code base. After this step completes, the Big Data Upgrade package for release 1.1 needs to be applied.

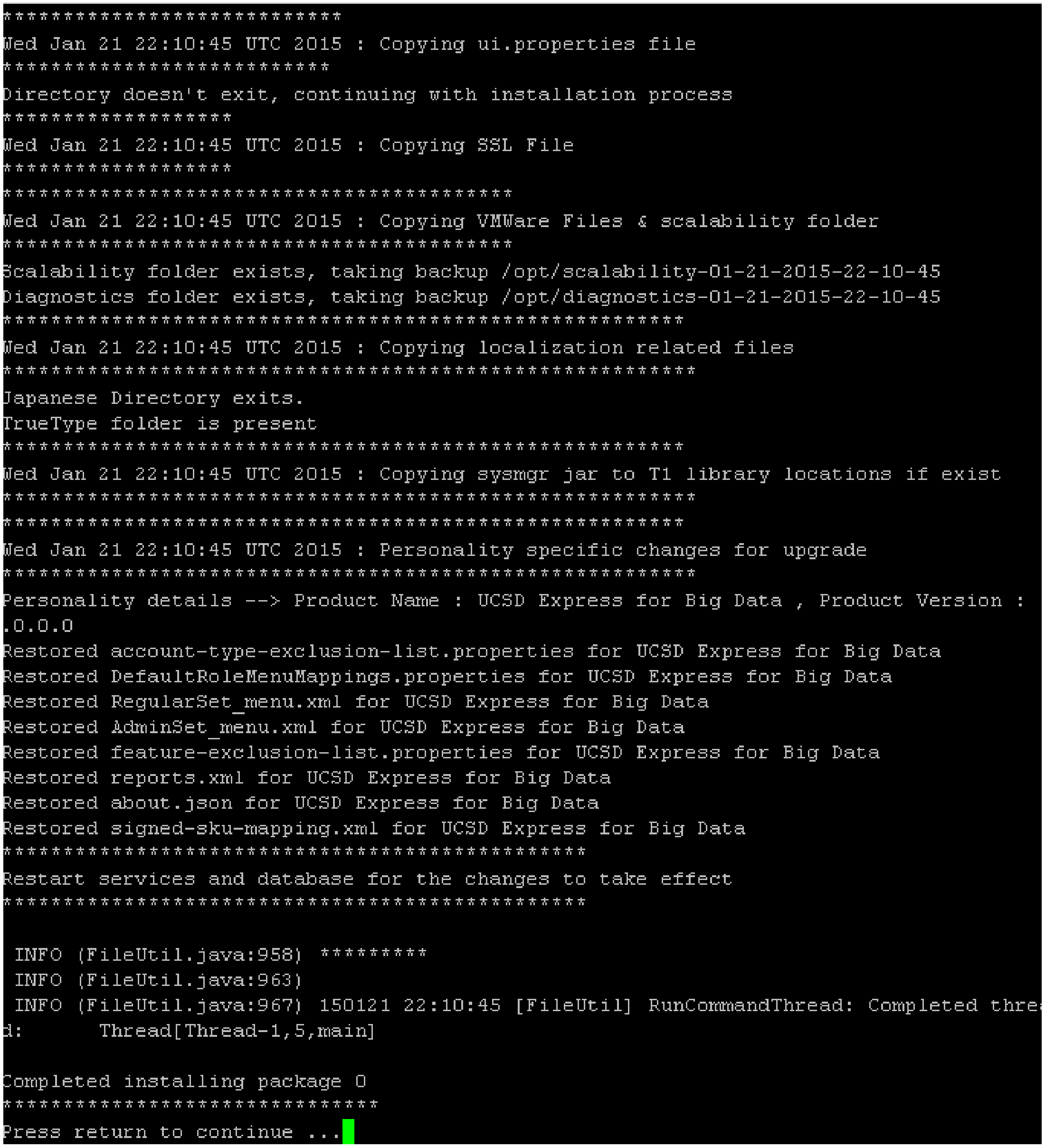
10. In the Shell Admin menu, type **19** and **ENTER** to start the patching process.
11. Type n to the prompt **Do you want to take database backup before applying patch[y/n]?**.
12. At the prompt, Patch URL:, enter **http://<BMA_IP>/patches/UCSDExpress_Big_Data_1.1_Upgrade_Package.zip**
13. Hit **ENTER** to continue.

Figure 259 Cisco UCS Director Express for Big Data 1.1 Upgrade Package Installation Process



```
                1)  Change ShellAdmin Password
                2)  Display Services Status
                3)  Stop Services
                4)  Start Services
                5)  Stop Database
                6)  Start Database
                7)  Backup Database
                8)  Restore Database
                9)  Time Sync
                10) Ping Hostname/IP Address
                11) Show Version
                12) Import CA Cert (JKS) File
                13) Import CA Cert(PEM) File for VNC
                14) Configure Network Interface
                15) Display Network Details
                16) Enable Database for Cisco UCS Director Baremetal Agent
                17) Add Cisco UCS Director Baremetal Agent Hostname/IP
                18) Tail Inframgr Logs
                19) Apply Patch
                20) Shutdown Appliance
                21) Reboot Appliance
                22) Manage Root Access
                23) Login as Root
                24) Configure Multi Node Setup (Advanced Deployment)
                25) Clean-up Patch Files
                26) Collect logs from a Node
                27) Collect Diagnostics
                28) Change Personality
                29) Quit

                SELECT> 19
Applying Patch...
Do you want to take database backup before applying patch[y/n]? n
User selected option not to take backup, proceeding with applying patch
   Applying Patch:
   Patch URL :http://10.29.160.36/patches/UCSDExpress_Big_Data_1.1_Upgrade_Package.z
ip

Applying the Patch http://10.29.160.36/patches/UCSDExpress_Big_Data_1.1_Upgrade_Pack
age.zip [y/n]? y
```

Figure 260 Cisco UCS Director Express for Big Data 1.1 Upgrade Package Application Complete



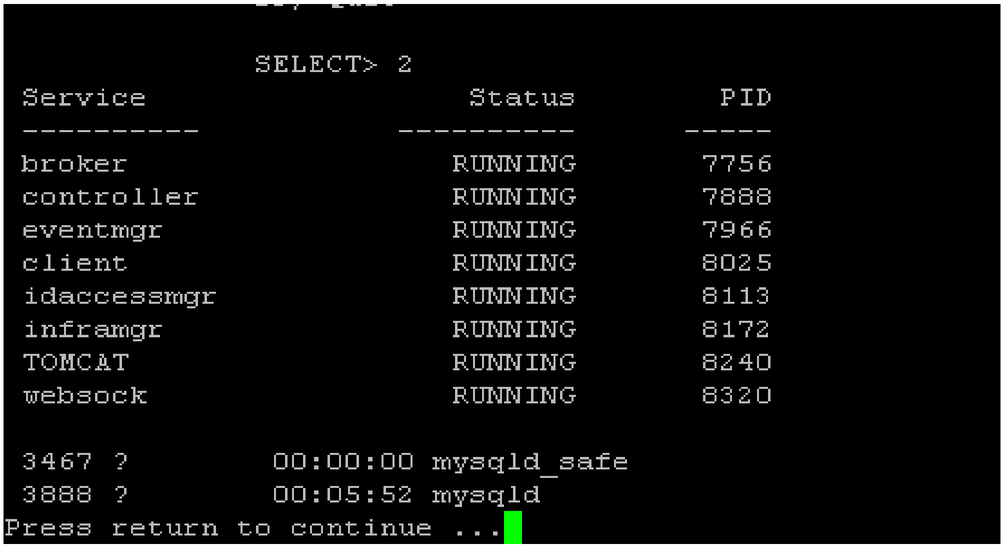
```
****************************
Wed Jan 21 22:10:45 UTC 2015 : Copying ui.properties file
***************************
Directory doesn't exit, continuing with installation process
*******************
Wed Jan 21 22:10:45 UTC 2015 : Copying SSL File
*******************
******************************************
Wed Jan 21 22:10:45 UTC 2015 : Copying VMWare Files & scalability folder
******************************************
Scalability folder exists, taking backup /opt/scalability-01-21-2015-22-10-45
Diagnostics folder exists, taking backup /opt/diagnostics-01-21-2015-22-10-45
********************************************************
Wed Jan 21 22:10:45 UTC 2015 : Copying localization related files
*********************************************************
Japanese Directory exits.
TrueType folder is present
********************************************************
Wed Jan 21 22:10:45 UTC 2015 : Copying sysmgr jar to T1 library locations if exist
*********************************************************
********************************************************
Wed Jan 21 22:10:45 UTC 2015 : Personality specific changes for upgrade
*********************************************************
Personality details --> Product Name : UCSD Express for Big Data , Product Version :
.0.0.0
Restored account-type-exclusion-list.properties for UCSD Express for Big Data
Restored DefaultRoleMenuMappings.properties for UCSD Express for Big Data
Restored RegularSet_menu.xml for UCSD Express for Big Data
Restored AdminSet_menu.xml for UCSD Express for Big Data
Restored feature-exclusion-list.properties for UCSD Express for Big Data
Restored reports.xml for UCSD Express for Big Data
Restored about.json for UCSD Express for Big Data
Restored signed-sku-mapping.xml for UCSD Express for Big Data
************************************************
Restart services and database for the changes to take effect
************************************************

 INFO (FileUtil.java:958) *********
 INFO (FileUtil.java:963)
 INFO (FileUtil.java:967) 150121 22:10:45 [FileUtil] RunCommandThread: Completed thre
d:       Thread[Thread-1,5,main]

Completed installing package 0
*******************************
Press return to continue ...
```

14. After the successful application of the patch, type **4** and **ENTER** to start the services.

Note It takes about a few minutes for all the services to get started.

15. Type 2 to check on the services status. All the services should now be in **RUNNING** state.

Figure 261 Verify the Status of the Services in the UCSD-VM



```
               SELECT> 2
 Service                   Status        PID
 ----------             ----------      -----
 broker                   RUNNING       7756
 controller               RUNNING       7888
 eventmgr                 RUNNING       7966
 client                   RUNNING       8025
 idaccessmgr              RUNNING       8113
 inframgr                 RUNNING       8172
 TOMCAT                   RUNNING       8240
 websock                  RUNNING       8320

 3467 ?         00:00:00 mysqld_safe
 3888 ?         00:05:52 mysqld
Press return to continue ...
```

Note Even after all the services are in a RUNNING state, it would take an additional 3 to 5 minutes for the UCSD-VM client services to become available.

Configuring the Cisco UCS Director Express for Big Data (UCSD Express)

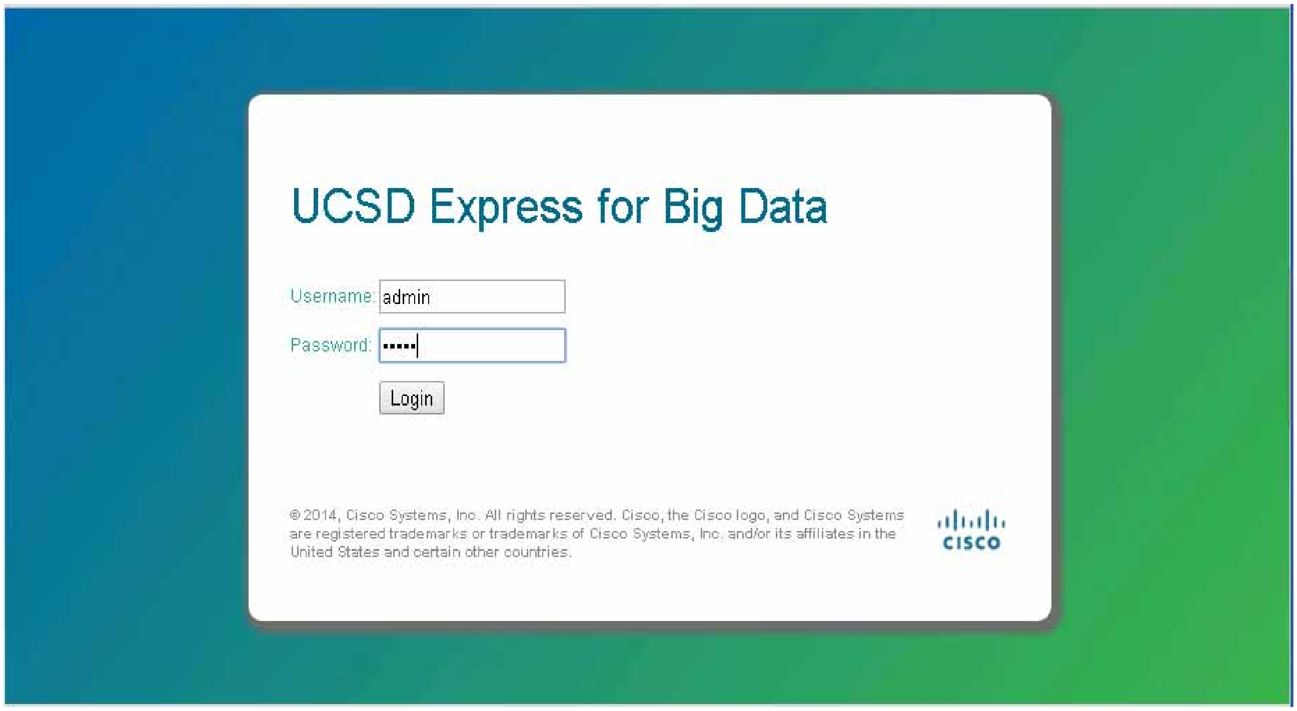
The Cisco UCS Director Express for Big Data, henceforth known as UCSD-Express, needs to be configured with the IP address to the UCS domain (i.e. UCS Manager's) physical account. This allows the UCSD-Express to query the UCS Manager and perform inventory collection.

The UCSD-Express will also need to be configured with the BMA's physical account and configure it's services such as DHCP.

Add the licenses to UCSD-Express

1. Using a web browser, visit the URL http://<UCSD-VM's IP>/.
2. Login as user **admin** with the default password **admin**.

Figure 262 Logging onto the Cisco UCS Director Express for Big Data



UCSD Express for Big Data

Username: admin

Password: •••••

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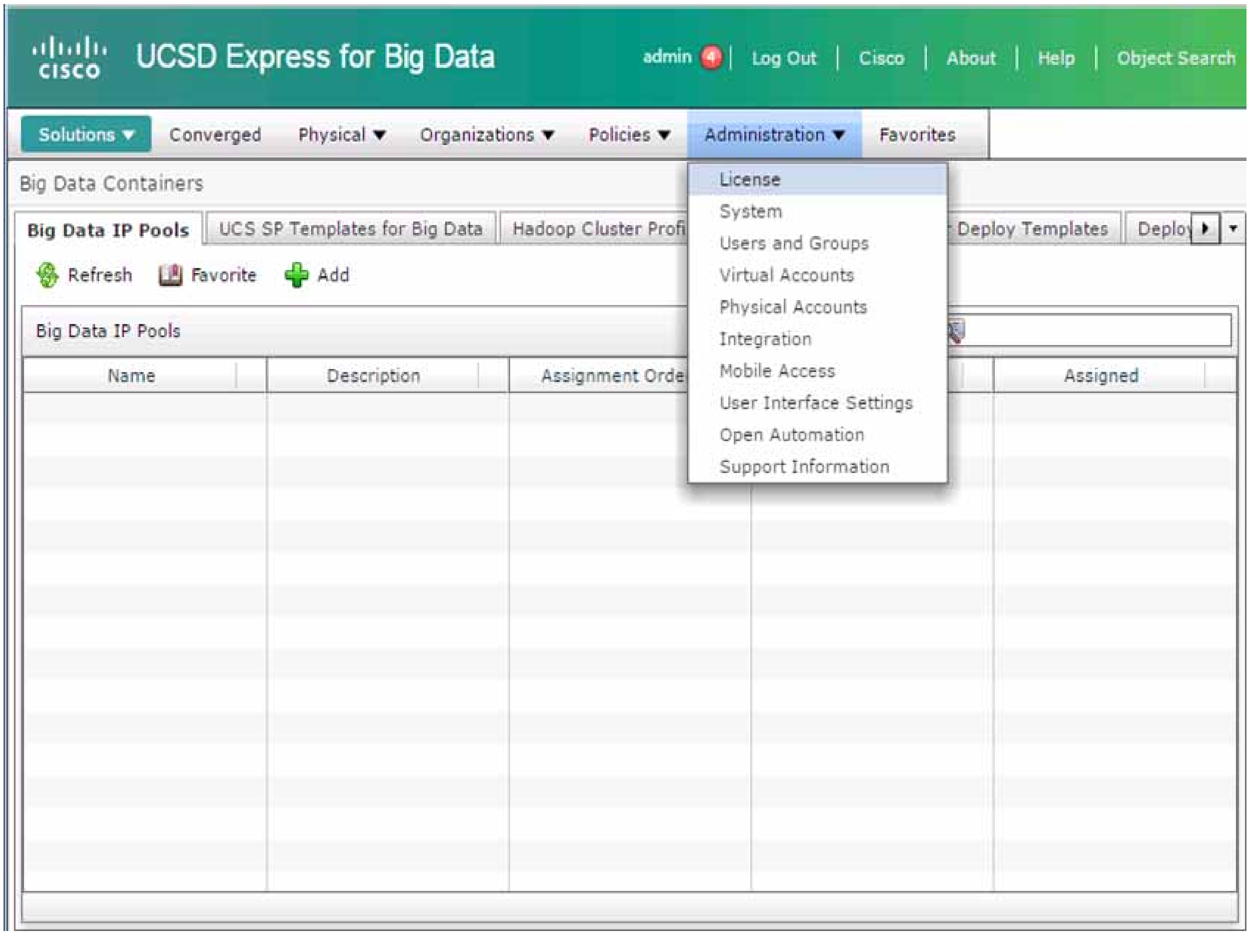
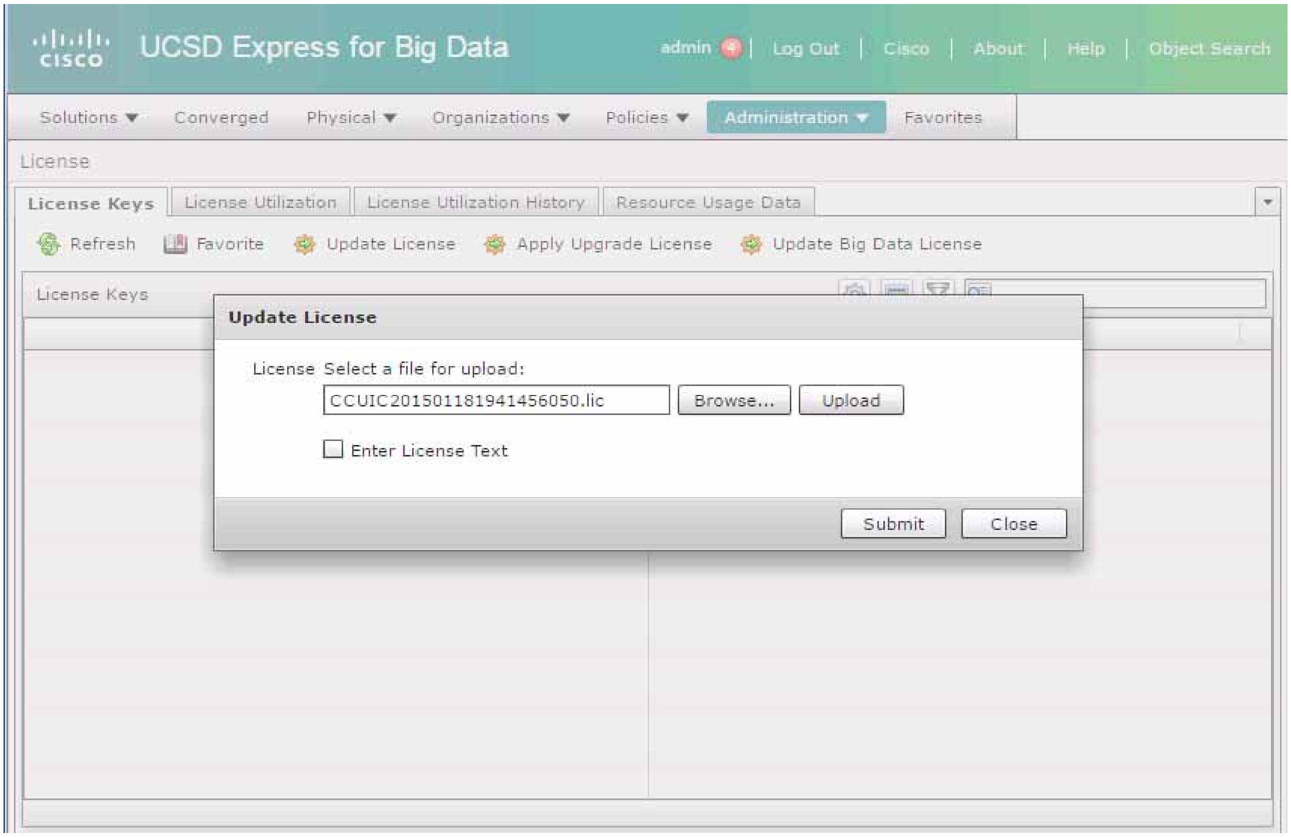
3. Navigate to **Administration > License screen.**

Figure 263 Accessing the License Administration Page


UCSD Express for Big Data
admin 4 | Log Out | Cisco | About | Help | Object Search
Solutions ▼ Converged Physical ▼ Organizations ▼ Policies ▼ Administration ▼ Favorites
License
System
Users and Groups
Virtual Accounts
Physical Accounts
Integration
Mobile Access
User Interface Settings
Open Automation
Support Information
Big Data Containers
Big Data IP Pools | UCS SP Templates for Big Data | Hadoop Cluster Profi | Deploy Templates | Deploy
Refresh Favorite Add
Big Data IP Pools
Name | Description | Assignment Orde | Assigned

4. Click on **License Keys** tab.
5. Click on **Update License**.
6. In the **Update License** dialog box, click **Browse** to select the license file.
7. Click **Upload**.
8. After the license file gets uploaded, Click **Submit** to apply the license.

Figure 264 Applying the Base Cisco UCS Director License.

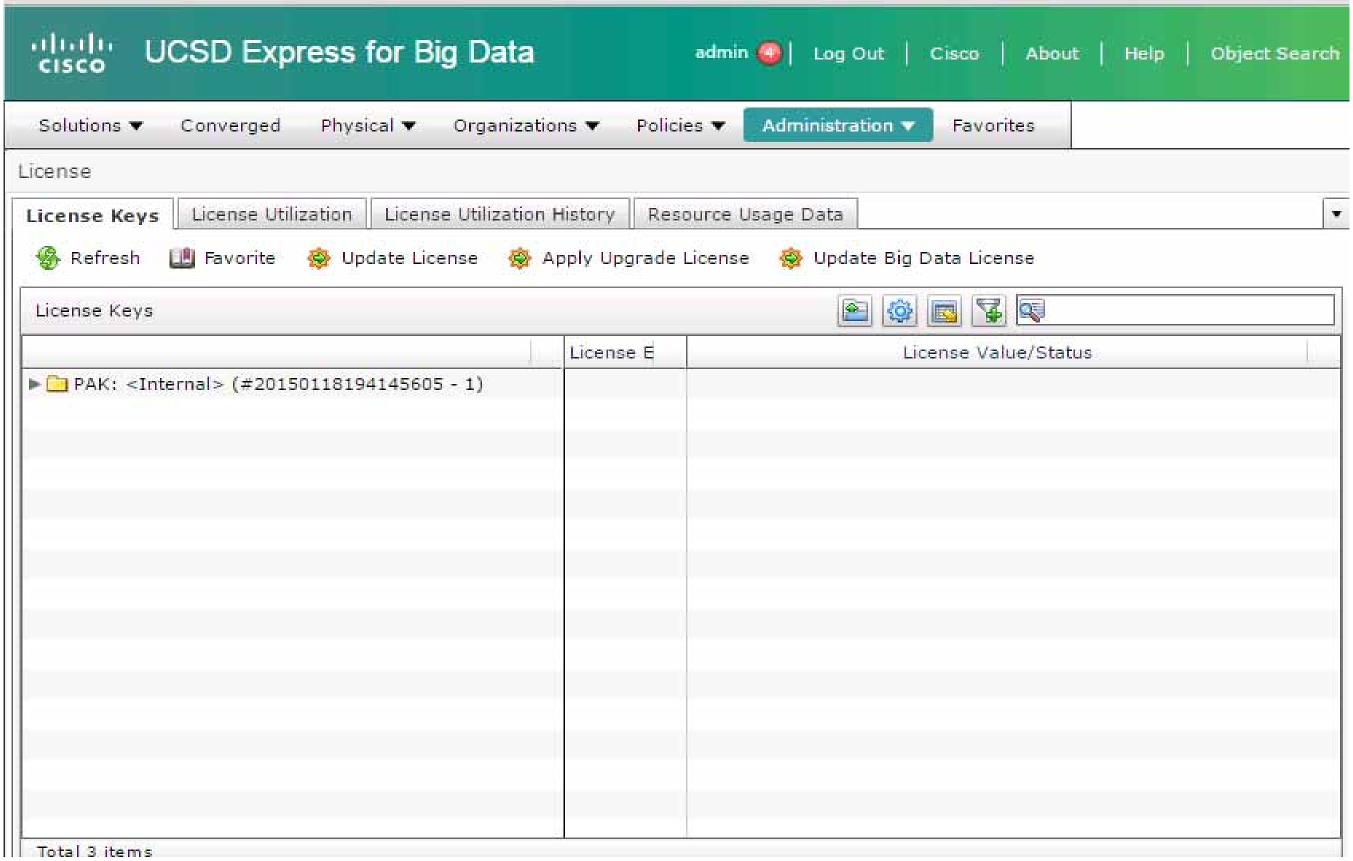

UCSD Express for Big Data
admin | Log Out | Cisco | About | Help | Object Search
Solutions Converged Physical Organizations Policies Administration Favorites
License
License Keys | License Utilization | License Utilization History | Resource Usage Data
Refresh Favorite Update License Apply Upgrade License Update Big Data License
License Keys
Update License
Browse...
Upload
Submit
Close

License Select a file for upload: CCUIC201501181941456050.lic

□ Enter License Text

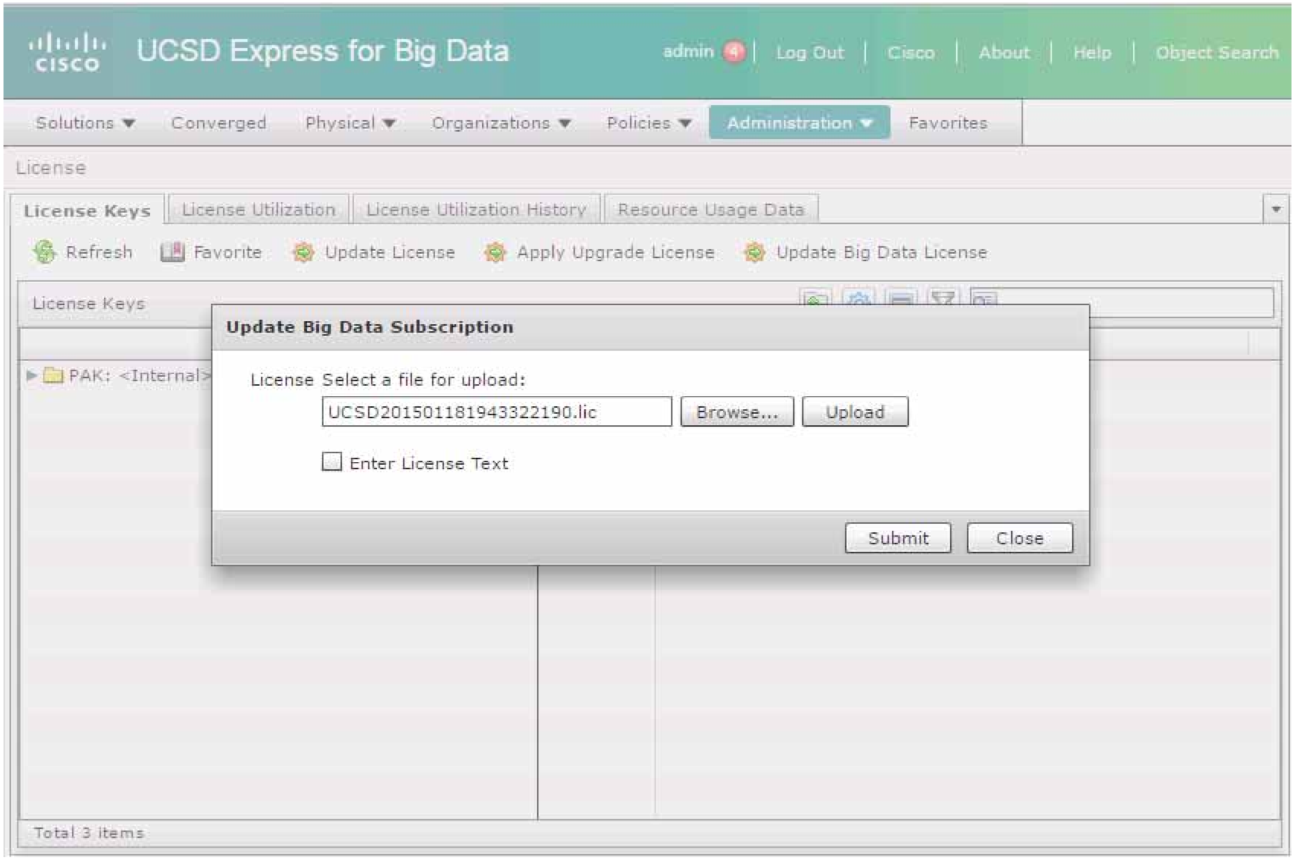
9. The license keys are displayed as shown below.

Figure 265 Cisco UCS Director Base Licenses got Applied Successfully


UCSD Express for Big Data
admin | Log Out | Cisco | About | Help | Object Search
Solutions ▼ Converged Physical ▼ Organizations ▼ Policies ▼ Administration ▼ Favorites
License
License Keys | License Utilization | License Utilization History | Resource Usage Data
Refresh Favorite Update License Apply Upgrade License Update Big Data License
License Keys
License E
License Value/Status
▶ PAK: <Internal> (#20150118194145605 - 1)
Total 3 items

10. Click on **Update Big Data License**.
11. In the **Update Big Data Subscription** dialog box, click **Browse** to select the Big Data specific license file.
12. Click **Upload**.
13. After the license file gets uploaded, Click **Submit**.

Figure 266 Applying the Cisco UCS Director Express Big Data Subscription License

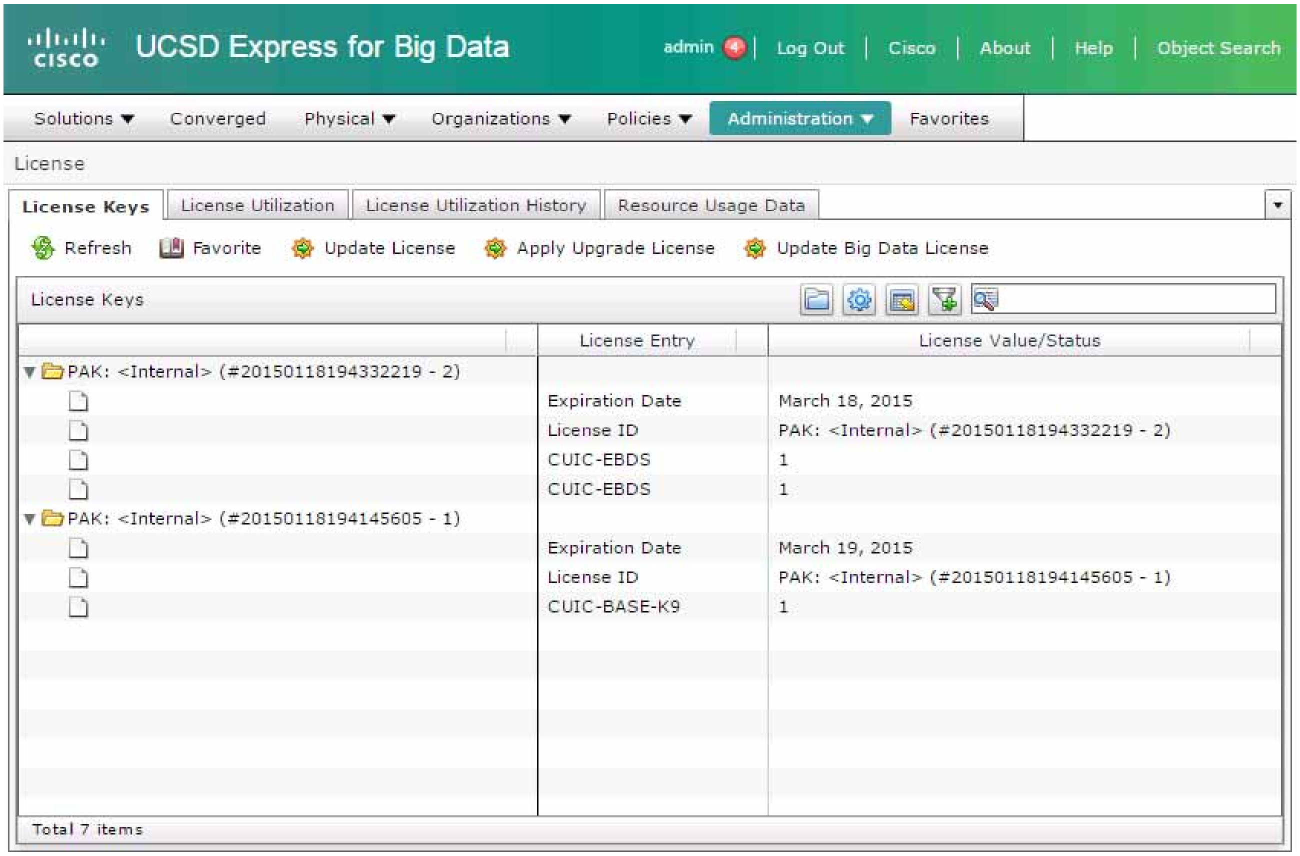


Update Big Data Subscription

License Select a file for upload: UCSD201501181943322190.lic

□ Enter License Text

Figure 267 Completion of the License Application.



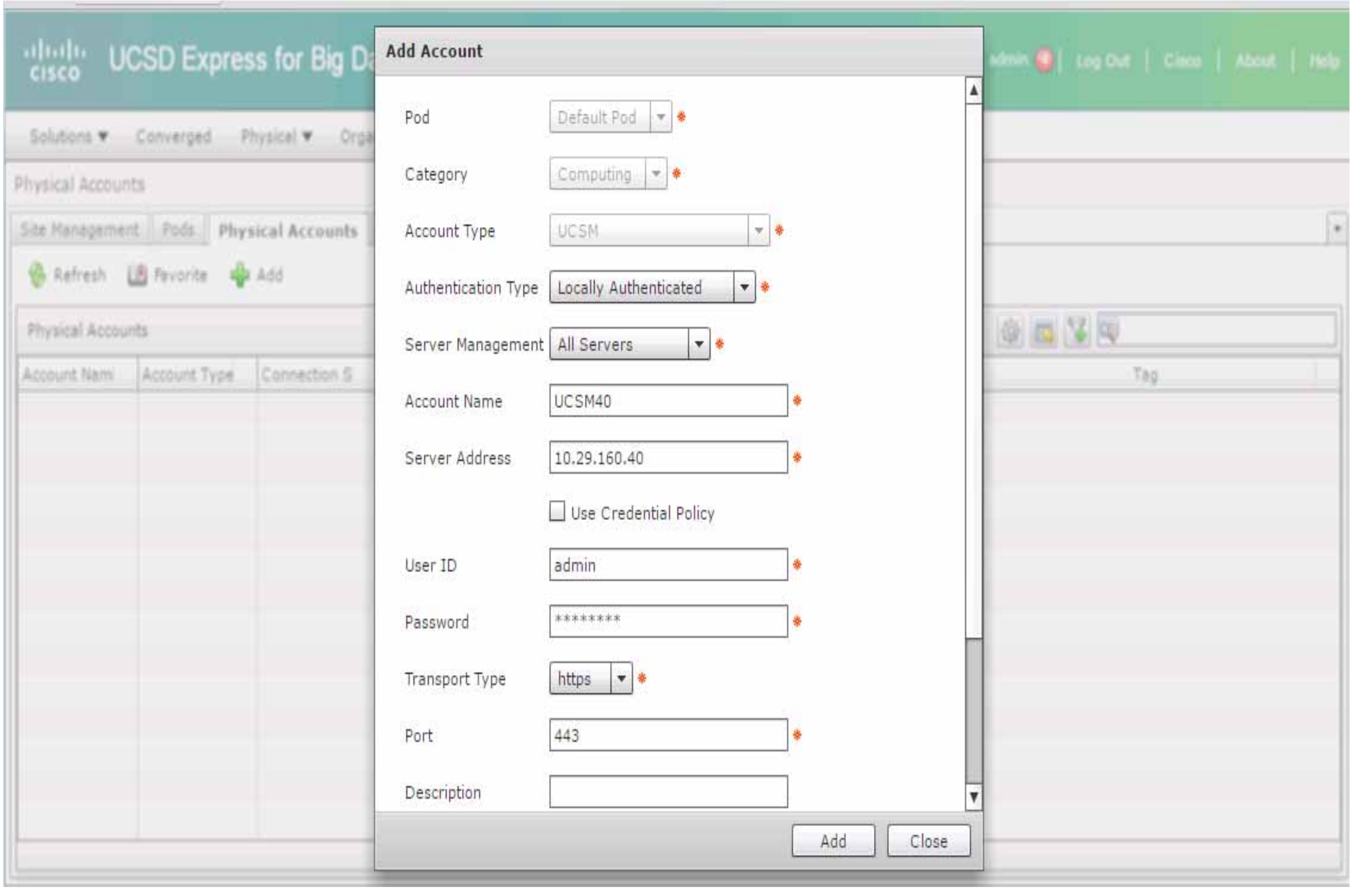
	License Entry	License Value/Status
PAK: <Internal> (#20150118194332219 - 2)		
	Expiration Date	March 18, 2015
	License ID	PAK: <Internal> (#20150118194332219 - 2)
	CUIC-EBDS	1
	CUIC-EBDS	1
PAK: <Internal> (#20150118194145605 - 1)		
	Expiration Date	March 19, 2015
	License ID	PAK: <Internal> (#20150118194145605 - 1)
	CUIC-BASE-K9	1

Total 7 items

Add the UCS Manager physical account to the UCSD-Express

1. In the UCSD-Express web console, navigate to **Administration >Physical Accounts**.
2. Click + **ADD** button
   a. Input the UCS Manager Account details as follows.
   b. In the Account Name field, enter a name to this UCS Manager account.
   c. In the Server Address field, enter the IP address of the UCS Manager.
   d. In the User ID field, enter admin.
   e. In the Password field, enter the password to the UCS Manager's admin user.
   f. In the Transport Type field, choose https.
3. Click **Add**.

Figure 268 Adding the UCS Manager as a Physical Account in the UCSD-VM



Add Account

Pod: Default Pod *

Category: Computing *

Account Type: UCSM *

Authentication Type: Locally Authenticated *

Server Management: All Servers *

Account Name: UCSM40 *

Server Address: 10.29.160.40 *

□ Use Credential Policy

User ID: admin *

Password: ******** *

Transport Type: https *

Port: 443 *

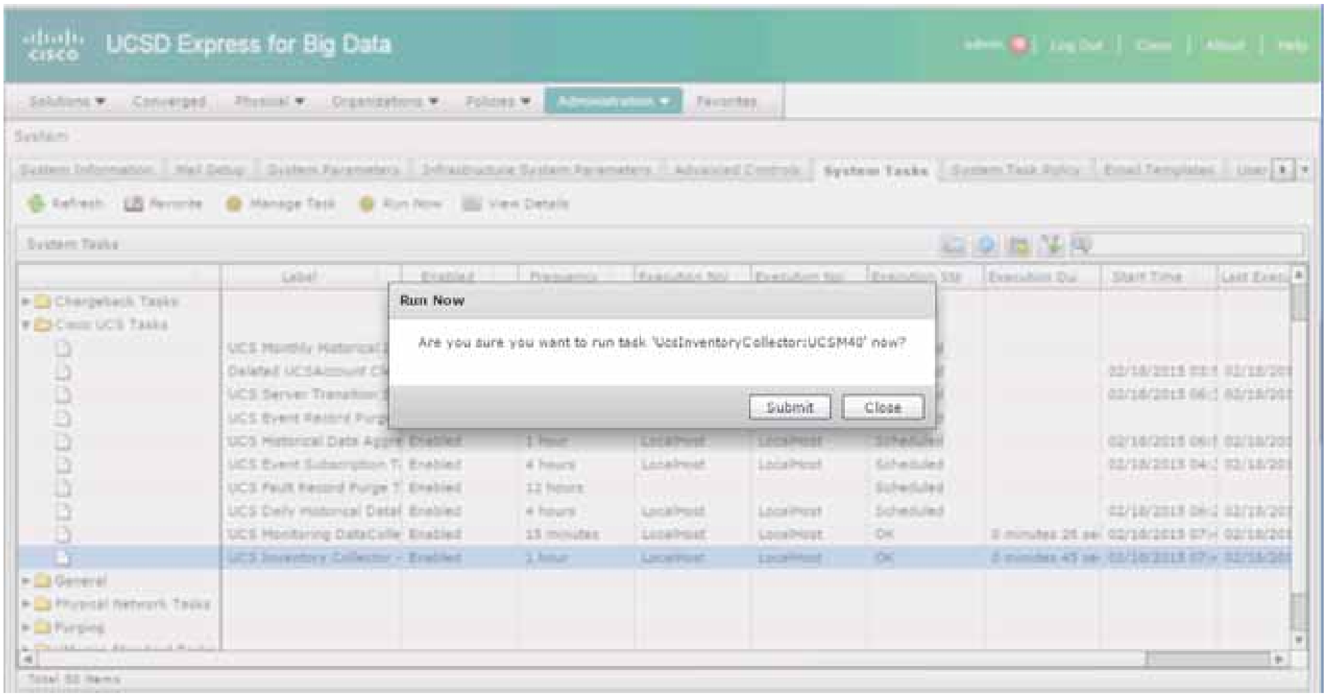
Description:

Add Close

Note After adding a physical account, the UCSD-Express will query the UCS Manager to perform the inventory collection. This process of inventory collection happens at scheduled intervals.Optionally, you may kick start the inventory collection process manually. These optional steps are described in the steps 4 to 8 below.

4. Goto **Administration > System**.
5. Click on **System Tasks** tab.
6. Open the folder Cisco UCS Tasks.
7. Click on UCS Inventory Collector Task.
8. Click **Run Now** button to execute the task.

Figure 269 Start the UCS Inventory Collection System Task

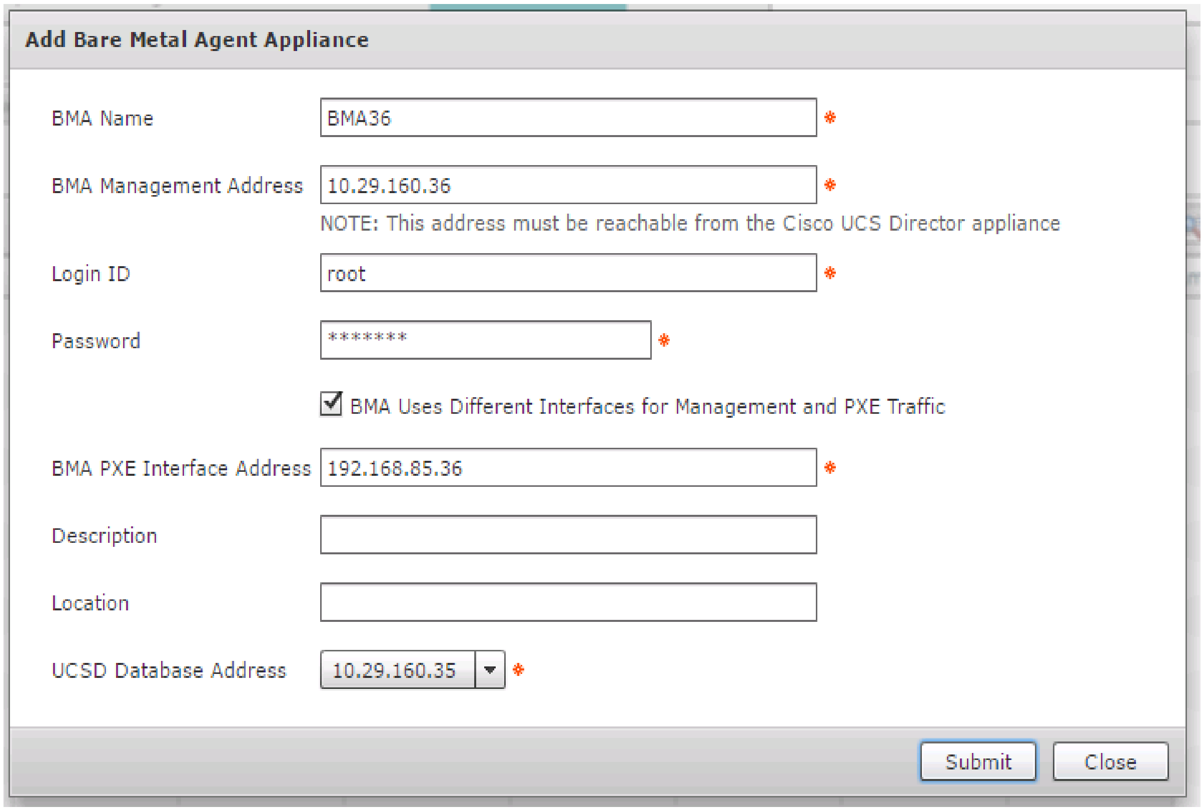


Are you sure you want to run task 'UcsInventoryCollector:UCSM40' now?

Add the Bare Metal Agent physical account to the UCSD-Express

1. In the UCSD-Express web console, navigate to **Administration > Physical Accounts**.
2. Click on **Bare Metal Agents** tab; Click **+ Add**.
3. Enter the BMA physical account information details as follows:
4. In BMA Name field, enter a name to this BMA physical account.
5. In the **BMA Management Address** field, enter the BMA-VM's IP address assigned to **NIC eth0**.
6. In the **Login ID field**, enter **root**.
7. In the **Password** field, enter the password. Default password is **pxeboot**.
8. Check the checkbox **BMA Uses Different Interfaces for Management and PXE Traffic**.
9. In the BMA PXE Interface Address field, enter PXE IP address i.e. BMA-VM's IP address assigned to NIC **eth1**.
10. Click **Submit**.

Figure 270 Adding the Bare Metal Agent Appliance Information



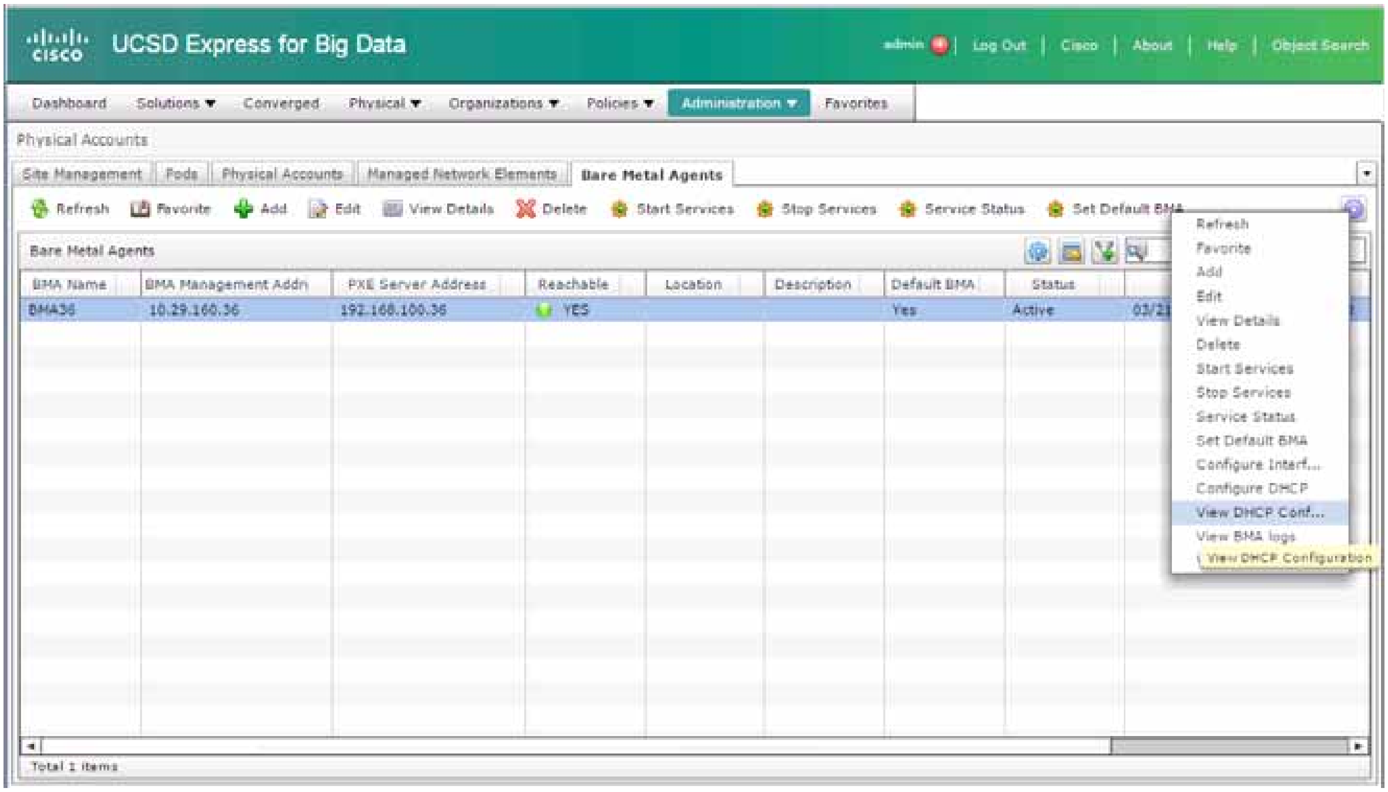
Add Bare Metal Agent Appliance

BMA Name	BMA36 *
BMA Management Address	10.29.160.36 * NOTE: This address must be reachable from the Cisco UCS Director appliance
Login ID	root *
Password	******* *
	☑ BMA Uses Different Interfaces for Management and PXE Traffic
BMA PXE Interface Address	192.168.85.36 *
Description	
Location	
UCSD Database Address	10.29.160.35 *

Configure the Bare Metal Agent's DHCP services

1. Navigate to **Administration > Physical Accounts >Bare Metal Agents**.
2. Select the **BMA** entry.
3. On the menu items row, click on the downward facing arrow located at the far right.
4. Select **Configure DHCP**.

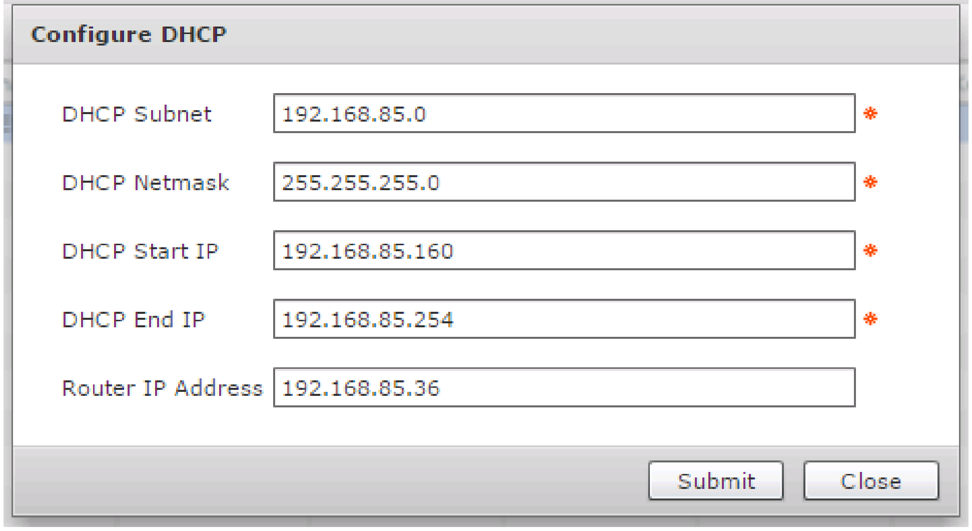
Figure 271 Configuring the DHCP



BMA Name	BMA Management Addr	PXE Server Address	Reachable	Location	Description	Default BMA	Status	
BMA36	10.29.160.36	192.168.100.36	YES			Yes	Active	03/21

5. In the **Configure DHCP** dialog box, enter the following
6. In the **DHCP Subnet** field, enter the subnet that's associated with the BMA-VM's **eth1** NIC.
7. In the **DHCP Netmask**, enter the appropriate subnet mask value for this network.
8. In the **DHCP Start IP**, enter a starting IP address in the same subnet.
9. In the **DHCP End IP**, enter a starting IP address in the same subnet.
10. In the **Router IP Address**, enter the IP address of the gateway router in the network if available, if not may be left as blank or input the IP address of the BMA-VM's **eth1** NIC.
11. Click **Submit**.

Figure 272 Configuring the DHCP services on the BMA.



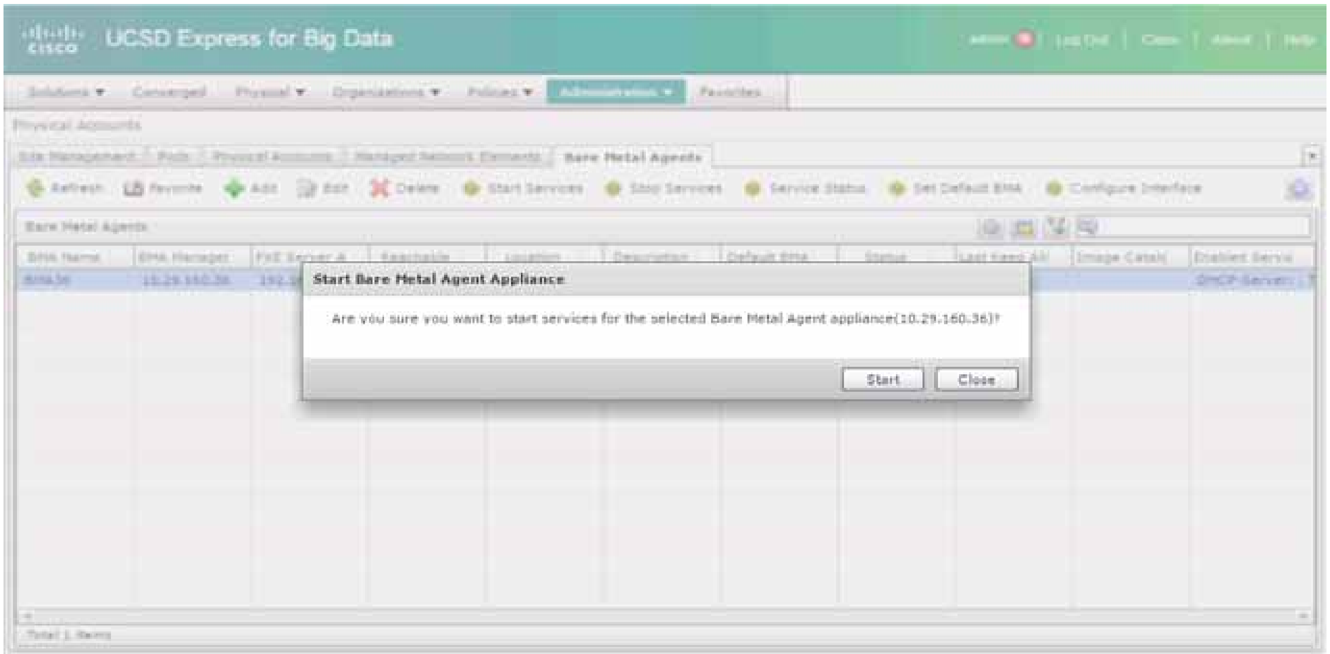
Configure DHCP

DHCP Subnet	192.168.85.0 *
DHCP Netmask	255.255.255.0 *
DHCP Start IP	192.168.85.160 *
DHCP End IP	192.168.85.254 *
Router IP Address	192.168.85.36

Start the BMA services

1. Navigate to **Administration >Physical Accounts >Bare Metal Agents**.
2. Select the BMA entry.
3. Click **Start Services**.
4. In the **Start Bare Metal Agent Appliance** dialog box, click **Start** to start the services.

Figure 273 *Starting the BMA Services*



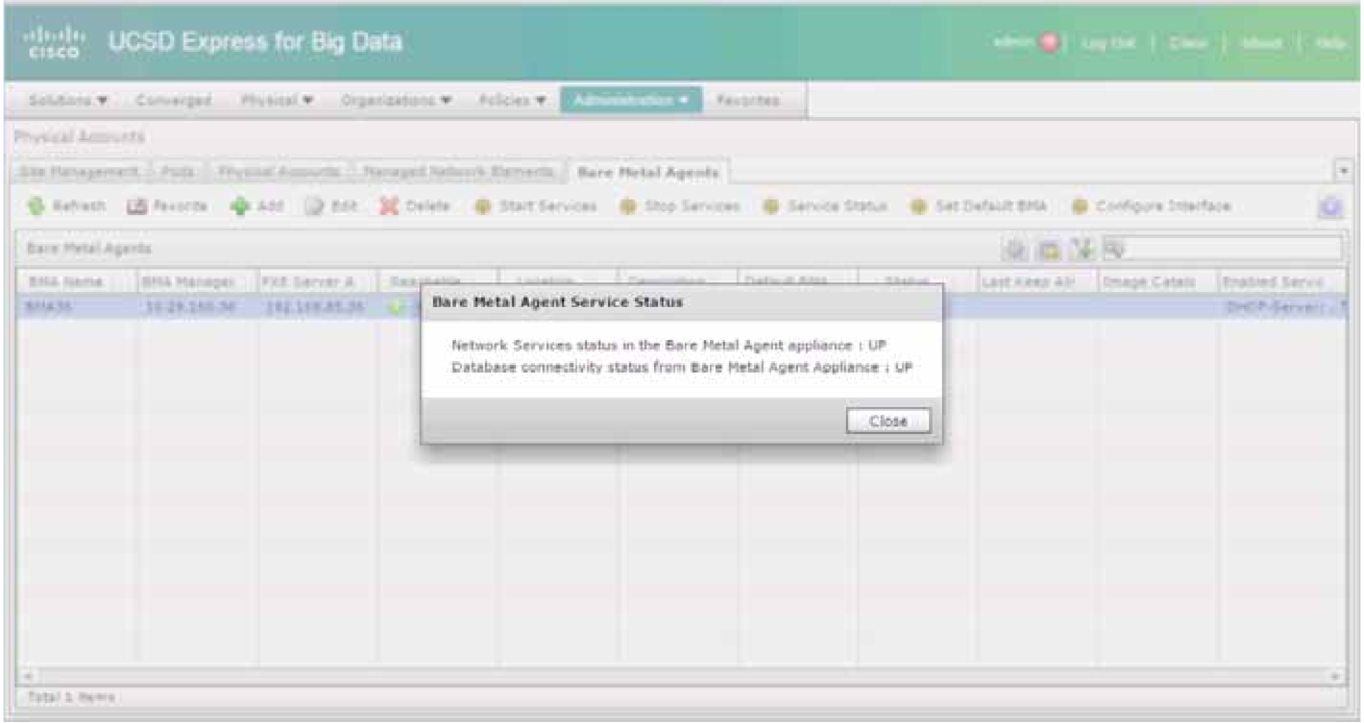
Start Bare Metal Agent Appliance

Are you sure you want to start services for the selected Bare Metal Agent appliance(10.29.160.36)?

Start Close

5. Click on **Service Status**, to **check the status of the services**.
6. The Bare Metal Agent Service Status **message box should display both the** Network Services status and Database connectivity status as UP.

Figure 274 Verifying the Bare Metal Agent Services Status



Bare Metal Agent Service Status

Network Services status in the Bare Metal Agent appliance : UP
Database connectivity status from Bare Metal Agent Appliance : UP

Note It may take a little while for the service status and on the BMA entry to get updated. The UCSD-Express and the associated BMA parts are now ready.

7. Double click on the BMA entry to verify the RHEL operating system repository.

Figure 275 Verifying the RHEL Operating System Software

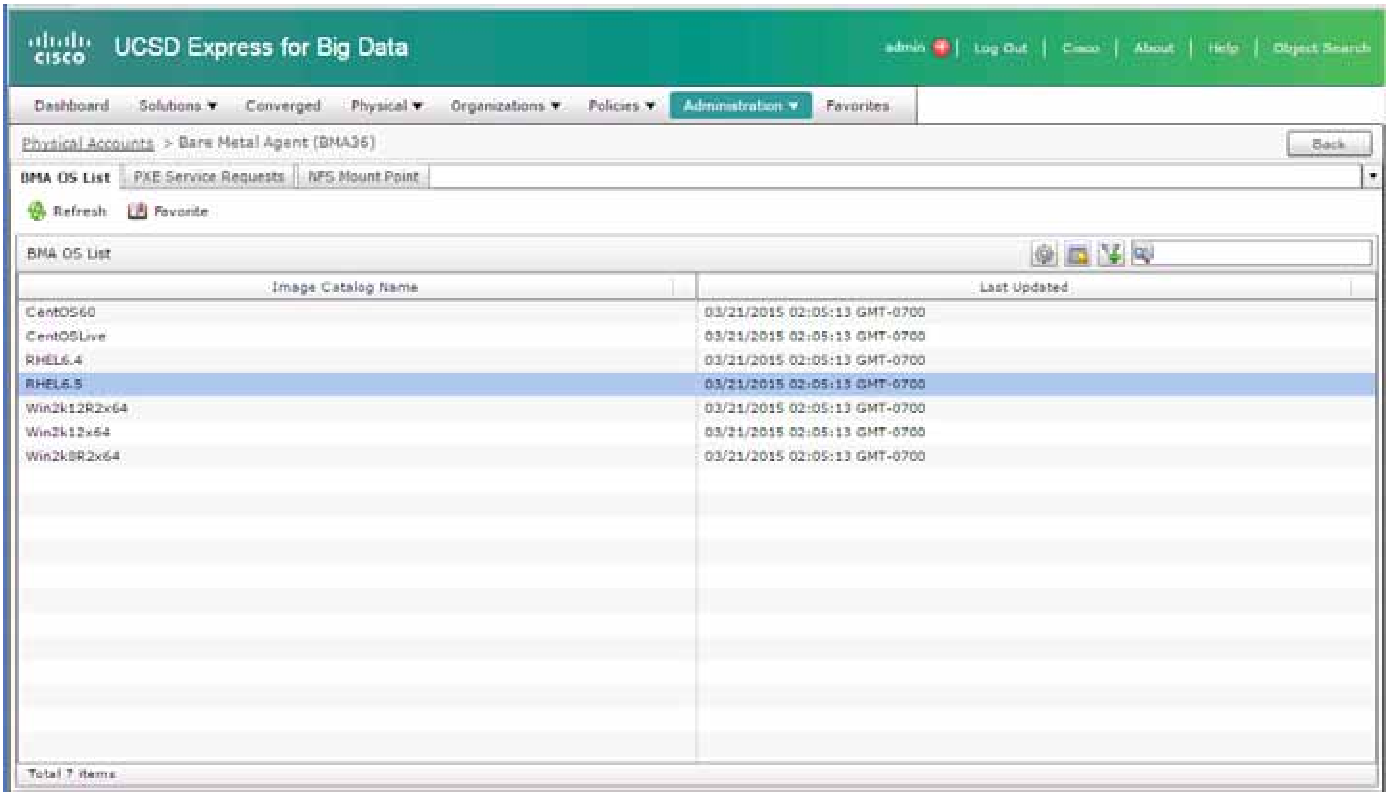


Image Catalog Name	Last Updated
CentOS60	03/21/2015 02:05:13 GMT-0700
CentOSLive	03/21/2015 02:05:13 GMT-0700
RHEL6.4	03/21/2015 02:05:13 GMT-0700
RHEL6.5	03/21/2015 02:05:13 GMT-0700
Win2k12R2x64	03/21/2015 02:05:13 GMT-0700
Win2k12x64	03/21/2015 02:05:13 GMT-0700
Win2k8R2x64	03/21/2015 02:05:13 GMT-0700

Total 7 items

Note BMA-VM software periodically scan the /opt/cnsaroot directory to update the available list of operating system software repositories.

Creating the Hadoop Cluster using UCSD-Express

For creating a Hadoop cluster of a desired distribution, the UCS Manager that's managing the target servers must be pre-configured to meet the following requirements. For performing these configurations, refer to any Cisco UCS Integrated Infrastructure for Big Data Cisco Validated Designs found at http://www.cisco.com/go/bigdata_design

a. The uplink ports fabric Interconnects must be reachable to that the UCSD-Express appliances management network (i.e. eth0).

b. The UCS-Manager must be configured with a host firmware policy containing C-series rack mount server firmware packages.

c. UCS Manager must be configured to discover the Rack Servers in its domain, and the respective ports are configured as server ports.

d. The server pool must be configured with appropriate set of physical servers that are part of the UCS domain.

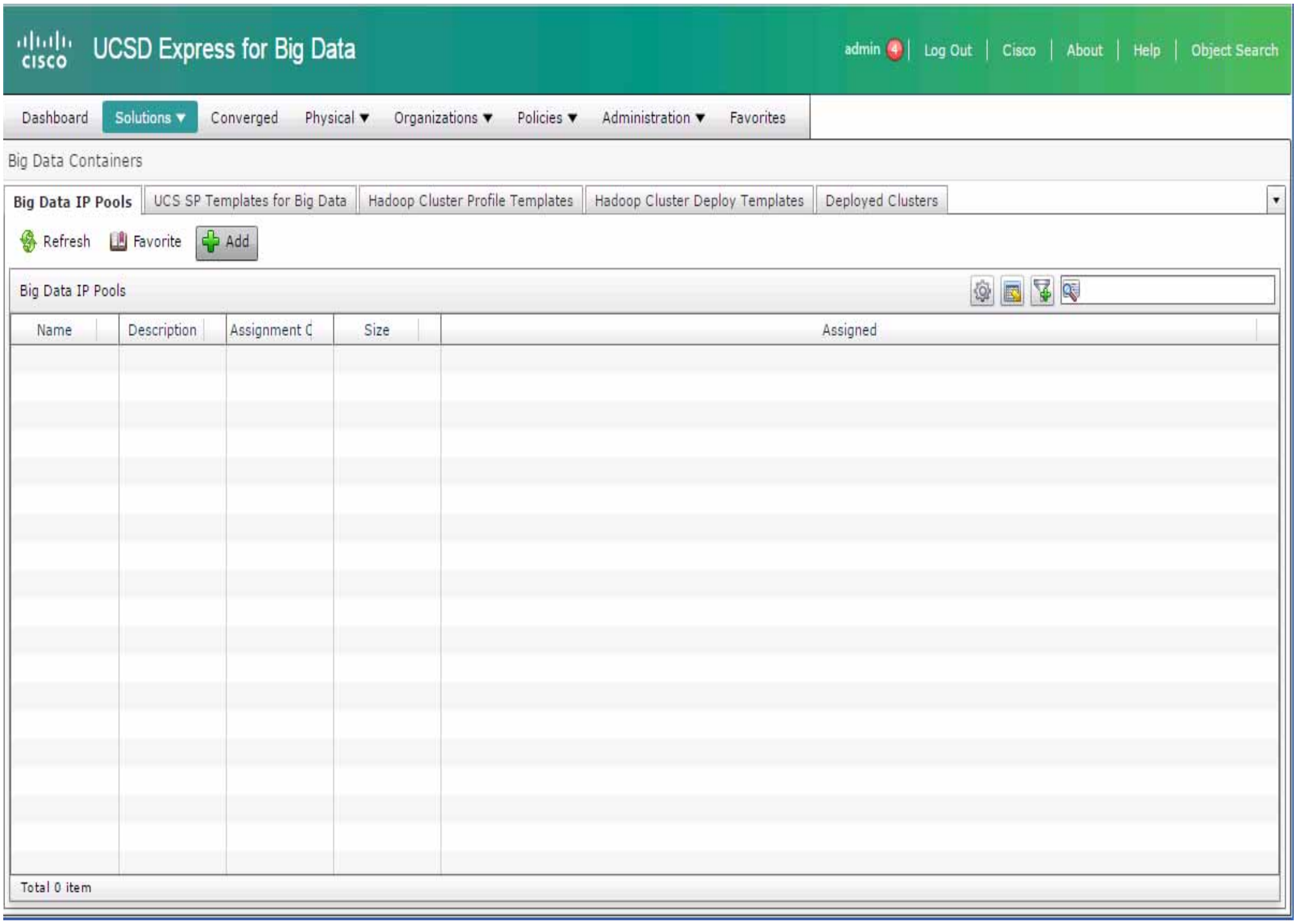
e. The QOS System Classes Platinum and Best Effort must be configured and enabled.

Note C240/C220 M4 Rack Servers are supported from UCS firmware 2.2(3d) onwards.

Create the IP Address pools

1. Using a web browser, visit the URL **http://<UCSD-VM's IP>/**.
2. Login as user admin with the default password **admin**.
3. Navigate to **Solutions > Big Data Containers**.
4. Click on the **Big Data IP Pools** Tab.
5. Click on **+ Add**.

Figure 276 *Creating the IP Address Pools*

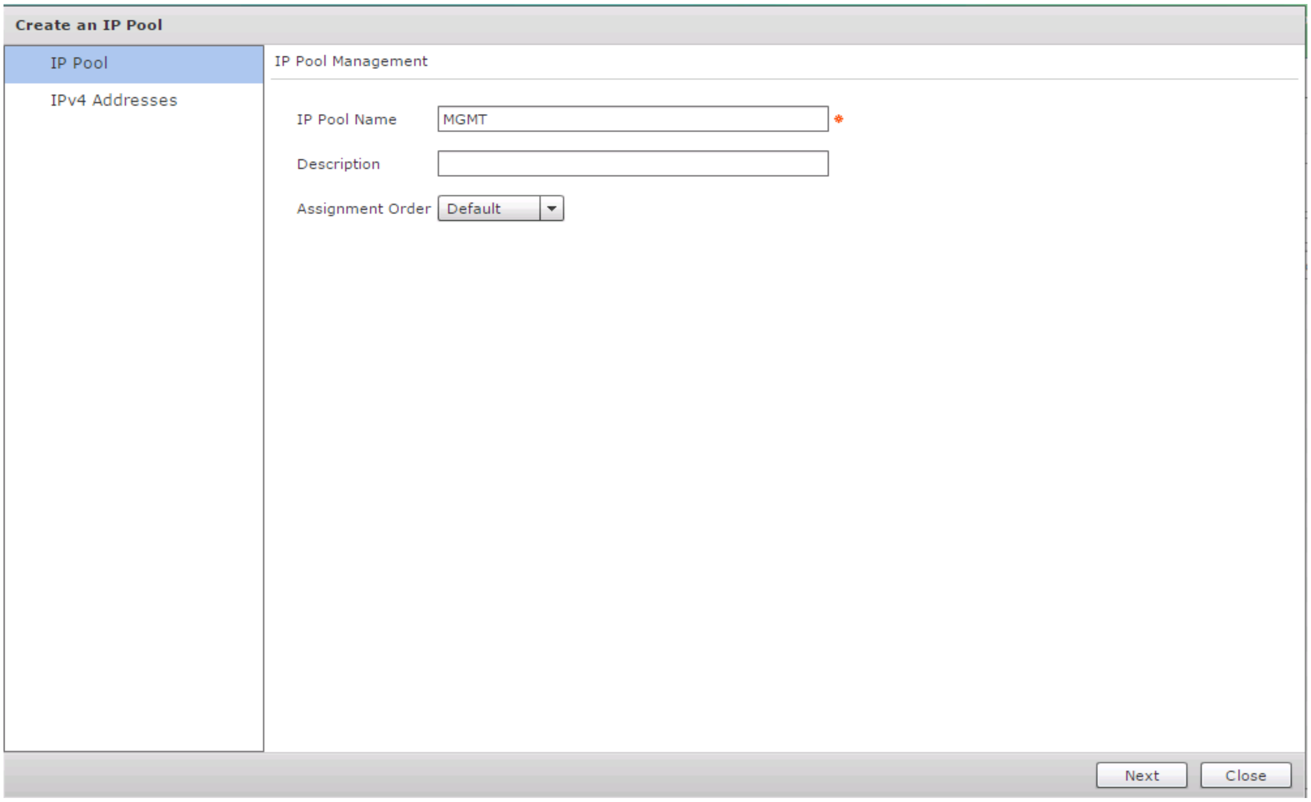


Name	Description	Assignment C	Size	Assigned

Total 0 item

6. In the **Create an IP Pool** dialog box.
7. Enter the name **MGMT**. Click **Next** to continue.

Figure 277 Creating the IP Address pool for MGMT VLAN



Create an IP Pool

IP Pool Management

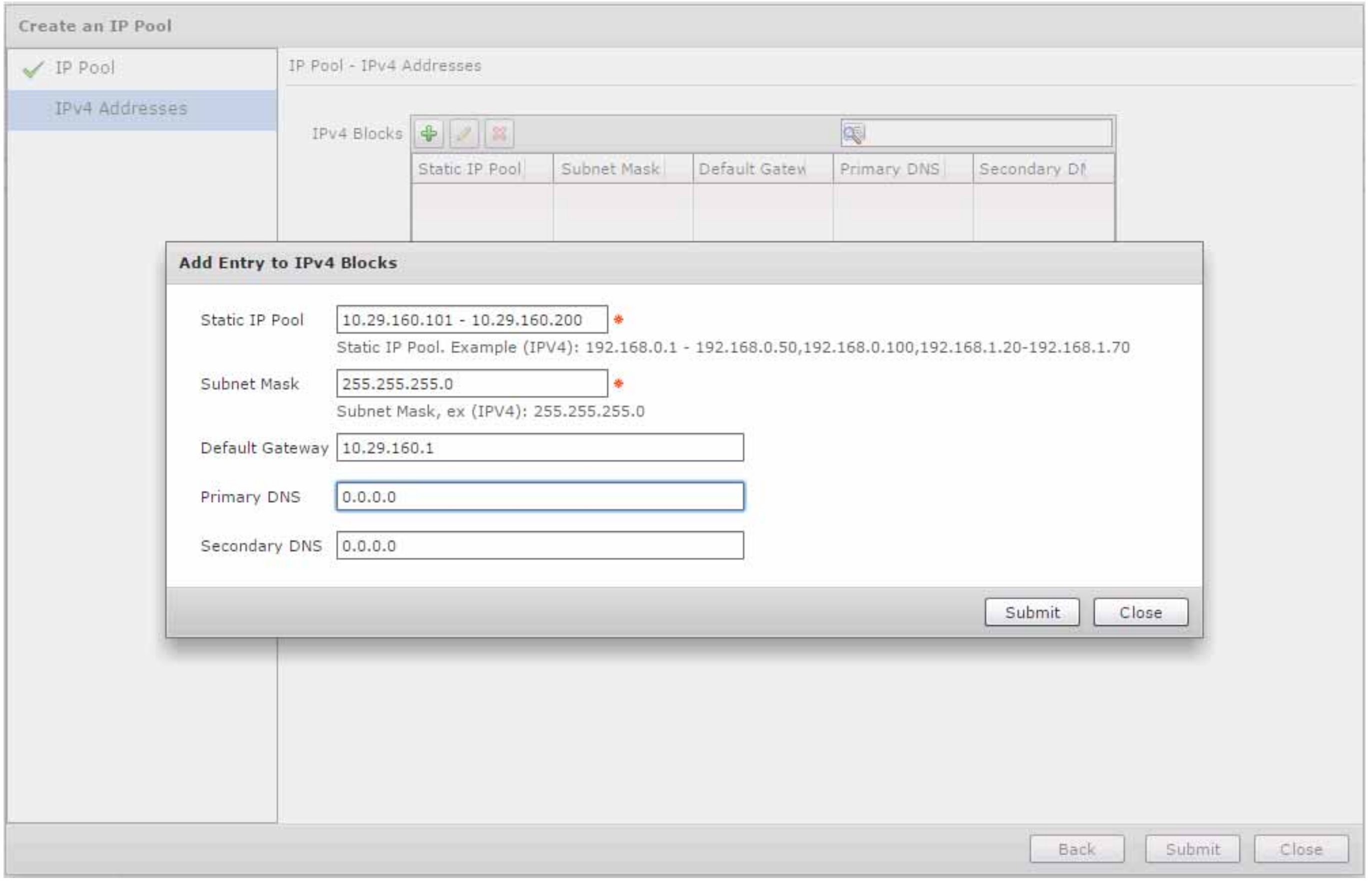
IP Pool Name: MGMT *

Description:

Assignment Order: Default

8. In the IPv4 Blocks table, click on +.
9. In the Add Entry to IPv4 Blocks dialog box, enter the following.
   - In the Static IP Pool field, enter the Static IP Address pool range in the format A.B.C.X – A.B.C.Y.
   - In the Subnet Mask field, enter the appropriate subnet mask.
   - In the Default Gateway field, enter the IP address of the Gateway if present.
   - In the Primary DNS field, enter the IP address of the DNS server.
10. Click **Submit**.

Figure 278 Adding a Block of IP Address to the MGMT IP Address Pool



Add Entry to IPv4 Blocks

Static IP Pool: 10.29.160.101 - 10.29.160.200 *

Static IP Pool. Example (IPV4): 192.168.0.1 - 192.168.0.50,192.168.0.100,192.168.1.20-192.168.1.70

Subnet Mask: 255.255.255.0 *

Subnet Mask, ex (IPV4): 255.255.255.0

Default Gateway: 10.29.160.1

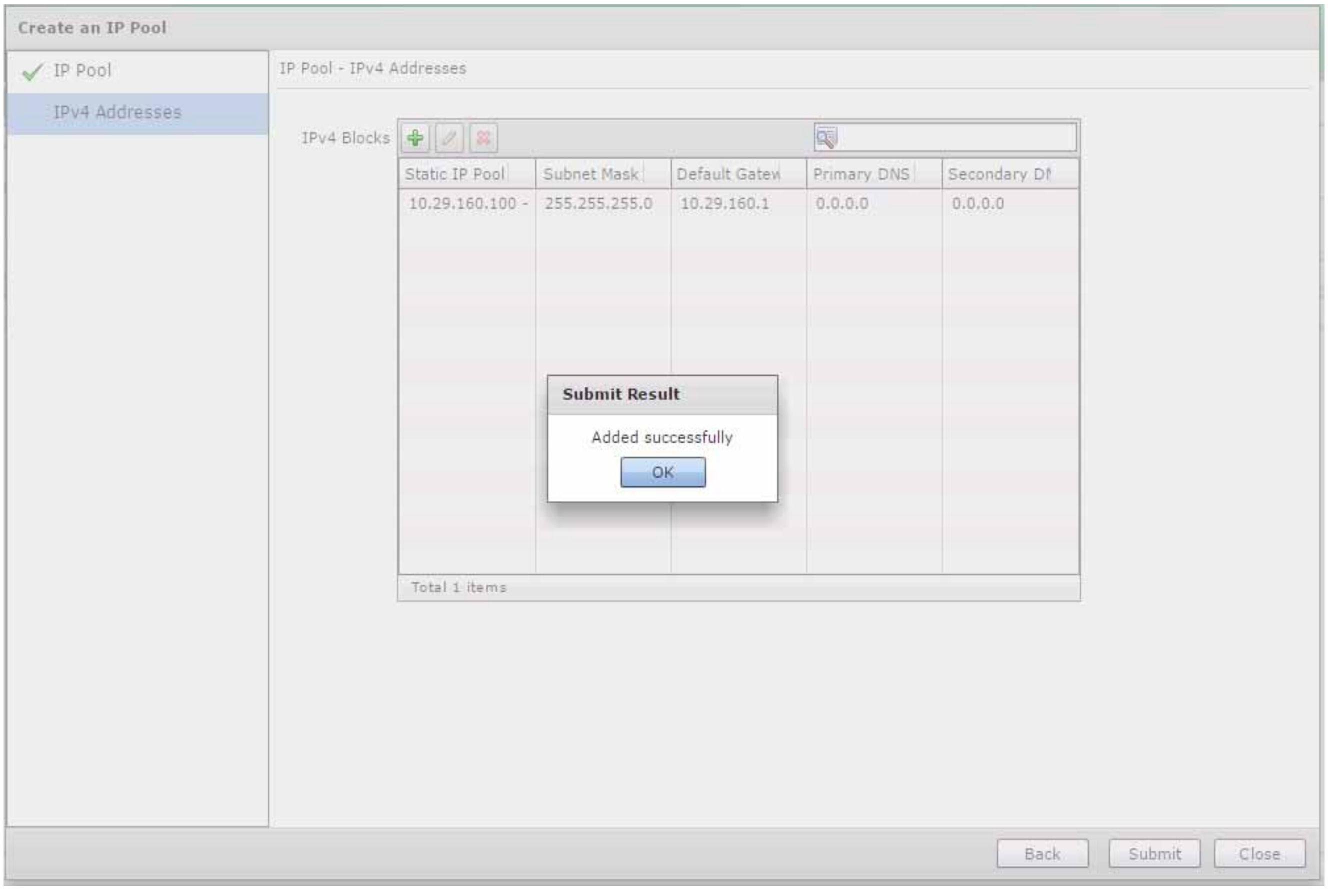
Primary DNS: 0.0.0.0

Secondary DNS: 0.0.0.0

Note The Default Gateway, Primary and Secondary DNS fields are optional.

11. Click **Submit** again to create the Big Data IP Pool.

Figure 279 IP Address Pool Added Successfully



Create an IP Pool

Static IP Pool	Subnet Mask	Default Gatew	Primary DNS	Secondary DI
10.29.160.100 -	255.255.255.0	10.29.160.1	0.0.0.0	0.0.0.0

Total 1 items

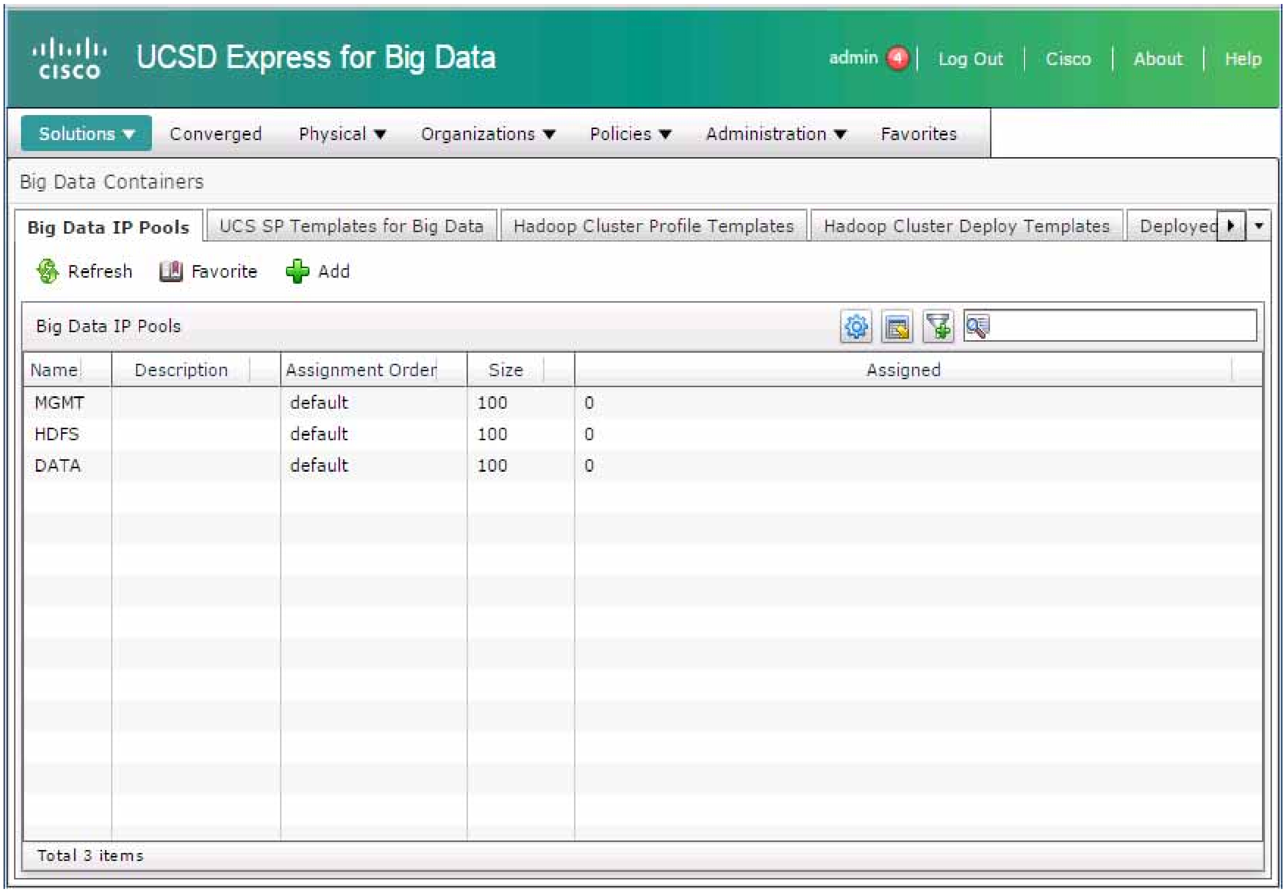
Submit Result

Added successfully

Repeat this process for two more interfaces, by creating an IP address pool by name HDFS for Hadoop configurations to be associated with vNIC eth1, and an IP address pool by name DATA to be associated with vNIC eth2 in the service profiles. Please refer to “Configuring VLAN Section” above in Cisco UCS Integrated Infrastructure for Big Data CVDs.

The following figure shows the UCSD-Express that is fully provisioned all the necessary Big Data IP address Pools.

Figure 280 All the IP Address Pools have been Configured Successfully



Big Data IP Pools

Name	Description	Assignment Order	Size	Assigned
MGMT		default	100	0
HDFS		default	100	0
DATA		default	100	0

Total 3 items

Creating a Hadoop Cluster

1. Using a web browser, visit the URL **http://<UCSD-VM’s IP>/**.
2. Login as user **admin** with the default password **admin**.
3. Navigate to **Solutions >Big Data Containers**.
4. Click on the **Hadoop Cluster Deploy Templates** Tab.
5. Click on **Create Instant Hadoop Cluster**.
6. In the Instant Hadoop Cluster Creation dialog box, enter the following.
7. In Big Data Account Name field, enter a preferred name.
8. In the UCS Manager Policy Name Prefix field, enter a prefix that is less than equal to 5 letters long.
9. In the Hadoop Cluster Name field, enter a preferred name of the cluster – this will be the name assigned to the Hadoop cluster within the context of selected Hadoop Manager.
10. In the Hadoop Node Count filed, enter the desired number of nodes.

The minimum number of nodes allowed for Cloudera and Hortonworks Hadoop cluster is 4 and for MapR cluster it is 3.

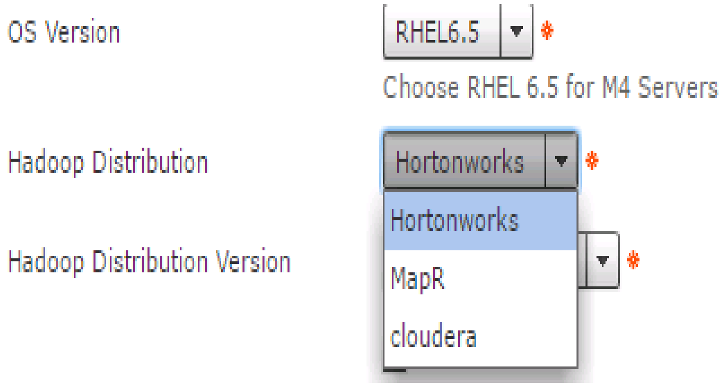
Note There should be sufficient number of servers available in the server pool.

11. In the password fields, enter the preferred passwords and confirm them.
12. Choose the OS Version from the drop-down box. For C220 M4/C240 M4 rack servers, only OS supported is RHEL 6.5.

Note At the time of this writing, RHEL6.5 is the only OS that is supported on C220 M4/C240 M4 rack servers.

13. In the Hadoop Distribution field, select **Hadoop** from the drop-down list.

Figure 281 Selecting the Desired Hadoop Distribution



OS Version: RHEL6.5 *

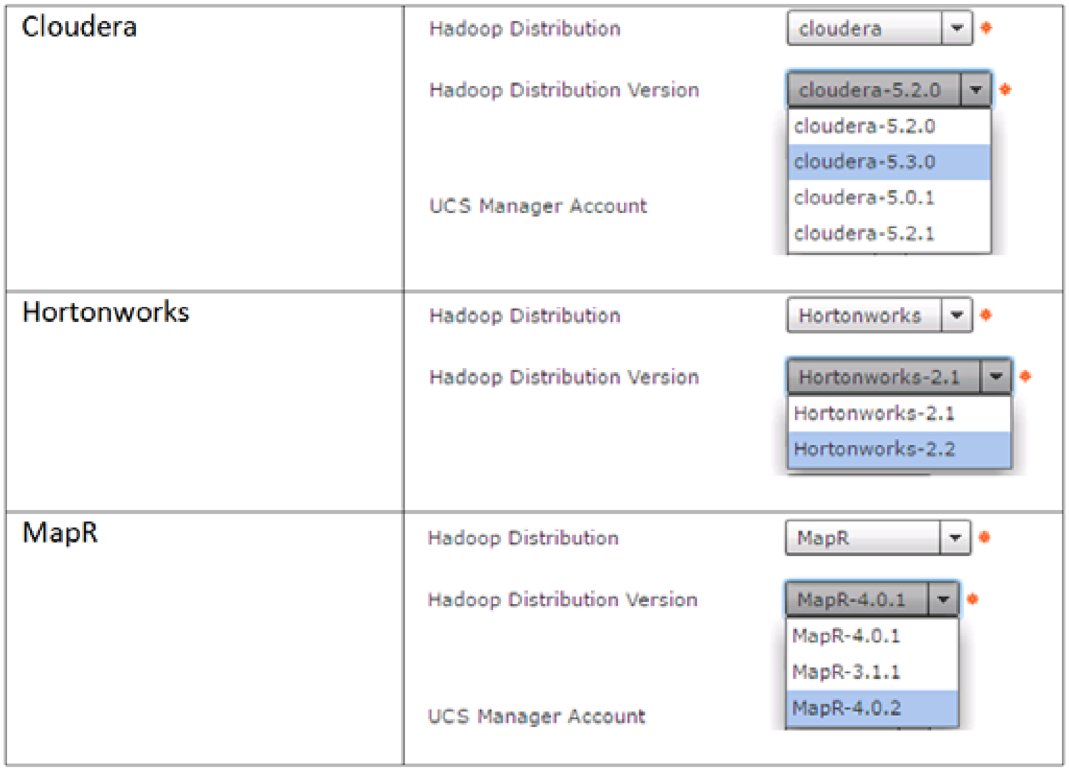
Choose RHEL 6.5 for M4 Servers

Hadoop Distribution: Hortonworks *

Hadoop Distribution Version: *

14. In the Hadoop Distribution Version field, select **Cloudera-5.3.0** from the drop down list.

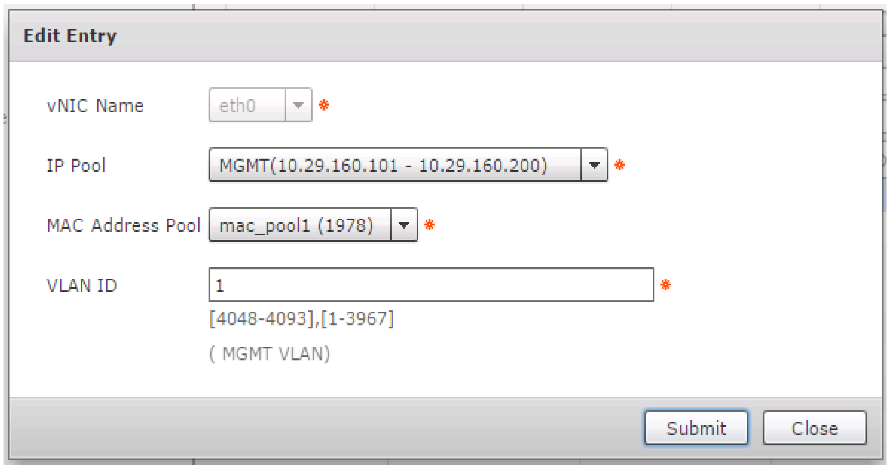
Figure 282 Selecting the Hadoop Distribution Version



Cloudera	Hadoop Distribution: cloudera * Hadoop Distribution Version: cloudera-5.2.0 * cloudera-5.2.0 cloudera-5.3.0 cloudera-5.0.1 cloudera-5.2.1 UCS Manager Account
Hortonworks	Hadoop Distribution: Hortonworks * Hadoop Distribution Version: Hortonworks-2.1 * Hortonworks-2.1 Hortonworks-2.2
MapR	Hadoop Distribution: MapR * Hadoop Distribution Version: MapR-4.0.1 * MapR-4.0.1 MapR-3.1.1 MapR-4.0.2 UCS Manager Account

15. In the UCS Manager Account, select the appropriate UCS-Manager account.
16. Select the organization.
17. vNIC Template Entry
18. Double-click on row eth0 and select appropriate Mgmt IP-pool, MAC Address Pool and enter the MGMT VLAN id. Click Submit.

Figure 283 Editing the vNIC Template to Provide the MGMT Network Configurations



Edit Entry

vNIC Name: eth0 *

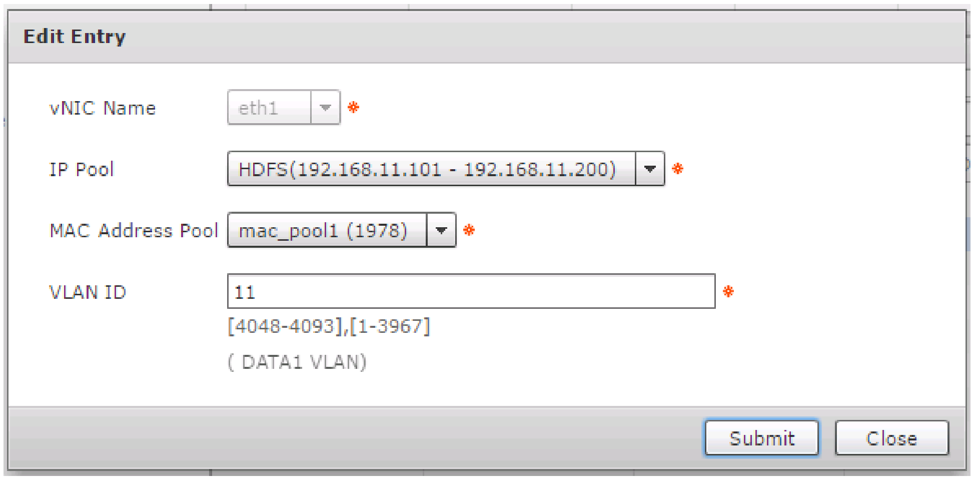
IP Pool: MGMT(10.29.160.101 - 10.29.160.200) *

MAC Address Pool: mac_pool1 (1978) *

VLAN ID: 1 *
[4048-4093],[1-3967]
(MGMT VLAN)

19. Double-click on **eth1** and select appropriate IP-pool, MAC Address Pool and enter the DATA1 VLAN ID. Click **Submit**.

Figure 284 Editing the vNIC Template to Provide the DATA1 Network Configurations



Edit Entry

vNIC Name: eth1 *

IP Pool: HDFS(192.168.11.101 - 192.168.11.200) *

MAC Address Pool: mac_pool1 (1978) *

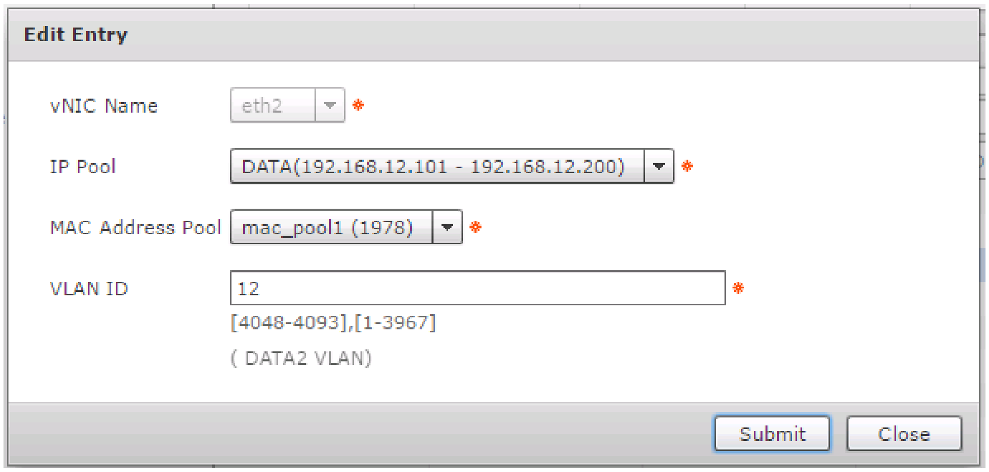
VLAN ID: 11 *

[4048-4093],[1-3967]

(DATA1 VLAN)

20. Double-click on **eth2** and select appropriate IP-pool, MAC Address Pool and enter the DATA VLAN ID. Click **Submit**.

Figure 285 Editing the vNIC Template to Provide the DATA2 Network Configurations



Edit Entry

vNIC Name: eth2 *

IP Pool: DATA(192.168.12.101 - 192.168.12.200) *

MAC Address Pool: mac_pool1 (1978) *

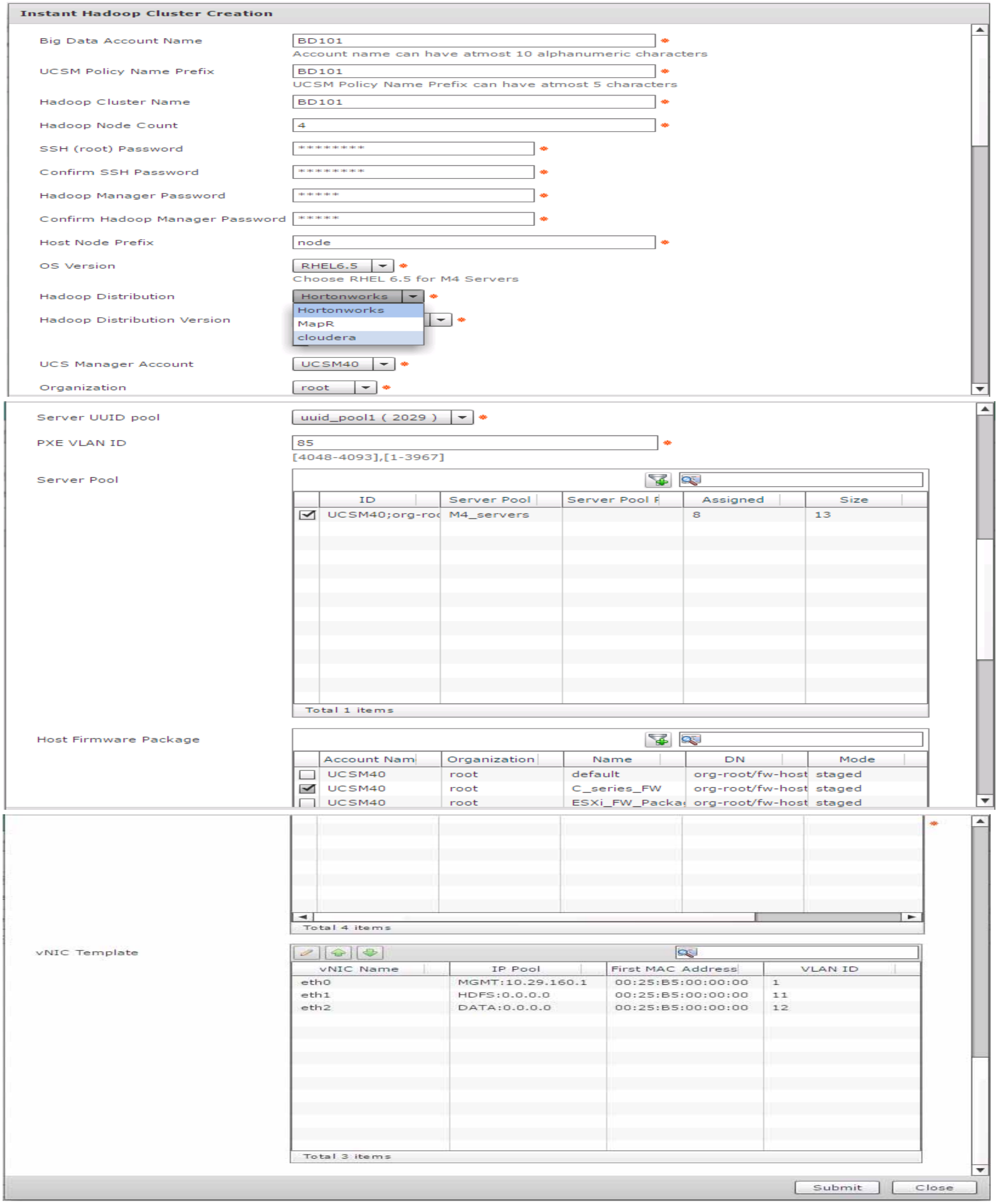
VLAN ID: 12 *

[4048-4093],[1-3967]

(DATA2 VLAN)

Note The following figure show the expanded version of the Instant Hadoop Cluster Creation dialog box with all the fields filed in.

Figure 286 Creating an Instant Hortonworks Hadoop Cluster



Instant Hadoop Cluster Creation

Big Data Account Name	BD101 * Account name can have atmost 10 alphanumeric characters
UCSM Policy Name Prefix	BD101 * UCSM Policy Name Prefix can have atmost 5 characters
Hadoop Cluster Name	BD101 *
Hadoop Node Count	4 *
SSH (root) Password	******** *
Confirm SSH Password	******** *
Hadoop Manager Password	***** *
Confirm Hadoop Manager Password	***** *
Host Node Prefix	node *
OS Version	RHEL6.5 * Choose RHEL 6.5 for M4 Servers
Hadoop Distribution	Hortonworks * Hortonworks MapR cloudera
Hadoop Distribution Version	*
UCS Manager Account	UCSM40 *
Organization	root *
Server UUID pool	uuid_pool1 (2029) *
PXE VLAN ID	85 * [4048-4093],[1-3967]

Server Pool

	ID	Server Pool	Server Pool F	Assigned	Size
☑	UCSM40;org-roo	M4_servers		8	13

Total 1 items

Host Firmware Package *

	Account Nam	Organization	Name	DN	Mode
□	UCSM40	root	default	org-root/fw-host	staged
☑	UCSM40	root	C_series_FW	org-root/fw-host	staged
□	UCSM40	root	ESXi_FW_Packa	org-root/fw-host	staged

Total 4 items

vNIC Template

vNIC Name	IP Pool	First MAC Address	VLAN ID
eth0	MGMT:10.29.160.1	00:25:B5:00:00:00	1
eth1	HDFS:0.0.0.0	00:25:B5:00:00:00	11
eth2	DATA:0.0.0.0	00:25:B5:00:00:00	12

Total 3 items

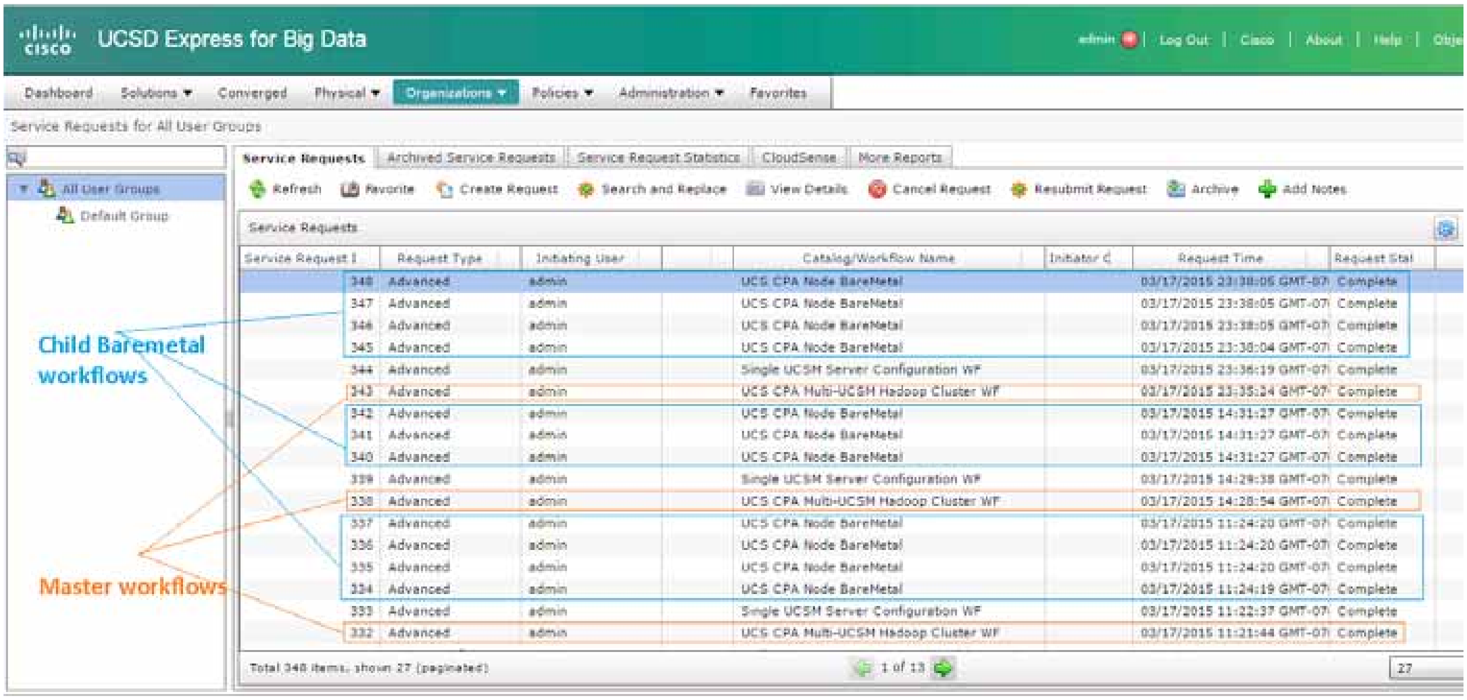
21. Click **Submit**.

Monitoring the Hadoop Cluster Creation

1. In the UCSD-Express web console, navigate to Organization ? Service Requests.
2. Browse through the workflows. There are 3 types of workflows executed.

- There would be one Master Workflows i.e. UCS CPA Multi-UCS Manager Hadoop cluster WF, per the Hadoop cluster creation request. Master workflow kick starts one or more UCS Manager-specific workflows. Besides that, this master workflow is responsible for Hadoop cluster provisioning.
- UCS Manager specific workflows i.e. Single UCS Manager Server Configuration WF, would in turn kick start one or more UCS CPA Node Baremetal workflows.
- UCS CPA Baremetal workflows provision the UCS service profiles and perform OS installation and custom configuration per node.

Figure 287 List of Workflows Recently Complete



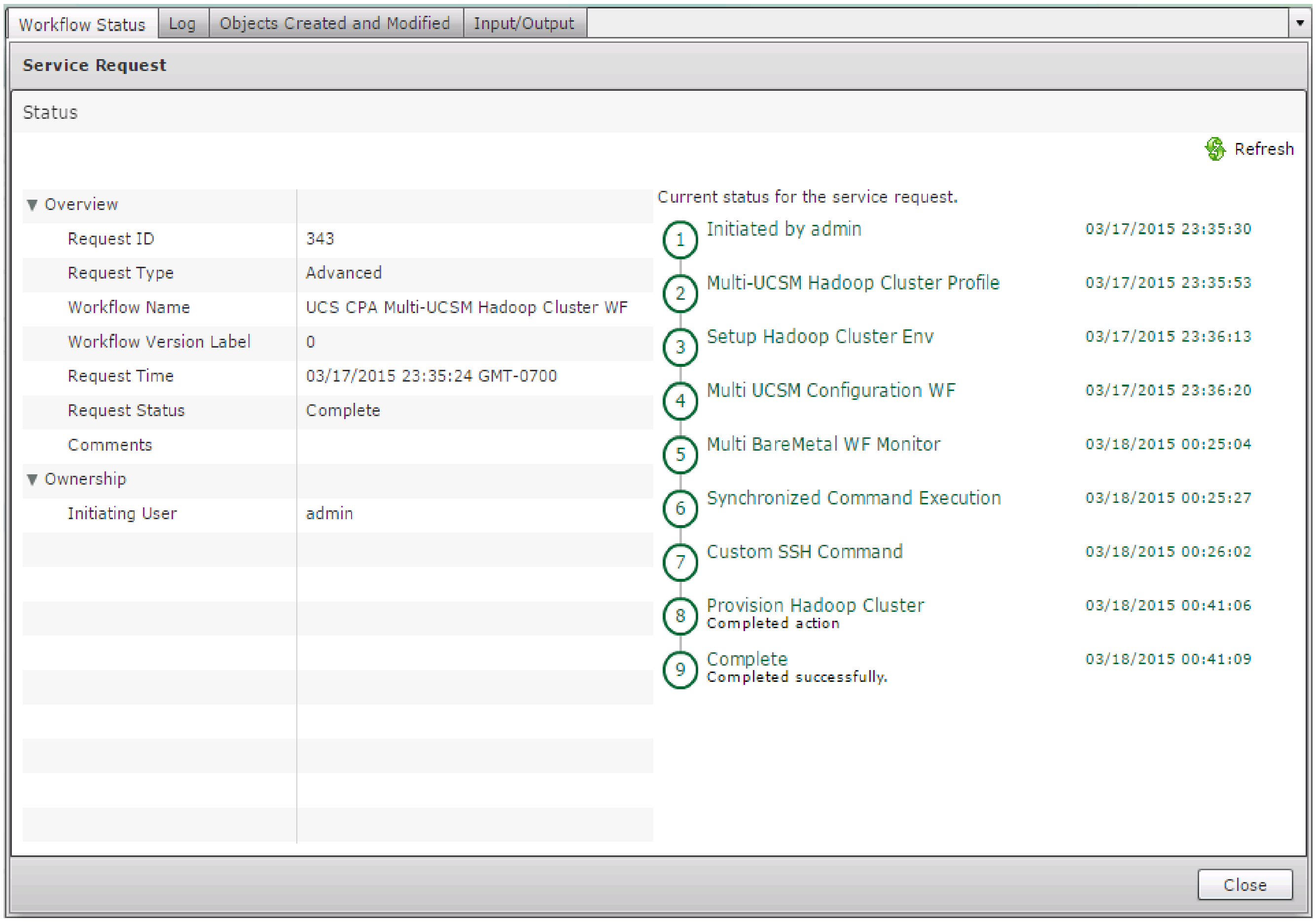
Service Requests

Service Request I	Request Type	Initiating User		Catalog/Workflow Name	Initiator C	Request Time	Request Stat
348	Advanced	admin		UCS CPA Node BareMetal		03/17/2015 23:38:05 GMT-07	Complete
347	Advanced	admin		UCS CPA Node BareMetal		03/17/2015 23:38:05 GMT-07	Complete
346	Advanced	admin		UCS CPA Node BareMetal		03/17/2015 23:38:05 GMT-07	Complete
345	Advanced	admin		UCS CPA Node BareMetal		03/17/2015 23:38:04 GMT-07	Complete
344	Advanced	admin		Single UCSM Server Configuration WF		03/17/2015 23:36:19 GMT-07	Complete
343	Advanced	admin		UCS CPA Multi-UCSM Hadoop Cluster WF		03/17/2015 23:35:24 GMT-07	Complete
342	Advanced	admin		UCS CPA Node BareMetal		03/17/2015 14:31:27 GMT-07	Complete
341	Advanced	admin		UCS CPA Node BareMetal		03/17/2015 14:31:27 GMT-07	Complete
340	Advanced	admin		UCS CPA Node BareMetal		03/17/2015 14:31:27 GMT-07	Complete
339	Advanced	admin		Single UCSM Server Configuration WF		03/17/2015 14:29:38 GMT-07	Complete
338	Advanced	admin		UCS CPA Multi-UCSM Hadoop Cluster WF		03/17/2015 14:28:54 GMT-07	Complete
337	Advanced	admin		UCS CPA Node BareMetal		03/17/2015 11:24:20 GMT-07	Complete
336	Advanced	admin		UCS CPA Node BareMetal		03/17/2015 11:24:20 GMT-07	Complete
335	Advanced	admin		UCS CPA Node BareMetal		03/17/2015 11:24:20 GMT-07	Complete
334	Advanced	admin		UCS CPA Node BareMetal		03/17/2015 11:24:19 GMT-07	Complete
333	Advanced	admin		Single UCSM Server Configuration WF		03/17/2015 11:22:37 GMT-07	Complete
332	Advanced	admin		UCS CPA Multi-UCSM Hadoop Cluster WF		03/17/2015 11:21:44 GMT-07	Complete

Total 348 items, shown 27 (paginated) 1 of 13 27

3. Double-click on one of the master workflows i.e. UCS CPA Multi-UCS Manager Hadoop Cluster to view the various steps undertaken to provision a Hadoop cluster.

Figure 288 Viewing a Completed Master Workflow



Service Request

Status

▼ Overview	
Request ID	343
Request Type	Advanced
Workflow Name	UCS CPA Multi-UCSM Hadoop Cluster WF
Workflow Version Label	0
Request Time	03/17/2015 23:35:24 GMT-0700
Request Status	Complete
Comments	
▼ Ownership	
Initiating User	admin

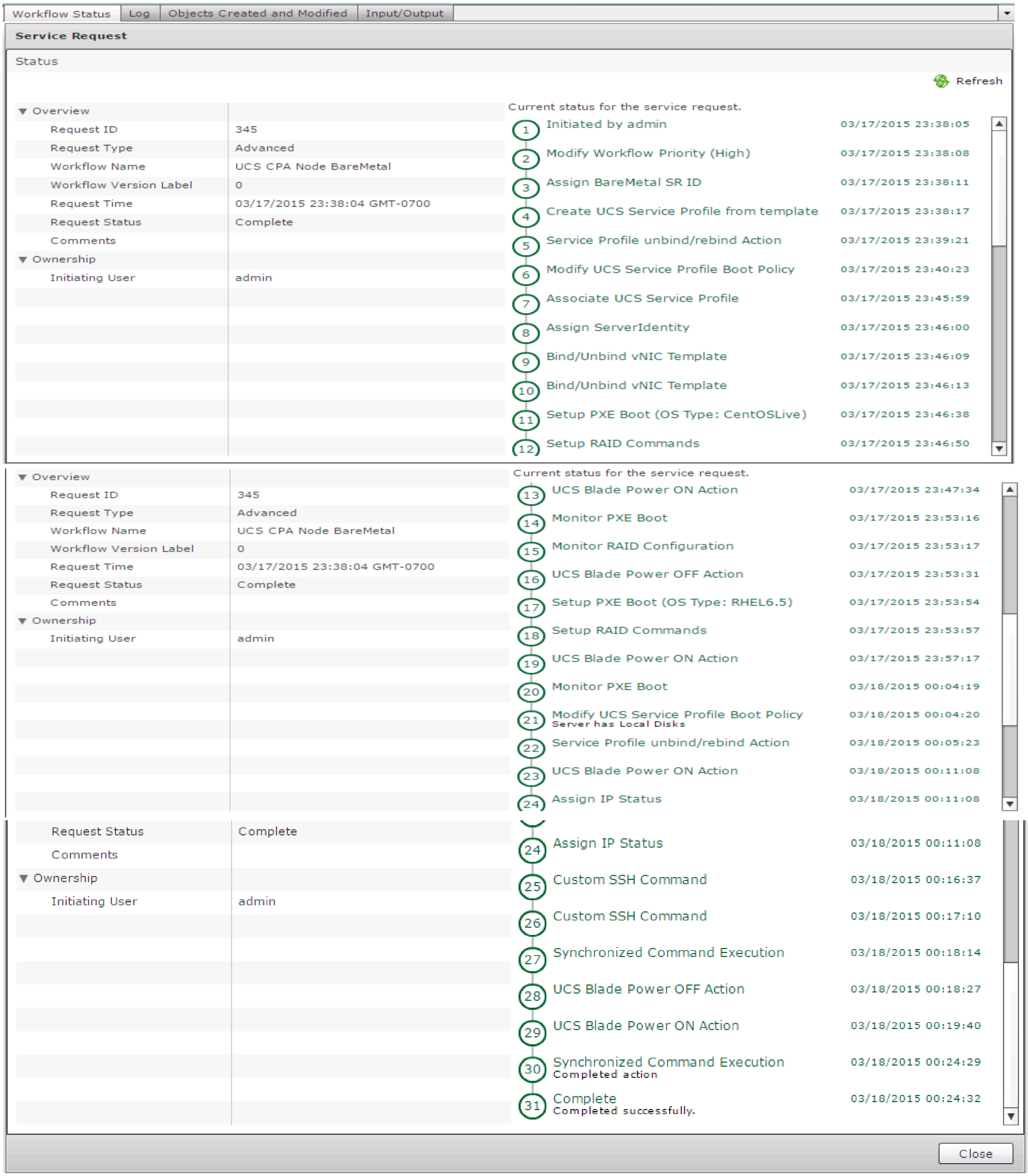
Current status for the service request.

1	Initiated by admin	03/17/2015 23:35:30
2	Multi-UCSM Hadoop Cluster Profile	03/17/2015 23:35:53
3	Setup Hadoop Cluster Env	03/17/2015 23:36:13
4	Multi UCSM Configuration WF	03/17/2015 23:36:20
5	Multi BareMetal WF Monitor	03/18/2015 00:25:04
6	Synchronized Command Execution	03/18/2015 00:25:27
7	Custom SSH Command	03/18/2015 00:26:02
8	Provision Hadoop Cluster Completed action	03/18/2015 00:41:06
9	Complete Completed successfully.	03/18/2015 00:41:09

Note If necessary click on the Log tab to view the logs generated during the provisioning of the Hadoop Cluster.

4. Double-click on one of the child workflows: i.e. UCS CPA Node Baremetal.

Figure 289 A Completed UCS CPA Node Baremetal workflow.



Service Request

Status

▼ Overview	
Request ID	345
Request Type	Advanced
Workflow Name	UCS CPA Node BareMetal
Workflow Version Label	0
Request Time	03/17/2015 23:38:04 GMT-0700
Request Status	Complete
Comments	
▼ Ownership	
Initiating User	admin

Current status for the service request.

1	Initiated by admin	03/17/2015 23:38:05
2	Modify Workflow Priority (High)	03/17/2015 23:38:08
3	Assign BareMetal SR ID	03/17/2015 23:38:11
4	Create UCS Service Profile from template	03/17/2015 23:38:17
5	Service Profile unbind/rebind Action	03/17/2015 23:39:21
6	Modify UCS Service Profile Boot Policy	03/17/2015 23:40:23
7	Associate UCS Service Profile	03/17/2015 23:45:59
8	Assign ServerIdentity	03/17/2015 23:46:00
9	Bind/Unbind vNIC Template	03/17/2015 23:46:09
10	Bind/Unbind vNIC Template	03/17/2015 23:46:13
11	Setup PXE Boot (OS Type: CentOSLive)	03/17/2015 23:46:38
12	Setup RAID Commands	03/17/2015 23:46:50

▼ Overview	
Request ID	345
Request Type	Advanced
Workflow Name	UCS CPA Node BareMetal
Workflow Version Label	0
Request Time	03/17/2015 23:38:04 GMT-0700
Request Status	Complete
Comments	
▼ Ownership	
Initiating User	admin

Current status for the service request.

13	UCS Blade Power ON Action	03/17/2015 23:47:34
14	Monitor PXE Boot	03/17/2015 23:53:16
15	Monitor RAID Configuration	03/17/2015 23:53:17
16	UCS Blade Power OFF Action	03/17/2015 23:53:31
17	Setup PXE Boot (OS Type: RHEL6.5)	03/17/2015 23:53:54
18	Setup RAID Commands	03/17/2015 23:53:57
19	UCS Blade Power ON Action	03/17/2015 23:57:17
20	Monitor PXE Boot	03/18/2015 00:04:19
21	Modify UCS Service Profile Boot Policy Server has Local Disks	03/18/2015 00:04:20
22	Service Profile unbind/rebind Action	03/18/2015 00:05:23
23	UCS Blade Power ON Action	03/18/2015 00:11:08
24	Assign IP Status	03/18/2015 00:11:08

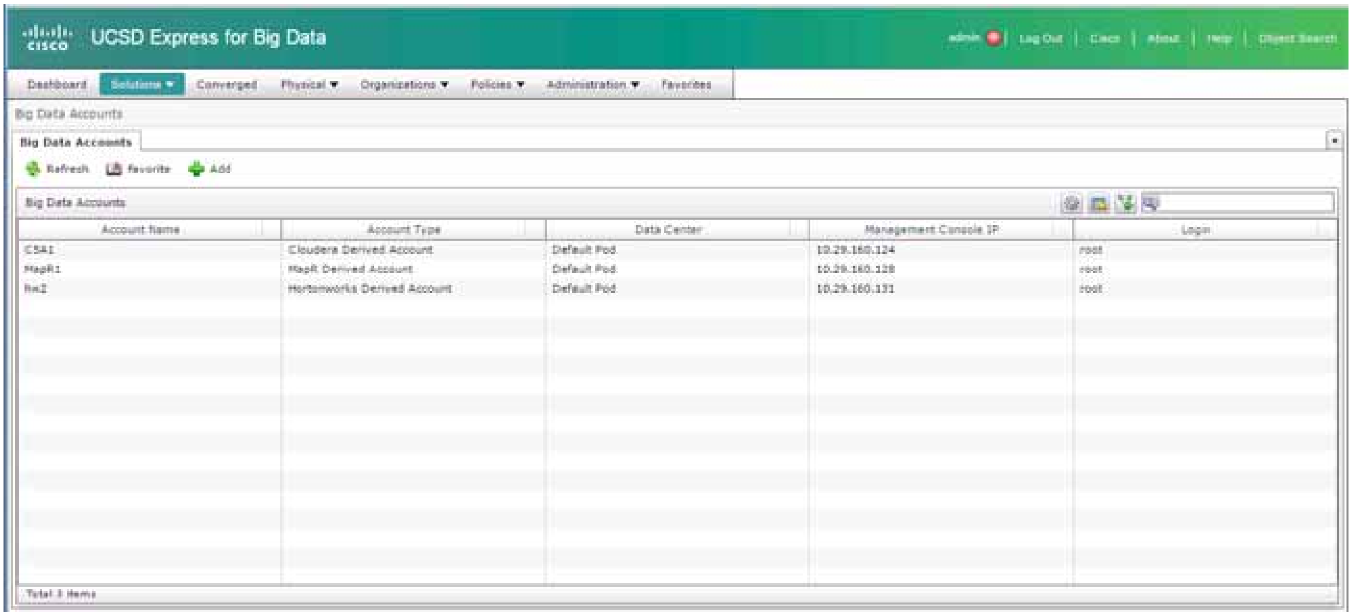
Request Status	Complete
Comments	
▼ Ownership	
Initiating User	admin

24	Assign IP Status	03/18/2015 00:11:08
25	Custom SSH Command	03/18/2015 00:16:37
26	Custom SSH Command	03/18/2015 00:17:10
27	Synchronized Command Execution	03/18/2015 00:18:14
28	UCS Blade Power OFF Action	03/18/2015 00:18:27
29	UCS Blade Power ON Action	03/18/2015 00:19:40
30	Synchronized Command Execution Completed action	03/18/2015 00:24:29
31	Complete Completed successfully.	03/18/2015 00:24:32

Host and Cluster Performance Monitoring

1. In the UCSD-Express web console, navigate to **Solutions > Big Data Accounts** for viewing the Hadoop cluster accounts.

Figure 290 *Big Data Accounts Summary Screen*

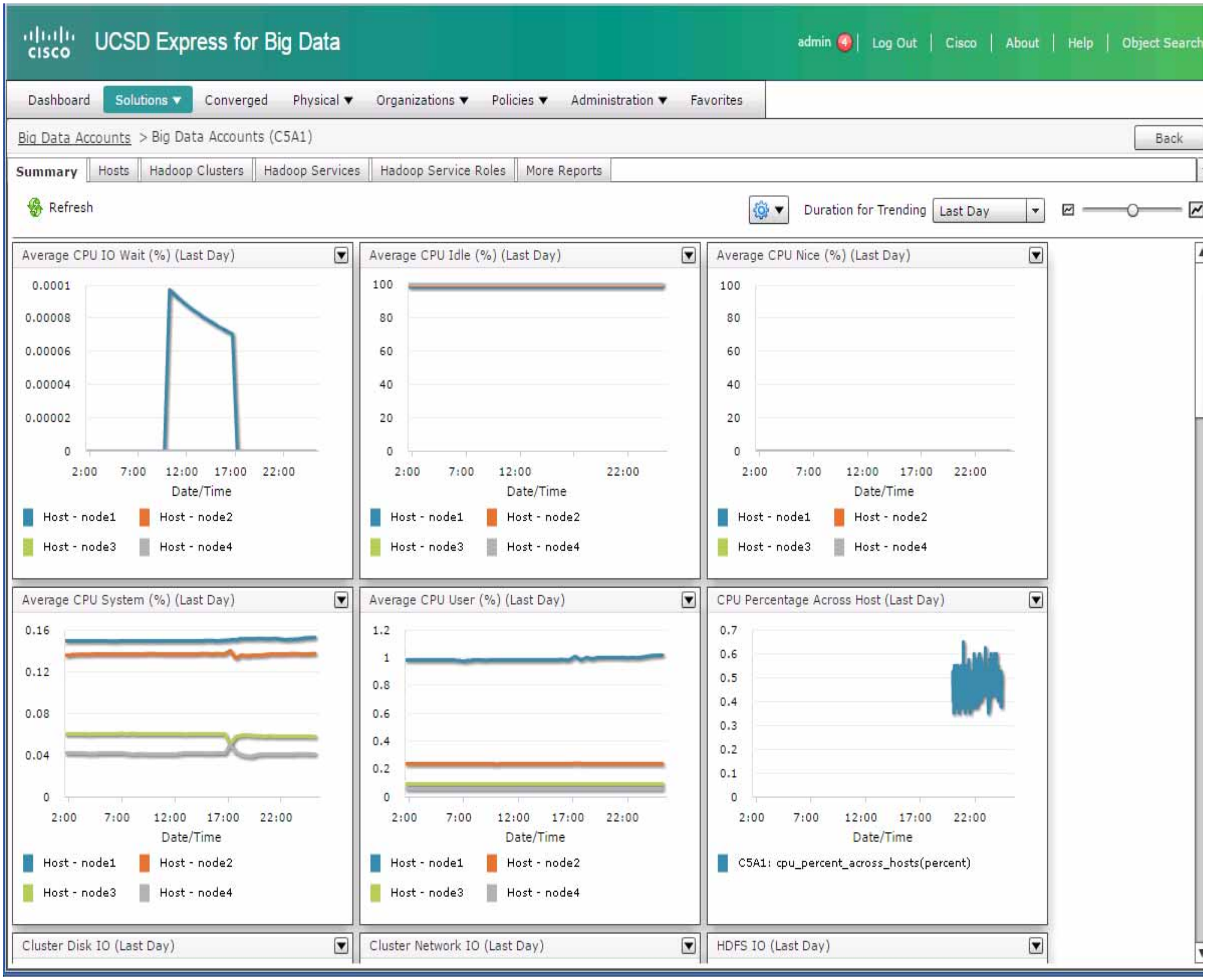


Account Name	Account Type	Data Center	Management Console IP	Login
CSA1	Cloudera Derived Account	Default Pod	10.29.160.124	root
MapR1	MapR Derived Account	Default Pod	10.29.160.128	root
Hw2	Hortonworks Derived Account	Default Pod	10.29.160.131	root

Total 3 items

2. Double-click on one of the accounts to view the cluster-wide performance charts.

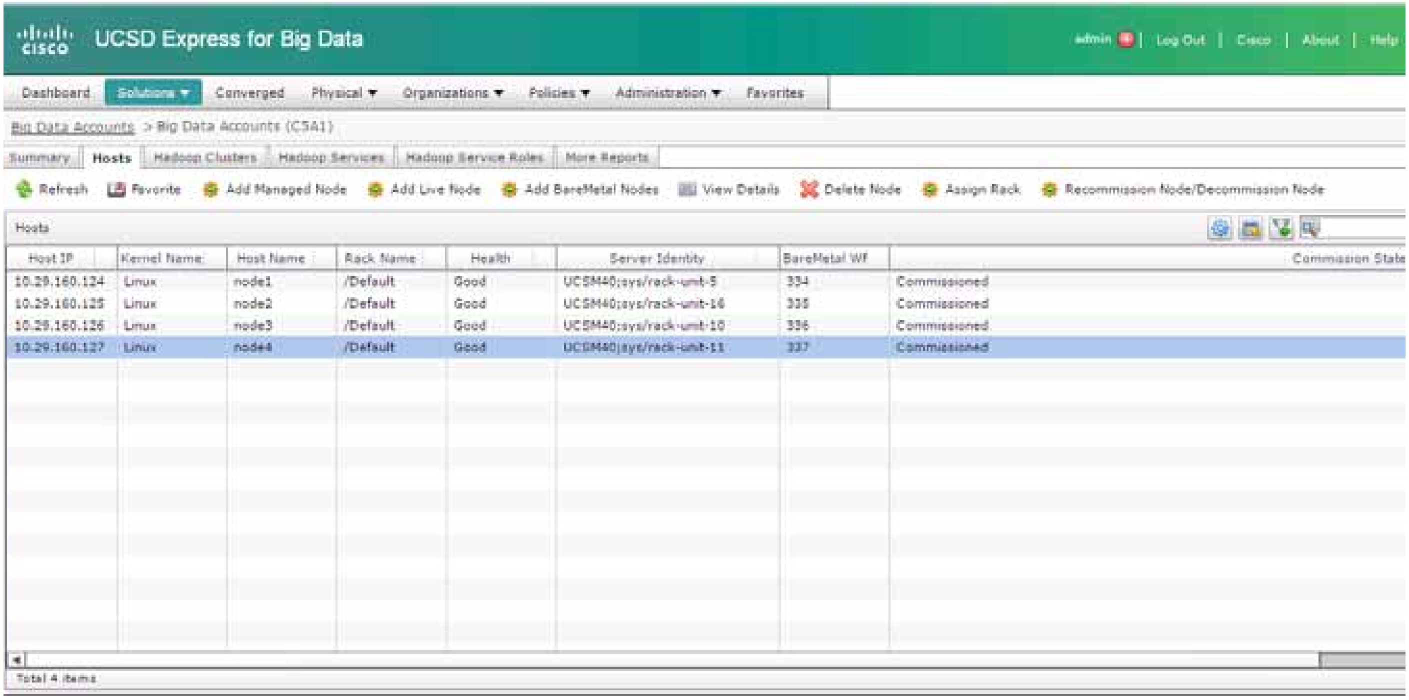
Figure 291 Hadoop Cluster Statistics



Cluster Management

1. In the UCSD-Express web console, navigate to **Solutions > Big Data Accounts** for viewing the Hadoop cluster accounts.
2. Double-Click on one of the accounts to drill into the cluster.
3. Click on the **Hosts** tab.

Figure 292 Big Data Accounts – Viewing the List of Hosts of a Particular Hadoop Cluster



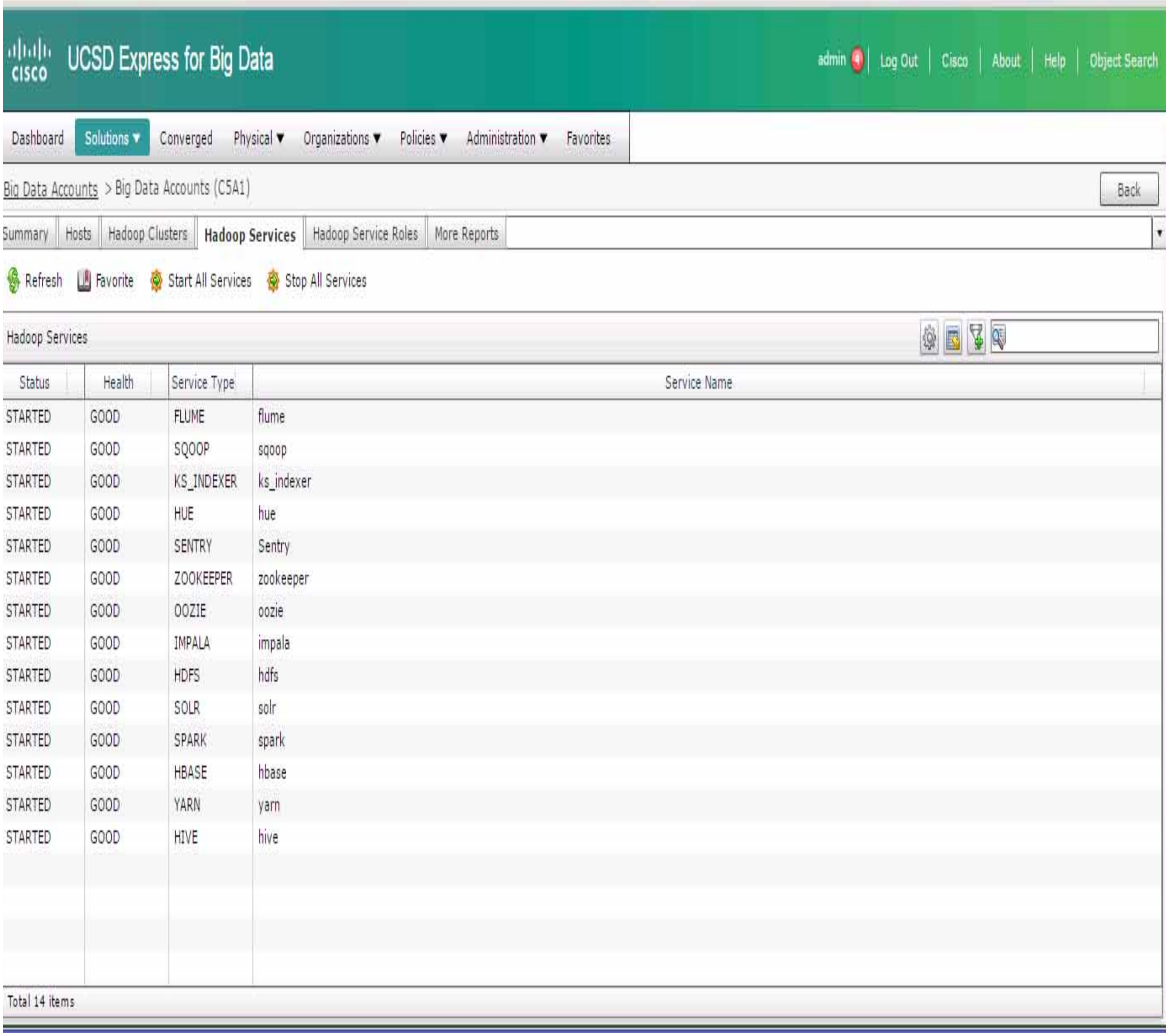
Host IP	Kernel Name	Host Name	Rack Name	Health	Server Identity	BareMetal WF	Commission State
10.29.160.124	Linux	node1	/Default	Good	UCSM40;sys/rack-unit-5	334	Commissioned
10.29.160.125	Linux	node2	/Default	Good	UCSM40;sys/rack-unit-16	335	Commissioned
10.29.160.126	Linux	node3	/Default	Good	UCSM40;sys/rack-unit-10	336	Commissioned
10.29.160.127	Linux	node4	/Default	Good	UCSM40;sys/rack-unit-11	337	Commissioned

In this screen, the user can perform various management operations such as,

- Add one/more Baremetal nodes to the cluster.
- Delete a node back to Baremetal
- Decommision/Recommission

4. Click on the **Services** tab, where one could Start/Stop the Hadoop services.

Figure 293 Viewing the Services Provisioned in Specific Hadoop Cluster



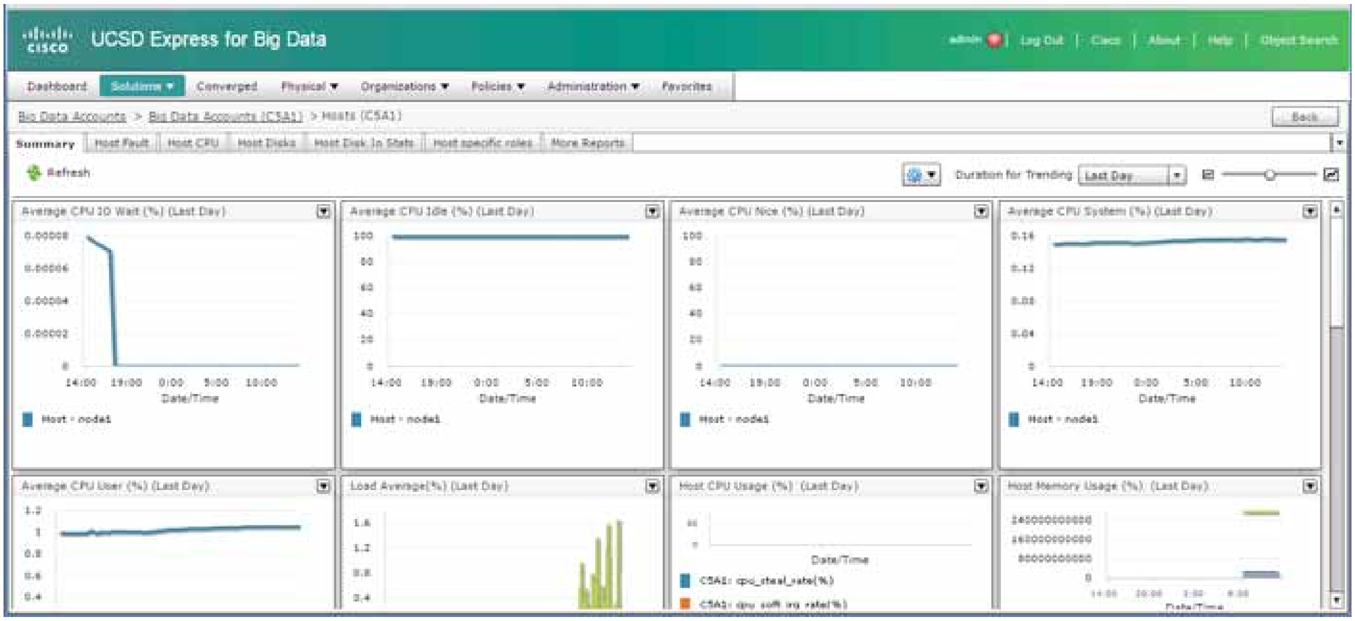
Status	Health	Service Type	Service Name
STARTED	GOOD	FLUME	flume
STARTED	GOOD	SQOOP	sqoop
STARTED	GOOD	KS_INDEXER	ks_indexer
STARTED	GOOD	HUE	hue
STARTED	GOOD	SENTRY	Sentry
STARTED	GOOD	ZOOKEEPER	zookeeper
STARTED	GOOD	OOZIE	oozie
STARTED	GOOD	IMPALA	impala
STARTED	GOOD	HDFS	hdfs
STARTED	GOOD	SOLR	solr
STARTED	GOOD	SPARK	spark
STARTED	GOOD	HBASE	hbase
STARTED	GOOD	YARN	yarn
STARTED	GOOD	HIVE	hive

Total 14 items

Host level Monitoring

In the **Hosts** tab, double-click on one of the hosts to view the host's statistics.

Figure 294 Summary Statistics Screen of a Specific Host in a Hadoop Cluster


UCSD Express for Big Data
admin | Log Out | Cisco | About | Help | Object Search
Dashboard
Solutions ▼
Converged
Physical ▼
Organizations ▼
Policies ▼
Administration ▼
Favorites
Big Data Accounts > Big Data Accounts (C5A1) > Hosts (C5A1)
Back
Summary
Host Fault
Host CPU
Host Disks
Host Disk In Stats
Host specific roles
More Reports
Refresh
Duration for Trending
Last Day
Average CPU IO Wait (%) (Last Day)
0.00008
0.00006
0.00004
0.00002
0
14:00
19:00
0:00
5:00
10:00
Date/Time
Host - node1
Average CPU Idle (%) (Last Day)
100
80
60
40
20
0
Average CPU Nice (%) (Last Day)
Average CPU System (%) (Last Day)
0.16
0.12
0.08
0.04
Average CPU User (%) (Last Day)
1.2
1
0.8
0.6
0.4
Load Average(%) (Last Day)
1.6
1.2
0.8
0.4
Host CPU Usage (%) (Last Day)
C5A1: cpu_steal_rate(%)
C5A1: cpu_soft_irq_rate(%)
Host Memory Usage (%) (Last Day)
24000000000
16000000000
8000000000

The user may monitor various resource utilization metrics of the particular host by clicking on the other tabs in this screen.

Reference

For details on managing the Hadoop clusters deployed on the Cisco UCS Integrated Infrastructure for Big Data, see the *Cisco UCS Director Express for Big Data Management Guide* at:

http://www.cisco.com/c/en/us/td/docs/unified_computing/ucs/ucs-director-express/management-guide/1-1/b_Management_Guide_for_Cisco_UCS_Director_Express_1_1.html

Bill of Materials

Table 23 provides the BOM for Cisco UCSD Big Data subscription licenses for up to 64 servers and Table 24 provides the BOM for the various Hadoop platforms.

Table 22 Bill of Material for UCSD for Big Data Subscription Licenses for up to 64 Servers

CUIC-SVR-OFFERS=	Cisco UCS Director Server Offerings	1
CON-SAU-SVROFFERS	Cisco UCS Director Server Offerings Software Application Sup	1
CUIC-BASE-K9	Cisco UCS Director Software License	1
CON-SAU-CUICBASE	SW APP SUPP + UPGR Cisco UCS Director Base Software	1
CUIC-TERM	Acceptance of Cisco UCS Director License Terms	1

Table 22 Bill of Material for UCSD for Big Data Subscription Licenses for up to 64 Servers

CUIC-EBDS-LIC=	UCSD Express for Big Data - Standard Edition (SE)	1
CUIC-EBDS-LIC	UCSD Express for Big Data - Standard Edition (SE)	64
CUIC-EBDS-S1-3YR	UCSD Express for Big Data - SE 3 year	64
CUIC-TERM	Acceptance of Cisco UCS Director License Terms	1

Table 23 Bill of Material for Various Hadoop Platforms

Part Number	Description
UCS-BD-CEBN=	CLOUDERA ENTERPRISE BASIC EDITION
UCS-BD-CEFN=	CLOUDERA ENTERPRISE FLEX EDITION
UCS-BD-CEDN=	CLOUDERA ENTERPRISE DATA HUB EDITION
UCS-BD-HDP-ENT=	HORTONWORKS ENTERPRISE EDITION
UCS-BD-HDP-EPL=	HORTONWORKS ENTERPRISE PLUS EDITION
UCS-BD-M5-SL=	MapR M5 EDITION
UCS-BD-M7-SL=	MapR M7 EDITION