



Cisco UCS S3260 Storage Server with Cloudera Enterprise

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Executive Summary

Big data is now a significant element in many industries and gaining meaningful traction across multiple industries. Organizations heavily using big data technologies include healthcare, education, and energy along with financial, utility, advertising, retail, public sector, and manufacturing. Apache Hadoop, a technology developed to handle large volumes of data of any format, is much more efficient than traditional enterprise data warehouses. Because Hadoop is designed to run on industry standard hardware with infinite scalability, the cost savings are significant. Overall savings increase as **organizations' data volumes grow. Cloudera and Cisco offer an industry-leading solution for enterprise Hadoop deployments.**

The Cisco® UCS S3260 Storage Server is the latest addition to the highly successful Cisco Unified **Computing System™ (Cisco UCS®) reference architecture for big data. This server provides up to 600 terabytes (TB) raw storage in only four rack units (4RU), providing the best dollar-per-terabyte value while delivering superior computing performance and a balanced core-to-spindle ratio. The Cisco® UCS S3260 Storage Server provides superior performance at a lower total cost and fewer servers mean less rack space, fewer OS and software licenses, and less networking equipment to purchase and maintain, and lower power and cooling costs. The UCS S3260 Storage Server is specifically designed to process huge volumes of data with high performance.**

The modular design of the Cisco® UCS S3260 Storage Server protects your long-term technology investment. The computing, storage, and network components can be upgraded independently as technology advances. There is no need to replace the entire server; simply upgrade an individual component.

It complements Cisco UCS Integrated Infrastructure for Big Data and Analytics, a highly scalable architecture for big data systems that includes computing, storage, and networking resources fully managed through Cisco UCS Manager and linearly scalable to thousands of nodes using Cisco Nexus® 9000 Series Switches **and the Cisco Application Centric Infrastructure (Cisco ACI™) platform.**

The Cisco UCS S3260 Storage Server for Big Data and Analytics with Cloudera Enterprise is a tested, dependable deployment model for Hadoop-based big data systems. Together, they offer a fast and predictable path for businesses to unlock the value of big data

Solution Overview

Introduction

Big data is now a significant element in many industries and gaining meaningful traction across multiple industries. Organizations heavily using big data technologies include healthcare, education, and energy along with financial, utility, advertising, retail, public sector, and manufacturing. But how do you put all of this information to work for you?

Apache Hadoop, a technology developed to handle large volumes of data of any format, is much more efficient than traditional enterprise data warehouses. Because Hadoop is designed to run on industry standard hardware with infinite scalability, the cost savings are significant. Overall **savings increase as organizations' data volumes grow.**

Cloudera and Cisco offer an industry-leading solution for enterprise Hadoop deployments. A solution optimized to enable effective distributed parallel processing of huge amounts of data so companies can extract the most value out of their data is required. The Cisco UCS S3260 Storage Server is an application-influenced server and is designed specifically for data-intensive workloads.

Audience

This document describes the architecture and deployment procedures for Cloudera Enterprise 5.8 on an enterprise data hub using 8 Cisco UCS S3260 Storage Servers with two C3x60 M4 server nodes each as worker nodes, and three Cisco UCS C240 M4 Rack Servers as master nodes. The intended audience for this document includes, but is not limited to, sales engineers, field consultants, professional services, IT managers, partner engineering, and customers who want to deploy Cloudera Enterprise 5.8 on the Cisco Unified Computing System (UCS) using Cisco UCS S3260 Storage Servers.

Solution Summary

This CVD describes in detail the process of installing Cloudera Enterprise 5.8 and the configuration details of the cluster. It also details application configuration for Apache Spark and the libraries it provides.

The configuration using Cisco UCS S3260 Storage Servers as data nodes and Cisco UCS C240 M4 Rack Servers as management nodes, is shown in Table 1. This configuration supports the massive scalability that big data enterprise deployments demand.

Table 1 Reference Architecture - Configuration Details

Connectivity: Two Cisco UCS 6332 Fabric Interconnects	
Eight Cisco UCS S3260 Storage Server, each with two C3x60 M4 server nodes, each server node with:	Three Cisco UCS C240 M4 Rack Servers each with:

Two Intel Xeon processor E5-2680 v4 CPUs (14 cores on each CPU)	Two Intel Xeon processor E5-2680 v4 CPUs (14 cores on each CPU)
256 GB of memory	256 GB of memory
Cisco UCS-C3K-M4RAID SAS Modular RAID Controller with 4-GB FBWC	Cisco 12-Gbps SAS Modular RAID Controller with 2-GB FBWC
Twenty-four 4-TB 7,200-rpm LFF SAS drives (96 terabytes [TB])(1.56 petabytes[PB] total)	Twelve 1.2-TB 10,000-rpm SFF SAS drives
Cisco UCS VIC 1387 (with 2 x 40 Gigabit Ethernet QSFP ports)	Cisco UCS VIC 1387 (with 2 x 40 Gigabit Ethernet QSFP ports)
Two 480-GB 6-Gbps 2.5-inch enterprise value SATA SSD drives for boot	Two 240-GB 6-Gbps 2.5-inch enterprise value SATA SSD drives for boot

Data Storage for Big Data

Data is being generated at an unprecedented scale. More data is being collected more quickly and stored longer than ever before. Traditional transactional data is being supplemented with data from high-speed, real-time streaming systems and then stored for long periods of time both for archival and regulatory purposes. Sensors, internet-of-things (IoT) devices, social media, online transactions, and other sources are all generating data that needs to be efficiently captured, processed, and stored.

In order to satisfy the business and functional requirements, applications built on these platforms must reliably process data with no data loss, at large scale, while retrieving data efficiently to meet the SLA requirements.

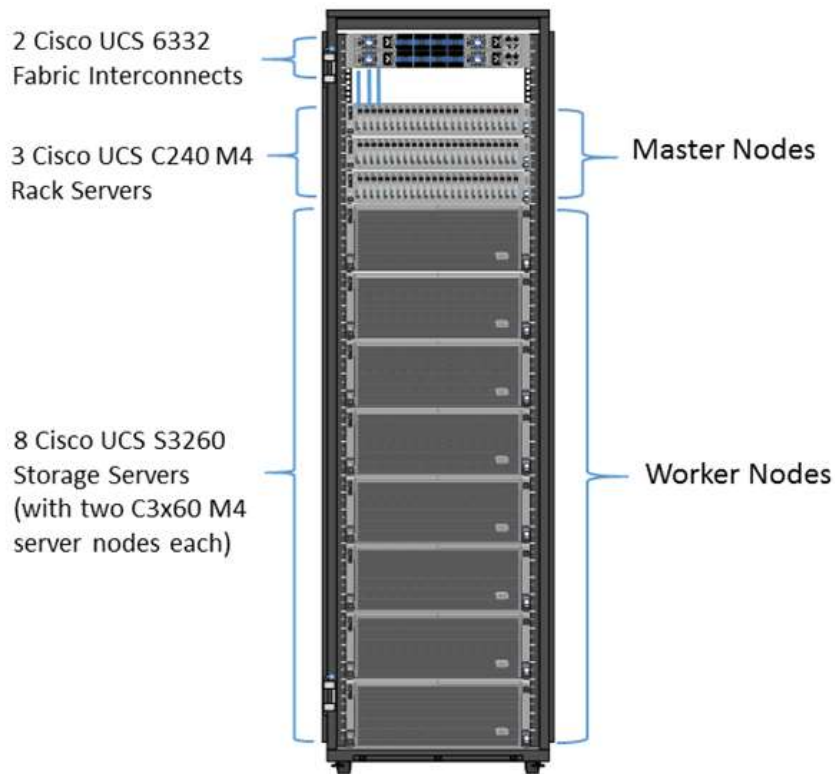
In order to do this, the system must be designed well and the software properly tuned. The next section details the relevant reference architecture for deploying Cloudera Enterprise on the Cisco Unified Computing System (UCS) using Cisco UCS S3260 Storage Servers.

Technology Overview

Reference Architecture

Figure 1 shows the base configuration of a high-availability Cloudera Enterprise cluster. It is comprised of 16 data nodes using 8 Cisco UCS S3260 Storage Servers (with two C3x60 M4 server nodes each) and 3 management nodes using Cisco UCS C240 M4 Rack Servers.

Figure 1 Reference Architecture



Note: This CVD describes the installation process of Cloudera Enterprise 5.8 (three master nodes for high-availability + 16 worker nodes).

Cisco UCS S3260 Storage Server for Big Data and Analytics with Cloudera Enterprise

This solution is based on the Cisco Unified Computing System (Cisco UCS) infrastructure using Cisco UCS 6300 Series Fabric Interconnects, and Cisco UCS S3260 Storage Servers. This architecture is specifically designed for high performance and linear scalability for big data workloads and is built using the following components:

Cisco UCS S3260 Storage Server

The Cisco UCS S3260 Storage Server (Figure 2) is a high-density modular storage server designed to deliver efficient, industry-leading storage for data-intensive workloads. The Cisco UCS S3260 Storage Server is a modular chassis with dual server nodes (two servers per chassis) and up to 60 large-form-factor (LFF) drives in a 4RU form factor. The server uses dual Intel® Xeon® Processor E5-2600 v4 Series CPUs and supports up to 512 GB of main memory and a range of hard-disk-drive (HDD) options. It comes with a pass-through controller or a RAID card with 4 GB cache and host bus adapter (HBA) controller, and up to two internal solid-state-disk (SSD) drives for boot, as shown in Figure 3 below.

Figure 2 Cisco UCS S3260 Storage Server



The Cisco UCS S3260 Storage Server chassis has 56 top-load LFF HDDs option as shown above with a maximum capacity of 4 TB per HDD and can be mixed with up to 28 SSDs.

Figure 3 Cisco UCSC S3260 Storage Server Chassis –Back view, showing Two Servers



The modular Cisco UCS S3260 Storage Server chassis offers flexibility with more computing, storage, and PCIe expansion on the second slot in the chassis. This second slot can be used for:

- An additional server node
- Four additional LFF HDDs with up to 10 TB capacity per HDD
- New PCIe expansion tray with up to two x8 half-height, half-width PCIe slots that can use any industry-standard PCIe card including Fibre Channel and Ethernet cards.

The Cisco UCS S3260 Storage Server Chassis includes a Cisco UCS Virtual Interface Card (VIC) 1300 platform chip onboard the system I/O controller, offering high-performance bandwidth with dual-port 40 Gigabit Ethernet and FCoE interfaces per system I/O controller.

Cisco UCS C240 M4 Rack Servers

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. For this CVD three Cisco UCS C240 servers each with 12 drives are used for the master nodes.

Cisco UCS C-Series Rack-Mount Servers are based on the Intel Xeon® E5-2600 v4 series processor family that delivers the best combination of performance, flexibility, and efficiency gains, with 12-Gbps SAS throughput. The Cisco UCS C240 M4 Rack servers provide 24 DIMMs slots and can support up to 1.5 TB of main memory, (128 or 256 GB is typical for Big Data applications). It can support a range of disk drive and SSD options; twenty-four Small Form Factor (SFF) disk drives plus two (optional) internal SATA boot drives, for a total of 26 internal drives, are supported in the Performance Optimized option. Twelve Large Form Factor (LFF) disk drives, plus two (optional) internal SATA boot drives, for a total of 14 internal drives, are supported in the Capacity Optimized option, along with 2x1 Gigabit Ethernet embedded LAN-on-motherboard (LOM) ports. Cisco UCS Virtual Interface Cards 1387 (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 4 show the Cisco UCS C240 M4 Rack Server. The back view is shown in Figure 5.

Figure 4 Cisco UCS C240 M4 Rack Server



Figure 5 Back View of Cisco UCS C240 M4 Rack Server



Cisco UCS VIC 1387

Cisco UCS Virtual Interface Cards (VICs) are unique to Cisco. The Cisco UCS VIC 1387 incorporates next-generation converged network adapter (CNA) technology from Cisco, and offers dual 40-Gbps ports designed for use with Cisco UCS Rack-Mount Servers. Optimized for virtualized networking, this card delivers high performance and bandwidth utilization, and supports up to 256 virtual devices.

The Cisco UCS VIC 1387 (Figure 6) offers dual-port, Enhanced Quad, Small Form-Factor Pluggable (QSFP) 40 Gigabit Ethernet and Fiber Channel over Ethernet (FCoE), in a modular-LAN-on-motherboard (mLOM) form factor. The mLOM slot can be used to install a Cisco VIC without consuming a PCIe slot providing greater I/O expandability.

Figure 6 Cisco UCS VIC 1387



Cisco UCS 6300 Series Fabric Interconnects

Cisco UCS 6300 Series Fabric Interconnects as shown in Figure 7, provide high-bandwidth, low-latency connectivity for servers, with Cisco UCS Manager providing integrated, unified management for all connected devices. The Cisco UCS 6300 Series Fabric Interconnects are a core part of Cisco UCS, providing low-latency, lossless 40 Gigabit Ethernet, Fibre Channel over Ethernet (FCoE), and Fibre Channel functions with management capabilities for systems 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 and automates 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.

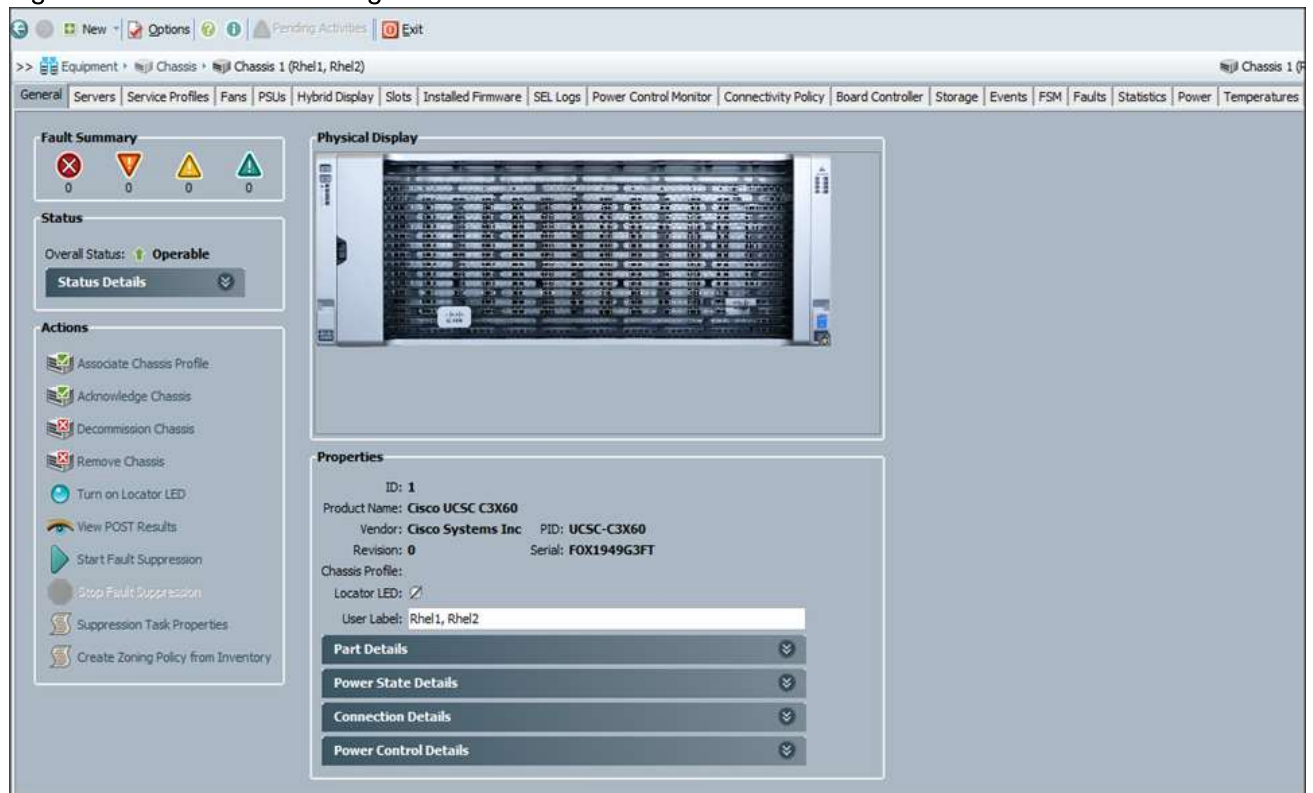
Figure 7 Cisco UCS 6332 32-Port Fabric Interconnect



Cisco UCS Manager resides within the Cisco UCS 6300 Series Fabric Interconnect. It makes the system errors-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), as shown in Figure 8, 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 the process takes minutes instead of days. This simplification allows IT departments to shift their focus from constant maintenance to strategic business initiatives.

The new Cisco UCS Manager has smart capabilities such as predictive drive failure and rebuild. With the integration with Cisco UCS S3260 Storage Server, Cisco UCS Manager can be configured to have hot spare drives in case of any drive failure. In such a case, Cisco UCS Manager will automatically detect the failed drives and replace it with one of the available hot spare drives, rebuild it and make it available to use within the Chassis.

Figure 8 Cisco UCS Manager



Cloudera Enterprise 5.8

Hadoop is a new type of data platform: one place to store unlimited data and access that data with multiple frameworks, all within the same platform. However, all too often, enterprises struggle to turn this new technology into real business value.

Powered by the world's most popular Hadoop distribution, only Cloudera Enterprise (Figure 9) makes Hadoop fast, easy, and secure so you can focus on results, not the technology.

Fast for Business - Only Cloudera Enterprise enables more insights for more users, all within a single platform. With the most powerful open source tools and the only active data optimization designed for Hadoop, you can move from big data to results faster. Key features include:

- In-Memory Data Processing: The most experience with Apache Spark
- Fast Analytic SQL: The lowest latency and best concurrency for BI with Apache Impala
- Native Search: Complete user accessibility built-into the platform with Apache Solr
- Active Data Optimization: Cloudera Navigator Optimizer (limited beta) helps tune data and workloads for peak performance with Hadoop

Easy to Manage - Hadoop is a complex, evolving ecosystem of open source projects. Only Cloudera Enterprise makes it simple so you can run at scale, across a variety of environments, all while meeting SLAs. Key features include:

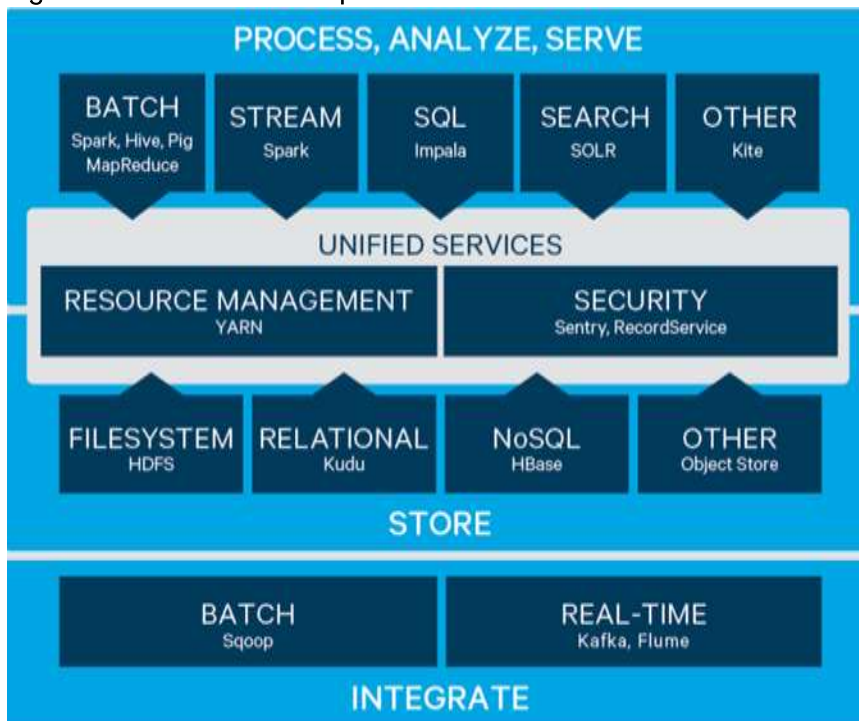
- Powerful Cluster Operations: Cloudera Manager is the Hadoop administration tool trusted by the professionals
- Hybrid Cloud Operations: Only Cloudera Director provides dynamic cluster management across all the major cloud environments
- Expert Support: Dedicated help and predictive care, just a click away
- Open Source Leadership: Constant open source development and curation, with the most rigorous testing, for trusted innovation

Secure without Compromise - The potential of big data is huge, but not at the expense of security. Cloudera Enterprise is the only Hadoop platform to achieve compliance with its comprehensive security and governance. Key features include:

- Enterprise Encryption and Key Management: Protect everything with Navigator Encrypt and Navigator Key Trustee
- Uniform Access Policy Enforcement: Uniformly manage and enforce role-based access controls across the entire platform with Apache Sentry and RecordService
- Automated Data Management: The only full-stack audit, lineage, discovery, and lifecycle management for Hadoop with Cloudera Navigator
- Secure Operations: The only separation of duties to protect production environments and built-in log and query redaction to protect sensitive information

Please refer to <http://www.cloudera.com/products.html> for more details.

Figure 9 Cloudera Enterprise



Apache Spark

Apache Spark is a fast and general-purpose engine for large-scale data processing. Running Spark on Cisco UCS Platform customers can accelerate streaming, interactive queries, machine learning, and batch workloads, and deliver more insights in less time.

Traditional servers are not designed to support the massive scalability, performance, and efficiency requirements of Big Data solutions. These outdated and siloed computing solutions are difficult to integrate with network and storage resources, and are time-consuming to deploy and expensive to operate. Cisco UCS Integrated Infrastructure for Big Data and Analytics takes a different approach, combining computing, networking, storage access, and management capabilities into a unified, fabric-based architecture that is optimized for big data workloads.

Spark's key advantage is speed, with an advanced DAG execution engine that supports cyclic data-flow and in-memory computing. Applications can be developed using built-in, high-level Apache Spark operations, or they can interact with applications like Python, R, and Scala REPLs, or Java. These various options allow users to quickly and easily build new applications and explore data faster.

Spark provides programmers with any application interface, centered on a data structure called the resilient distributed dataset (RDD), a read-only multiset of data items distributed over a cluster of machines that is maintained in a fault-tolerant way. Calculations are performed and results are delivered only when needed, and results can be configured to persist in memory, allowing Apache Spark to deliver a new level of computing efficiency and computation performance to Big Data deployments.

Spark has a number of libraries:

- Spark SQL/DataFrame API for querying structured data inside Spark programs.
- **Spark Streaming offers Spark's core API that is able to perform real-time processing of streaming data, including web server log files, social media, and messaging queues.**
- MLlib to take advantage of machine-learning algorithms and accelerate application performance across clusters.

Spark runs on Hadoop, stands alone, or in the cloud. It can access diverse data sources including HDFS, HBase. Spark with YARN is an optimal way to schedule and run Spark jobs on a Hadoop cluster alongside a variety of other data-processing frameworks, leveraging existing clusters using queue placement policies, and enabling security by running on Kerberos-enabled clusters.

Some common use cases popular in the field with Apache Spark:

- Simpler, faster, ETL – Data can be processed into the required format by avoiding intermediate writes to disk, and cleaned and aggregated in-memory before the final disk write.
- Real-time actions – Anomalous behaviors detected in real-time, and downstream actions are processed accordingly. For example; credit card transactions occurring in a different location generating actions for fraud alert, IOT sensors transmitting device failure data, etc.

- Data enrichment – Live data is enriched with more information by joining it with cached static datasets, allowing for a more comprehensive features set in real-time.
- Exploratory analytics – Events related to a specific time-window can be grouped together and analyzed. This sample data can be used by Data Scientists to update machine-learning models using tools like Python, etc. within Spark.
- Streaming data with analytics – The same code for streaming analytic operations can be used for batch, to compute over both the stream and historical data. This reduces moving parts and helps increase the productivity, consistency, and maintainability of analytic procedures. Spark is compatible with the rest of the streaming data ecosystem, supporting data sources including Flume, Kafka, ZeroMQ, and HDFS.
- Model building and machine learning – Spark is a big data tool that data scientists find easy to use which makes it ideal for building models for analytical purposes. Offline model building which needs data transfer from a Hadoop environment can be avoided now that Spark is used for model building and deployment.

Solution Design

Requirements

This CVD describes the architecture and deployment procedures to install Cloudera (Cloudera Enterprise 5.8.0) on eight Cisco UCS S3260 Storage Servers each with two C3x60 M4 server nodes each as Hadoop data nodes, and three Cisco UCS C240M4 Rack servers as Hadoop Management nodes for Big Data and Analytics. The solution goes into detail configuring Cloudera Enterprise 5.8.0 on the infrastructure.

The cluster configuration consists of the following:

- Two Cisco UCS 6332 Fabric Interconnects
- Three Cisco UCS C240 M4 Rack Servers
- Eight Cisco UCS S3260 Storage Servers with two C3x60 M4 server nodes each
- One Cisco R42610 standard rack
- Two Vertical Power distribution units (PDUs) (Country Specific)

Rack and PDU Configuration

Each rack contains two vertical PDUs, two Cisco UCS 6332 Fabric Interconnects, eight Cisco UCS S3260 Storage Servers with two C3x60 M4 server nodes each and three Cisco UCS C240 M4 Rack Servers. Each chassis is connected to two vertical PDUs for redundancy; ensuring availability during power source failure. The Rack Configuration is shown in Table 2



Note: Please contact your Cisco representative for country specific information.

Table 2 Rack Configuration

Position	Devices
42	Cisco UCS FI 6332
41	Cisco UCS FI 6332
40	Unused
39	Unused
38	Cisco UCS C240 M4 Rack Server
37	
36	Cisco UCS C240 M4 Rack Server
35	
34	Cisco UCS C240 M4 Rack Server
33	
32	Cisco UCS S3260 Storage Server
31	
30	
29	

28	Cisco UCS S3260 Storage Server
27	
26	
25	
24	Cisco UCS S3260 Storage Server
23	
22	
21	
20	Cisco UCS S3260 Storage Server
19	
18	
17	
16	Cisco UCS S3260 Storage Server
15	
14	
13	
12	Cisco UCS S3260 Storage Server
11	
10	
9	
8	Cisco UCS S3260 Storage Server
7	
6	
5	
4	Cisco UCS S3260 Storage Server
3	
2	
1	

Port Configuration on Fabric Interconnects

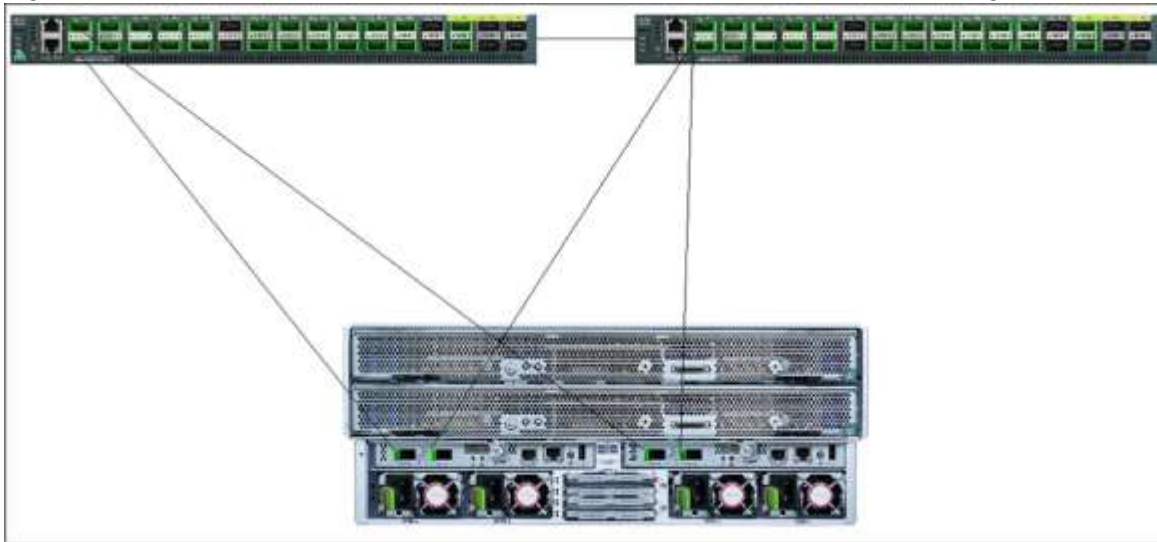
Port Type	Port Number
Network	32
Server	1-19

Server Configuration and Cabling for Cisco UCS S3260 Storage Server

The Cisco UCS S3260 Storage Server Chassis is equipped with two C3x60 M4 server nodes each and four 480 GB SATA SSDs. Each server node is equipped with two Intel Xeon® E5-2680 v4 processors, 256 GB of memory and a Cisco UCS-C3K-M4RAID SAS Modular RAID Controller with 4-GB FBWC.

Figure 10 illustrates the port connectivity between the Cisco UCS 6332 Fabric Interconnect, and Cisco UCS S3260 Storage Server Chassis. Eight Cisco UCS S3260 Storage Server Chassis are used in single rack configurations.

Figure 10 Cisco UCS 6332 Fabric Interconnects for Cisco UCS S3260 Storage Server



For more information on physical connectivity illustrations and cluster setup, see:

http://www.cisco.com/c/en/us/td/docs/unified_computing/ucs/c-series_integration/ucsm3-1/b_C-Series-Integration_UCSM3-1/b_C-Series-Integration_UCSM3-1_chapter_010.html

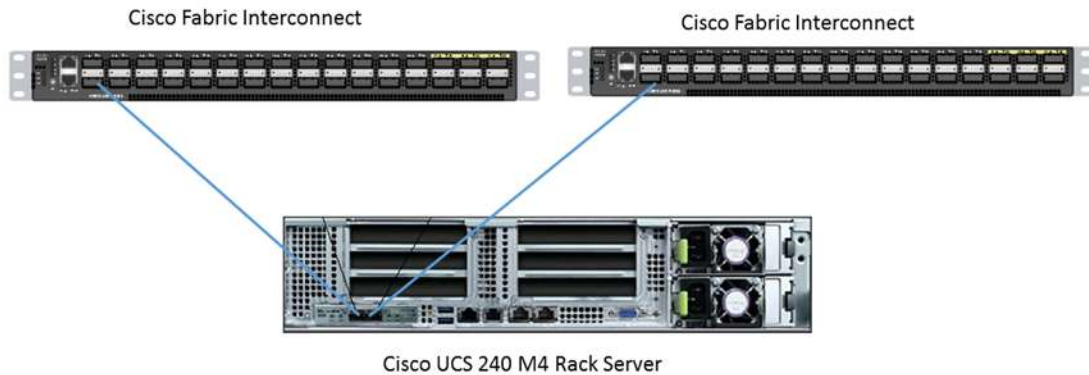
Figure 10 depicts the connectivity between Cisco UCS S3260 Storage Server chassis and Cisco UCS 6300 Fabric Interconnects. Each chassis has two C3x60 M4 server nodes. Each link in the figure represents a 40 Gigabit Ethernet link from the Cisco UCS S3260 Storage Server chassis connecting to a Fabric Interconnect. Every chassis is connected to both Fabric Interconnects represented with dual links.

Since each chassis will have two server nodes, the top server node works with the left SIOC and the bottom server node works with right SIOC (as show in Figure 10). Similarly, for the boot drives, the top two SSD slots are assigned for server node 1 and the bottom two SSD slots are assigned for server node 2.

Server Configuration and Cabling for Cisco UCS C240 M4 Rack Server

Each Cisco UCS C240M4 Rack Server is equipped with two Intel Xeon® E5-2680 v4 processors, 256 GB of memory and a Cisco 12-Gbps SAS Modular RAID Controller with 2-GB FBWC. The Fabric Topology for the Cisco UCS C240 M4 Rack Server is shown in Figure 11.

Figure 11 Fabric Topology for Cisco UCS C240 M4 Rack Server



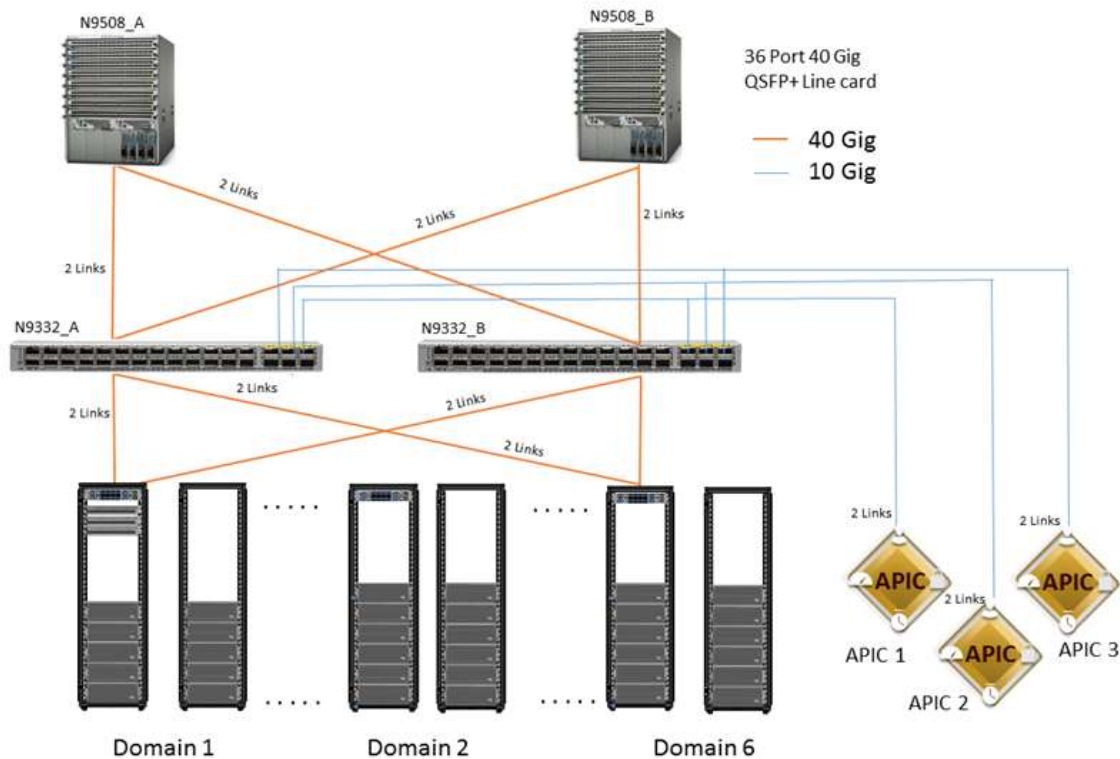
Cisco UCS S3260 Storage Server Scaling with Cisco Application Centric Infrastructure (ACI)

The system architecture includes the Cisco UCS S3260 Storage Server chassis. Each Fabric Interconnect domain can have 12 chassis under a single pair of Fabric Interconnects which are interconnected through the Cisco Application Centric Infrastructure (ACI) Fabric.

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 can be scaled up linearly and consists of 1 domain (1 pair of FIs) connecting to ACI having two Nexus 9508 switches acting as a Spine, two Nexus 9332PQ as the leaf switches, and three APIC-L1 as an APIC appliance. Figure 12

Figure 12 System Architecture



The following explains the system architecture for the base rack:

- The 8 Cisco UCS S3260 Storage Server chassis are rack mounted and connected to a pair of Fabric Interconnect representing a domain through 40GE link (4x40GE link to a pair of FI)
- Multiple such domains can be connected to a pair of ACI leaf switches. Here 40GE x 4 links from each FI are connected to leaf switches. This is done through a virtual port-channel of 2 links connected to each of the Nexus 9332.
- Nexus 9332 receives the 4x40GE from each pair of Fabric Interconnect as a vPC (Virtual Port-Channel), i.e., 2 ports coming from each single FI as an uplink to the leaf. There are 2 vPC for the 1 domain in each of 9332 connecting to a single pair of FIs
- Each leaf is connected to each Spine via 2 x 40 Gig connectivity cables.
- **The three APIC's are connected to two leaves (Nexus 9332) via 10 gig SFP cable.**

Six UCS domains can be connected to a pair of Leaf switches, this will accommodate up to 70 Cisco UCS S3260 Storage Servers.

- 1 pair of FI can connect up to 12 chassis
- 1 pair of Leaf switch can connect up to 6 pair of FI
- 1 Pair of Line card can connect up to 9 pair of leaf switches.

Further scaling can be done based on the requirement and is explained in Table 3 below.

Table 3 Spine to Leaf Connectivity

Spine	Line Card Pair	Ports Used	POD	Chassis	Leaf
N9508_A	Line Card 1	1-2			9332_1A
	Line Card 1	3-4	1	70	9332_1B
	Line Card 1	5-6			9332_2A
	Line Card 1	7-8	2	154	9332_2B
	Line Card 1	9-10			9332_3A
	Line Card 1	11-12	3	238	9332_3B
	Line Card 1	13-14			9332_4A
	Line Card 1	15-16	4	322	9332_4B
	Line Card 1	17-18	5		9332_5A
	Line Card 1	19-20		406	9332_5B

	Line Card 1	33-34			9332_9A
	Line Card 1	35-36	9	742	9332_9B

	Line Card 8	1-2			9332_64A
	Line Card 8	3-4	64	5362	9332_64B
	Line Card 8	1-2			9332_65A
	Line Card 8	3-4	65	5446	9332_65B
	Line Card 8	1-2			9332_66A
	Line Card 8	3-4	66	5530	9332_66B
	Line Card 8	1-2			9332_67A
	Line Card 8	3-4	67	5614	9332_67B
	Line Card 8	5-6			9332_68A
	Line Card 8	7-8	68	5698	9332_68B
....	
Line Card 8	9-10			9332_72A	
Line Card 8	11-12	72	6034	9332_72B	

Spine	Line Card Pair	Ports Used	POD	Chassis	Leaf
N9508_B	Line Card 1	1-2			9332_1A
	Line Card 1	3-4	1	70	9332_1B
	Line Card 1	5-6			9332_2A
	Line Card 1	7-8	2	154	9332_2B
	Line Card 1	9-10			9332_3A
	Line Card 1	11-12	3	238	9332_3B
	Line Card 1	13-14			9332_4A
	Line Card 1	15-16	4	322	9332_4B
	Line Card 1	17-18	5		9332_5A
	Line Card 1	19-20		406	9332_5B

	Line Card 1	33-34			9332_9A
	Line Card 1	35-36	9	742	9332_9B

	Line Card 8	1-2			9332_64A
	Line Card 8	3-4	64	5362	9332_64B
	Line Card 8	1-2			9332_65A
	Line Card 8	3-4	65	5446	9332_65B
	Line Card 8	1-2			9332_66A
	Line Card 8	3-4	66	5530	9332_66B
	Line Card 8	1-2			9332_67A
	Line Card 8	3-4	67	5614	9332_67B
	Line Card 8	5-6			9332_68A
	Line Card 8	7-8	68	5698	9332_68B

	Line Card 8	9-10			9332_72A
	Line Card 8	11-12	72	6034	9332_72B

Table 4 Leaf to Fabric Interconnect Connectivity

LeafF	Ports Used	FI Domain	Chassis
9332_1A	1-4	Domain-1	1-10
9332_1A	5-8	Domain-2	11-22
9332_1A	9-12	Domain-3	23-34
9332_1A	13-16	Domain-4	35-46
9332_1A	17-20	Domain-5	47-58
9332_1A	21-24	Domain-6	59-70
9332_1A	25-27 28-31 32	APIC Uplink to Spine Unused	
9332_2A	1-4	Domain-1	1-10
9332_2A	5-8	Domain-2	11-22
9332_2A	9-12	Domain-3	23-34
9332_2A	13-16	Domain-4	35-46
9332_2A	17-20	Domain-5	47-58
9332_2A	21-24	Domain-6	59-70
9332_2A	25-27 28-31 32	APIC Uplink to Spine Unused	

Based on the system architecture above, only 6 UCS FI Domains can be connected to the first pair of leaf switches due to the port restrictions, as the leaf switch needs to connect three APIC Appliances, providing the scalability up to 70 chassis (10 chassis and 3 management nodes for the first domain and 12 chassis in each additional FI Domain). Each additional leaf pair can have up to 7 UCS FI Domain, providing the scalability up to 84 chassis (12 chassis in each FI Domain). The Cisco UCS S3260 Storage Server can be scaled up to 742 chassis with just a pair of line cards on the Nexus 9508 spine switch. Nexus 9508 can have up to 8 linecards, and with all 8 linecards being used for scaling can connect up to 6034 chassis providing a massive storage solution for the industry.

The architecture above has 4 unused ports in each FI, these ports can either be used as an uplink to Leaf switches or can be connected to external appliances. Most Hadoop distributions

require more than 3 management nodes in case the data nodes exceed more than 100. In that case these unused ports can be used to connect additional management nodes.

If the scaling is performed beyond the pair of leaf switches, it is recommended to connect APIC in three different leaf switches for maximum redundancy.



Note: This example shows a sample scaling capability using ACI a production implementation might vary based on the customer's network throughput requirements. Please reach out to a Cisco representative for your specific requirements.

Software Distributions and Versions

The required software distribution versions are listed below.

Cloudera Enterprise 5.8.0

Cloudera Enterprise version used is 5.8.0. For more information visit https://www.cloudera.com/documentation/enterprise/release-notes/topics/cdh_vd_cdh5_maven_repo_58x.html - concept_s1z_m5f_x5

Red Hat Enterprise Linux (RHEL)

The operating system supported is Red Hat Enterprise Linux 7.2. For more information visit <http://www.redhat.com>.

Software Versions

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

Table 5 Software Versions

Layer	Component	Version or Release
Compute (Chassis) System IO Controller	Board Controller	1.0.14
	Chassis Management Controller	2.0(13aS4)
	Shared Adapter	4.1(2a)
	SAS Expander	04.08.01.B073
Compute (Server Nodes)	BIOS	C3x60M4.2.0.13c
	Board Controller	2.0
	CIMC Controller	2.0(13e)
Network	Cisco UCS 6332	3.1(2b)
	Kernel	5.0(3)N2(3.12b)
	Driver	2.3.0.30
Storage	Storage Controller SAS	29.00.1-0042
	Driver	06.810.10.00
Software	Red Hat Enterprise Linux Server	7.2 (x86_64)

Layer	Component	Version or Release
	Cisco UCS Manager	3.1(2b)
	Cloudera CDH	5.8.0



Note: The latest drivers can be downloaded from the link:
[https://software.cisco.com/download/release.html?mdfid=283862063&release=2.0\(13\)&relinid=AVAILABLE&flowid=25886&softwareid=283853158&rellifecycle=&reltype=latest](https://software.cisco.com/download/release.html?mdfid=283862063&release=2.0(13)&relinid=AVAILABLE&flowid=25886&softwareid=283853158&rellifecycle=&reltype=latest)



Note: The latest supported RAID controller driver is already included with the RHEL 7.2 operating system.

Fabric Configuration

This section provides details for configuring a fully redundant, highly available Cisco UCS 6332 fabric configuration.

- Initial setup of the Fabric Interconnect A and B.
- Connect to UCS Manager using virtual IP address or using the web browser.
- Launch UCS Manager.
- Enable server, uplink and appliance ports.
- Start discovery process.
- Create pools and policies for service profile template.
- Create chassis and storage profile.
- Create Service Profile template and 16 Service profiles.
- Associate Service Profiles to servers.

Initial Setup of Cisco UCS 6332 Fabric Interconnects

This section describes the initial setup of the Cisco UCS 6332 Fabric Interconnects A and B.

Configure Fabric Interconnect A

1. **Connect to the console port on the first Cisco UCS 6332 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 `n` 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 `y` 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 6332 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 Cisco UCS 6300 Series Fabric Interconnect, see:

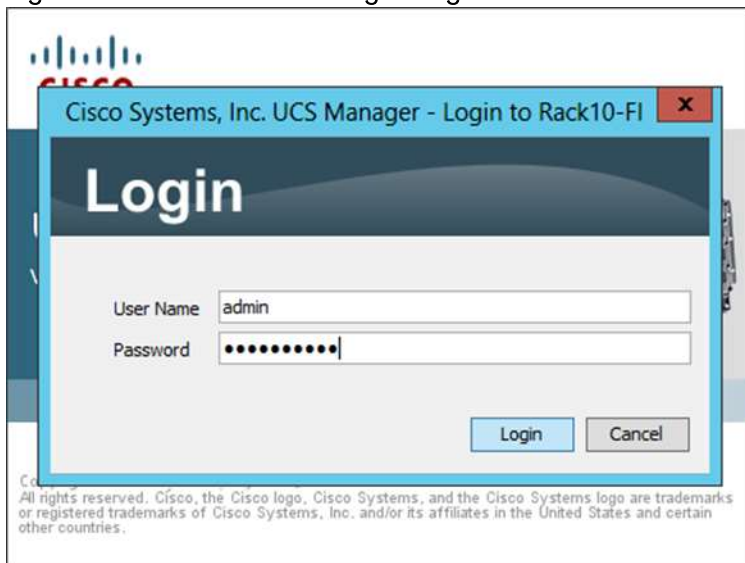
<http://www.cisco.com/c/en/us/products/servers-unified-computing/ucs-6300-series-fabric-interconnects/index.html>

Logging Into Cisco UCS Manager

To login to Cisco UCS Manager, complete the following steps:

1. **Open a Web browser and navigate to the Cisco UCS 6332 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 username and enter the administrative password.**
5. **Click Login to log in to the Cisco UCS Manager, Figure 13**

Figure 13 Cisco UCS Manager Login Screen

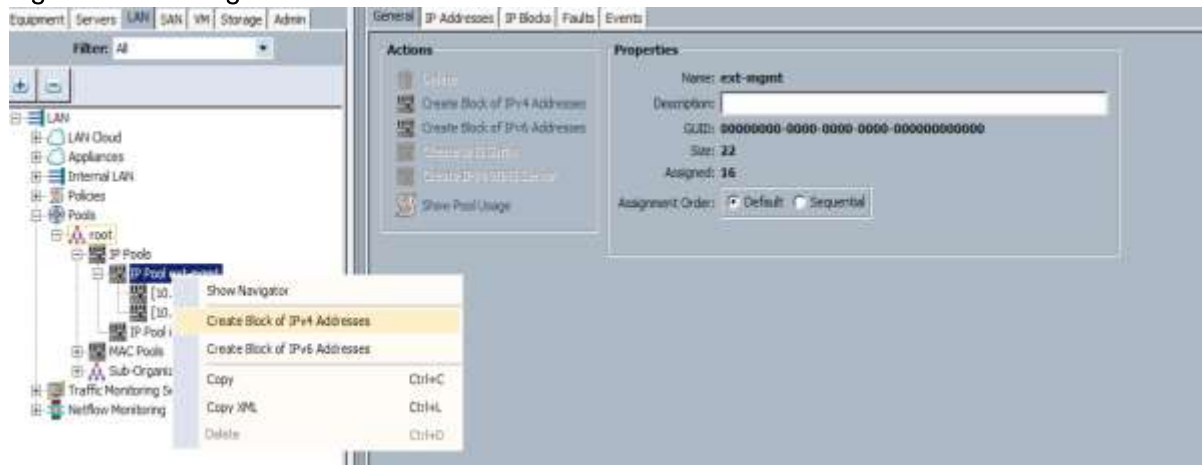


Adding a Block of IP Addresses for KVM Access

To create a block of KVM IP addresses for server access in the Cisco UCS environment, complete the following steps:

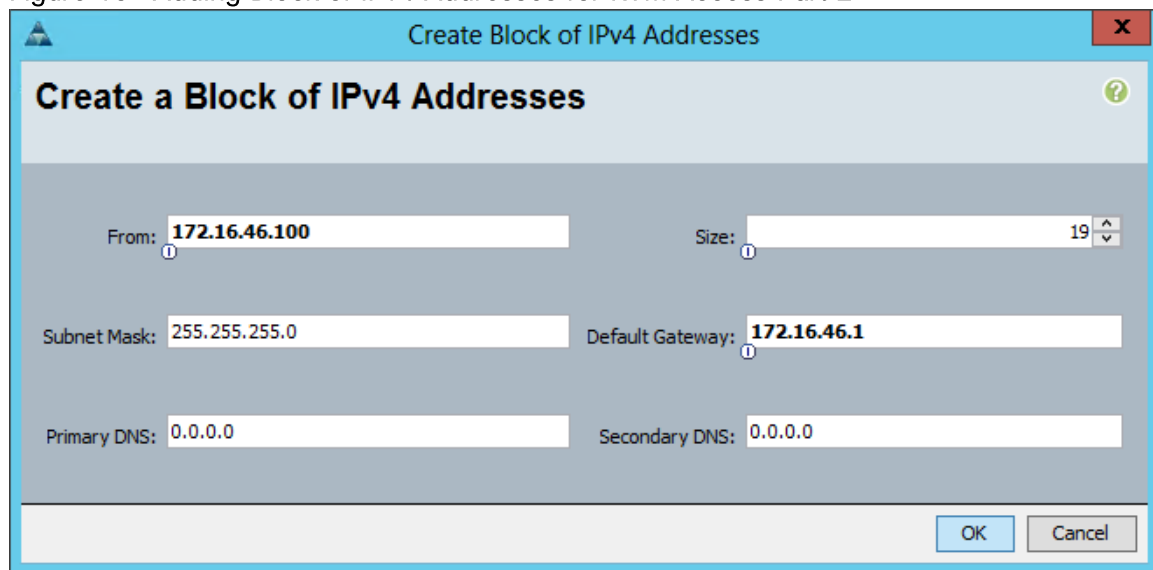
1. **Select the LAN tab at the top of the left window, Figure 14**
2. **Select Pools > IpPools > Ip Pool ext-mgmt.**
3. **Right-click IP Pool ext-mgmt.**
4. **Select Create Block of IPv4 Addresses.**

Figure 14 Adding a Block of IPv4 Addresses for KVM Access Part 1



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

Figure 15 Adding Block of IPv4 Addresses for KVM Access Part 2



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

Enabling Uplink Ports

To enable uplinks ports, complete the following steps:

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

3. Click Ethernet Ports section.
4. Select port 32 that are connected to the uplink switch, right-click, and then select Configure as Uplink Port. (Figure 16)
5. Select Equipment > Fabric Interconnects > Fabric Interconnect B (subordinate) > Fixed Module.
6. Click Ethernet Ports section.
7. Select port 32 that is connected to the uplink switch, right-click, and then select Configure as Uplink Port.

Figure 16 Enabling Uplink Ports

0	1	CC-46:D6-B3:16:0E	Server	Physical
0	2	CC-46:D6-B3:16:12	Server	Physical
0	3	CC-46:D6-B3:16:16	Server	Physical
0	4	CC-46:D6-B3:16:1A	Server	Physical
0	5	CC-46:D6-B3:16:1E	Server	Physical
0	6	CC-46:D6-B3:16:22	Server	Physical
0	7	CC-46:D6-B3:16:26	Server	Physical
0	8	CC-46:D6-B3:16:2A	Server	Physical
0	9	CC-46:D6-B3:16:2E	Server	Physical
0	10	CC-46:D6-B3:16:32	Server	Physical
0	11	CC-46:D6-B3:16:36	Server	Physical
0	12	CC-46:D6-B3:16:3A	Server	Physical
0	13	CC-46:D6-B3:16:3E	Server	Physical
0	14	CC-46:D6-B3:16:3F	Server	Physical
0	15	CC-46:D6-B3:16:40	Server	Physical
0	16	CC-46:D6-B3:16:44	Server	Physical
0	17	CC-46:D6-B3:16:48	Server	Physical
0	18	CC-46:D6-B3:16:4C	Server	Physical
0	19	CC-46:D6-B3:16:50	Server	Physical
0	20	CC-46:D6-B3:16:54	Server	Physical
0	21	CC-46:D6-B3:16:58	Server	Physical
0	22	CC-46:D6-B3:16:5C	Server	Physical
0	23	CC-46:D6-B3:16:60	Server	Physical
0	24	CC-46:D6-B3:16:64	Server	Physical
0	25	CC-46:D6-B3:16:68	Server	Physical
0	26	CC-46:D6-B3:16:6C	Server	Physical
0	27	CC-46:D6-B3:16:70	Server	Physical
0	28	CC-46:D6-B3:16:74	Server	Physical
0	29	CC-46:D6-B3:16:78	Server	Physical
0	30	CC-46:D6-B3:16:7C	Server	Physical
0	31	CC-46:D6-B3:16:7E	Server	Physical
0	32	CC-46:D6-B3:16:7F	Server	Physical

LAN Uplinks Manager

Show Navigator

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

Configuring VLAN

The VLANs are configured as in shown in Table 6

Table 6 VLAN Configurations

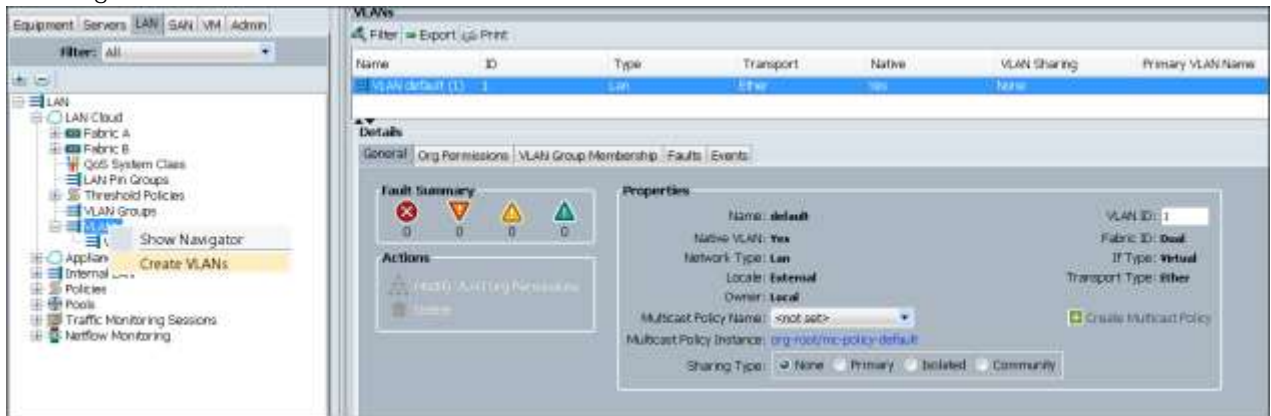
VLAN	NIC Port	Function
VLAN76	Eth0	Management & Data Traffic

The NIC will carry both the management and the data traffic from VLAN76. A single vNIC is used in this configuration and the Fabric Failover feature in Fabric Interconnects will take care of any physical port down issues. It will be a seamless transition from an application perspective.

To configure VLANs in the Cisco UCS Manager GUI, complete the following steps:

1. Select the **LAN** tab in the left pane in the UCSM GUI.
2. Select **LAN > LAN Cloud > VLANs**.
3. Right-click the **VLANs** under the root organization.
4. Select **Create VLANs** to create the VLAN. (0)

Creating a VLAN



Enter **vlan76** for the **VLAN Name**. (0)

Keep **multicast policy** as **<not set>**.

Select **Common/Global** for **vlan76**.

Enter **76** in the **VLAN IDs** field for the **Create VLAN IDs**.

Click **OK** and then, click **Finish**

Click **OK** in the **success message box**.

Creating VLAN for Data

Create VLANs

VLAN Name/Prefix:

Multicast Policy Name:

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:

Sharing Type: None Primary Isolated Community

Click **OK** and then, click **Finish**

Enabling Server Ports

To enable server ports, complete the following steps:

1. Select the **Equipment** tab on the top left of the window.
2. Select **Equipment > Fabric Interconnects > Fabric Interconnect A (primary) > Fixed Module**
3. Click the **Ethernet Ports** section.
4. Select all the ports that are connected to the Servers right-click them, and select **Configure as a Server Port**. (In this case it is ports 1-19). (Figure 17)

5. Select Equipment > Fabric Interconnects > Fabric Interconnect B (subordinate) > Fixed Module.
6. Click Ethernet Ports section.
7. Select all the ports that are connected to the Servers right-click them, and select Configure as a Server Port (In this case it is ports 1-19).

Figure 17 Enabling Server Ports

Slot	Aggr. Port ID	Port ID	MAC	If Role	If Type
1	0	1	CC:46:D6:B3:16:0E	Enable	
1	0	2	CC:46:D6:B3:16:12	Disable	
1	0	3	CC:46:D6:B3:16:16	Configure as Server Port	
1	0	4	CC:46:D6:B3:16:1A	Configure as Uplink Port	
1	0	5	CC:46:D6:B3:16:1E	Configure as FCoE Uplink Port	
1	0	6	CC:46:D6:B3:16:22	Configure as FCoE Storage Port	
1	0	7	CC:46:D6:B3:16:26	Configure as Appliance Port	
1	0	8	CC:46:D6:B3:16:2A	Unconfigure	
1	0	9	CC:46:D6:B3:16:2E	Unconfigure FCoE Uplink Port	
1	0	10	CC:46:D6:B3:16:32	Unconfigure Uplink Port	
1	0	11	CC:46:D6:B3:16:36	Unconfigure FCoE Storage Port	
1	0	12	CC:46:D6:B3:16:3A	Unconfigure Appliance Port	
1	0	13	CC:46:D6:B3:16:3E	Unconfigure both	
1	0	14	CC:46:D6:B3:16:3F	Configure Breakout Port	
1	0	15	CC:46:D6:B3:16:40	Copy	Ctrl+C
1	0	16	CC:46:D6:B3:16:44	Copy XML	Ctrl+L
1	0	17	CC:46:D6:B3:16:48	Unconfigured	Physical
1	0	18	CC:46:D6:B3:16:4C	Unconfigured	Physical
1	0	19	CC:46:D6:B3:16:50	Unconfigured	Physical
1	0	20	CC:46:D6:B3:16:54	Unconfigured	Physical
1	0	21	CC:46:D6:B3:16:58	Unconfigured	Physical
1	0	22	CC:46:D6:B3:16:5C	Unconfigured	Physical
1	0	23	CC:46:D6:B3:16:60	Unconfigured	Physical
1	0	24	CC:46:D6:B3:16:64	Unconfigured	Physical
1	0	25	CC:46:D6:B3:16:68	Unconfigured	Physical
1	0	26	CC:46:D6:B3:16:6C	Unconfigured	Physical
1	0	27	CC:46:D6:B3:16:70	Unconfigured	Physical
1	0	28	CC:46:D6:B3:16:71	Unconfigured	Physical
1	0	29	CC:46:D6:B3:16:72	Unconfigured	Physical
1	0	30	CC:46:D6:B3:16:73	Unconfigured	Physical

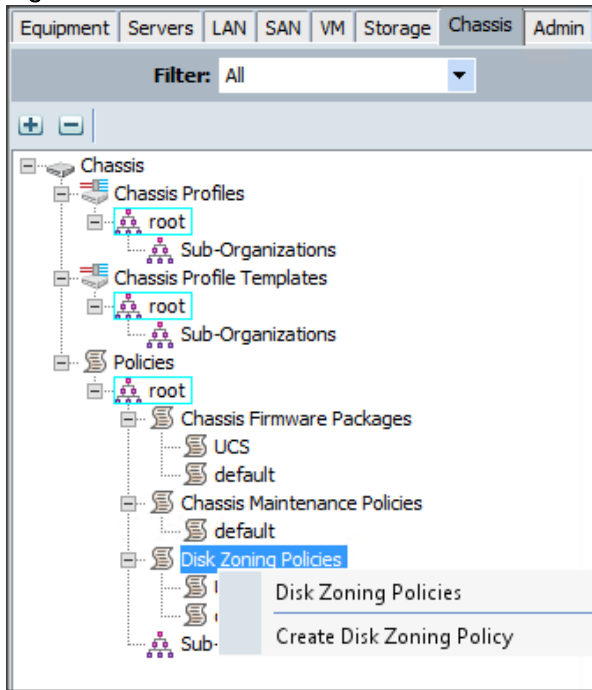
Creating Chassis Profile

Chassis profile is required to assign the number of drives to the particular server nodes and also to upgrade the chassis firmware.

Creating Disk Zoning Policy

1. Click the Chassis tab on UCS Manager on the top left menu. Figure 18
2. Expand Policies→Root→Disk Zoning Policies
3. Right click on the Disk Zoning Policies and click Create Disk Zoning Policy.

Figure 18 Chassis Profile Screen



4. On Create Disk Zoning Policy windows enter the Name UCS and click "+" to create the Disk Zoning. Figure 19

Figure 19 Disk Zoning Policy Screen

Create Disk Zoning Policy

Name:

Description:

Preserve Config:

Disk Zoning Information

Name	Slot Number	Ownership	Assigned to Server	Assigned to Controller	Controller Type	
------	-------------	-----------	--------------------	------------------------	-----------------	--

5. In the Add Slots to Policy window (Figure 20), select the "Dedicated" radio button. From the server drop down list choose "1", from the controller drop down list choose "1", in the slot range enter 1-24 and click "OK".

Figure 20 Add Slots to Policy

Add Slots to Policy

Ownership: Unassigned Dedicated Shared Chassis Global Hot Spare

Server: 1

Controller: 1

Controller Type: **SAS**

Slot Range: 1-24

OK Cancel

6. Click "+" again and In Add Slots to Policy window, select the "Dedicated" radio button. From the server drop down list choose "2", from the controller drop down list choose "1", in the slot range enter 29-52 and click "OK". (Figure 21)

Figure 21 Add Slots to Policy Screen 2

Add Slots to Policy

Ownership: Unassigned Dedicated Shared Chassis Global Hot Spare

Server: 2

Controller: 1

Controller Type: **SAS**

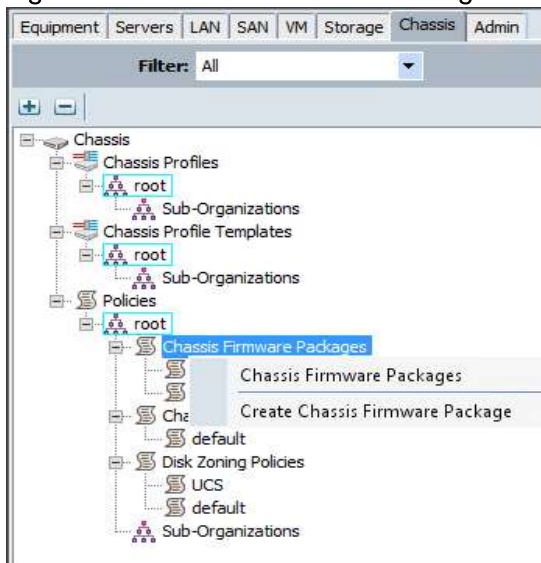
Slot Range: 29-52

OK Cancel

Creating Chassis Firmware Package Policy

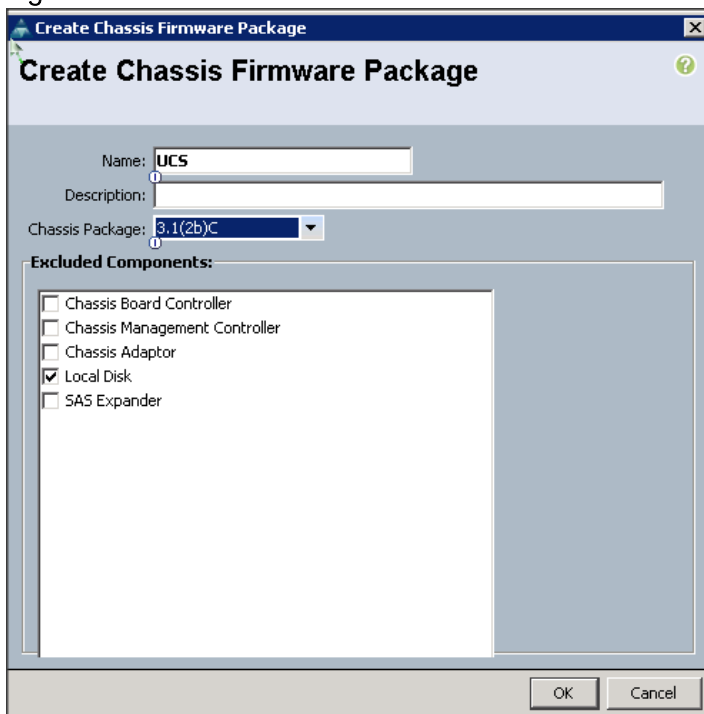
1. Right click on the Chassis Firmware Packages and click "Create Chassis Firmware Packages". (Figure 22)

Figure 22 Chassis Firmware Packages



2. In Create Chassis Firmware Package window enter UCS as the Name. (Figure 23)
3. From the Chassis Packages drop down list choose the appropriate package and click OK.

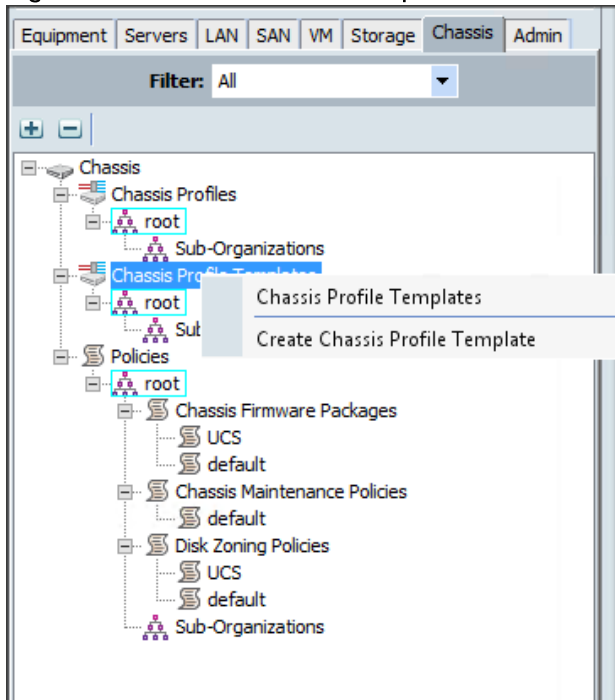
Figure 23 Create Chassis Firmware Screen



Creating Chassis Profiles from Template

1. Under Chassis Profile Template, right click and click "Create Chassis Profile Templates" (Figure 24).

Figure 24 Chassis Profile Templates



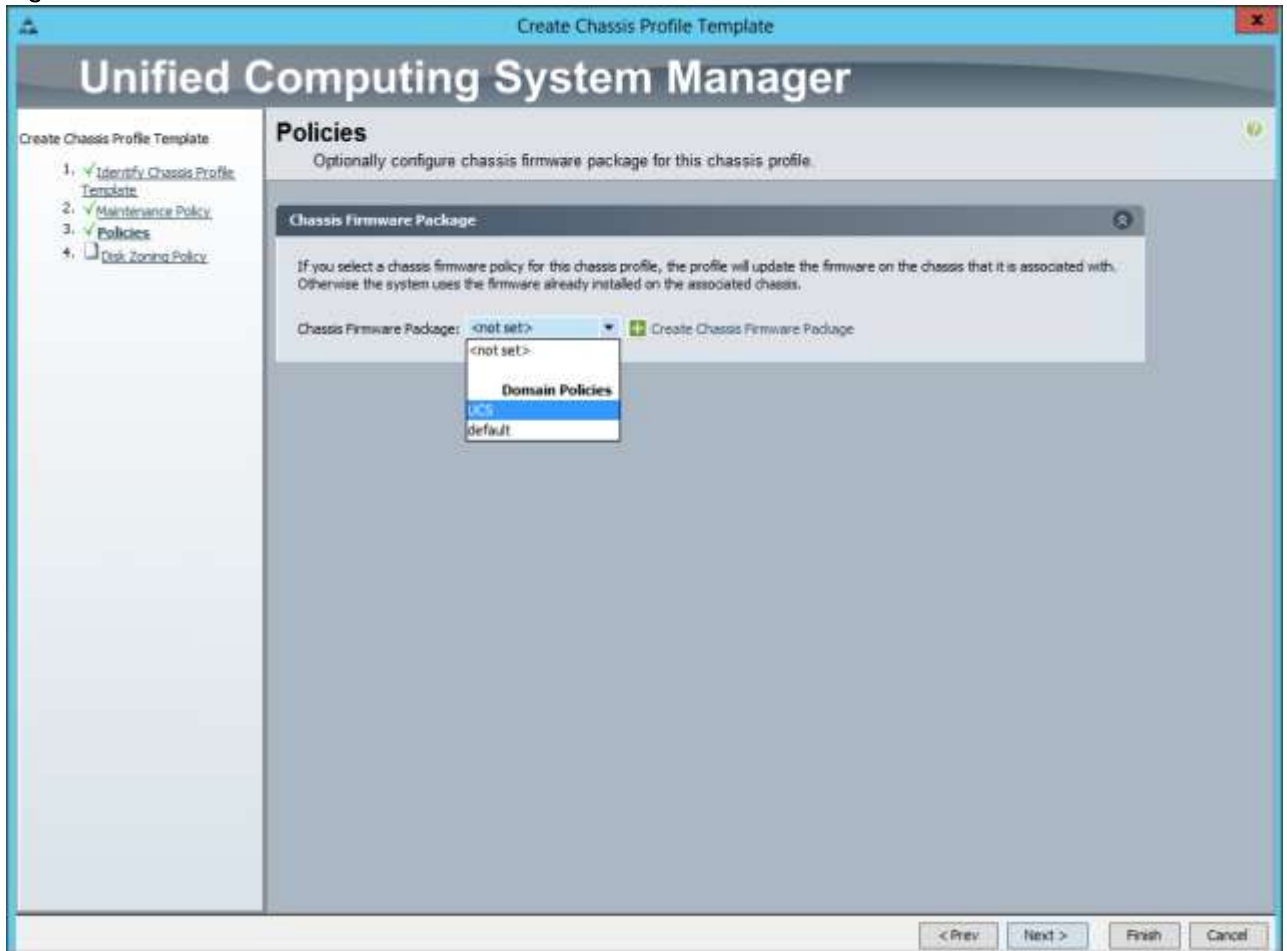
2. Enter the Name "UCS" and select "Updating Template" as the type, and click Next and Next again. (Figure 25)

Figure 25 Identify Chassis Profile Template



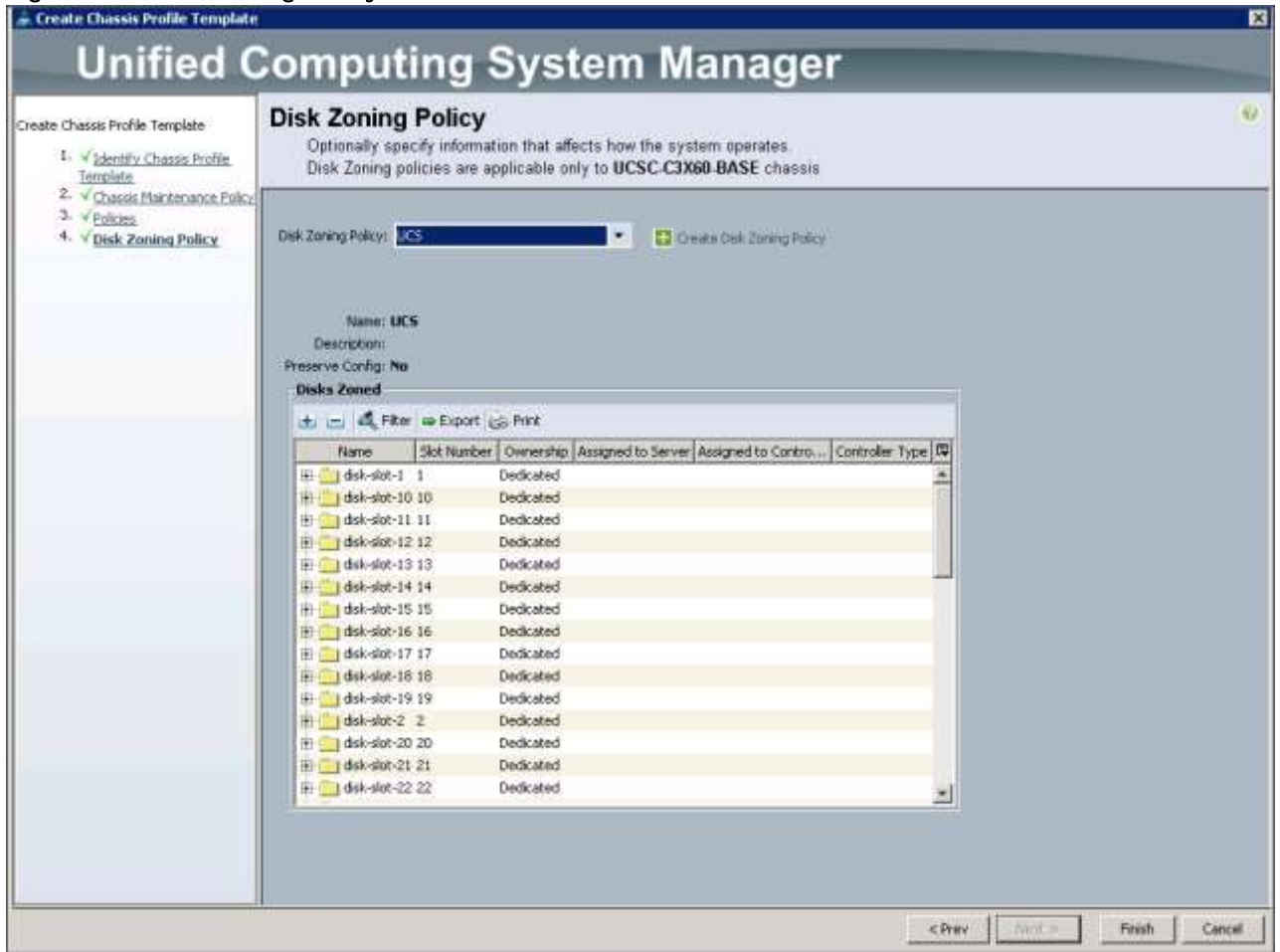
3. From the Chassis Firmware Package drop down list choose UCS and click Next. (Figure 26)

Figure 26 UCS Policies



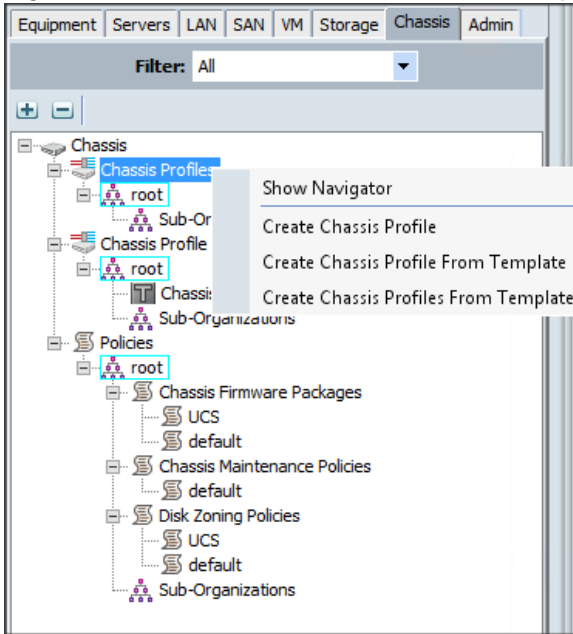
4. From the Disk Zoning Policy drop down list choose UCS and click Finish. (Figure 27)

Figure 27 Disk Zoning Policy



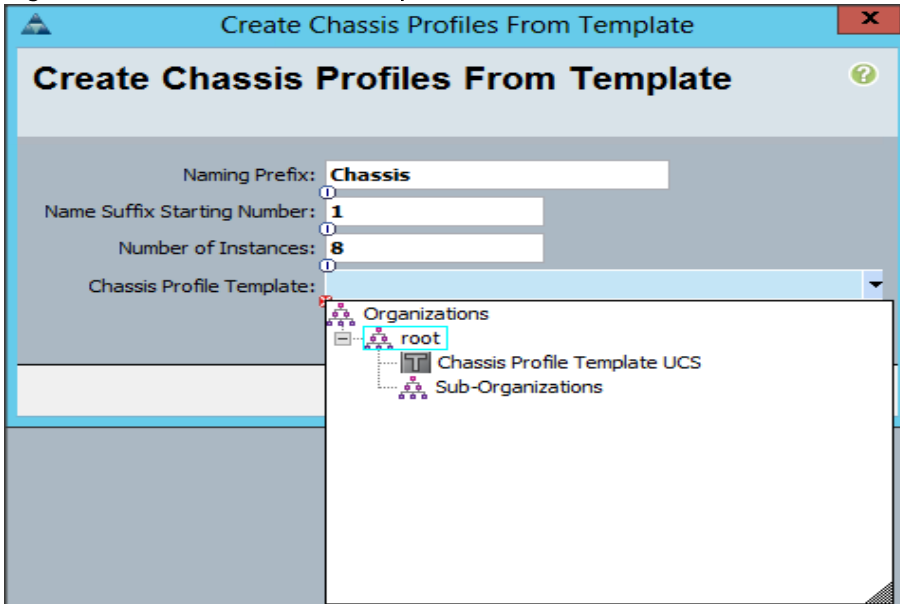
5. Right click on the Chassis Profiles and click "Create Chassis Profile from Templates" (Figure 28).

Figure 28 Create Chassis Profile from Templates



6. Enter Chassis as the Naming Prefix, the Number of Instances is "8" and from the Chassis Profile Template drop down list choose "Chassis Profile Template UCS" and click OK. (Figure 29)

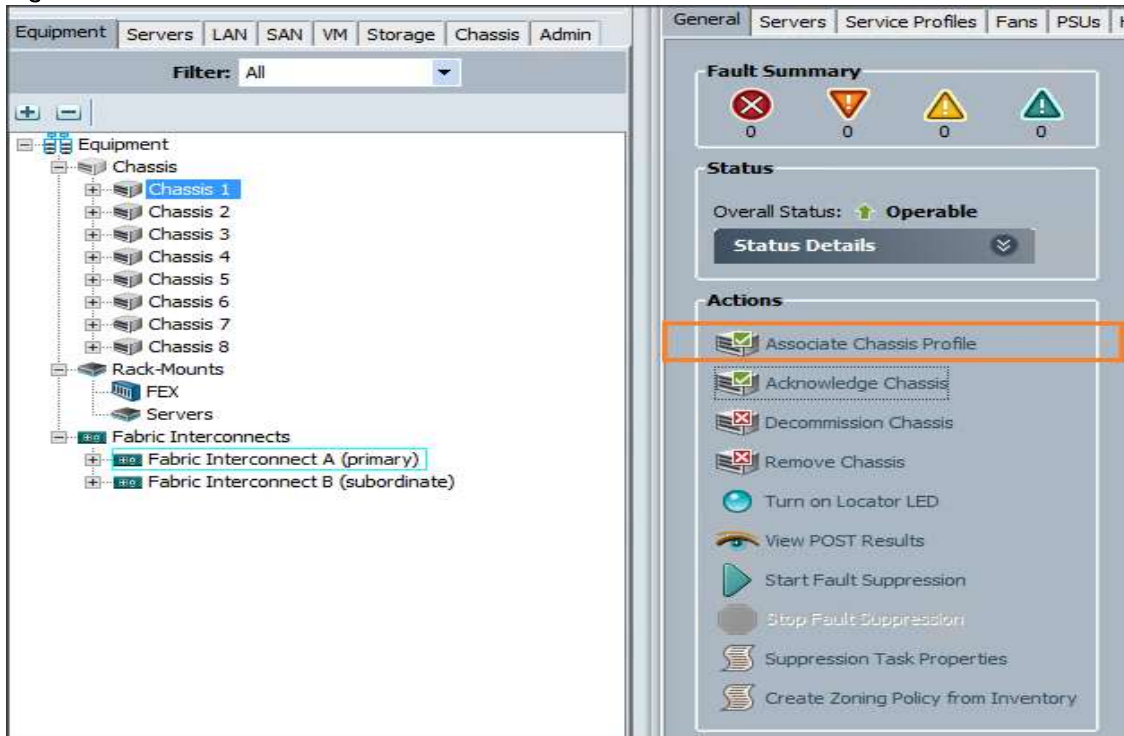
Figure 29 Chassis Profile Template UCS



Associating Chassis Profiles to Individual Chassis

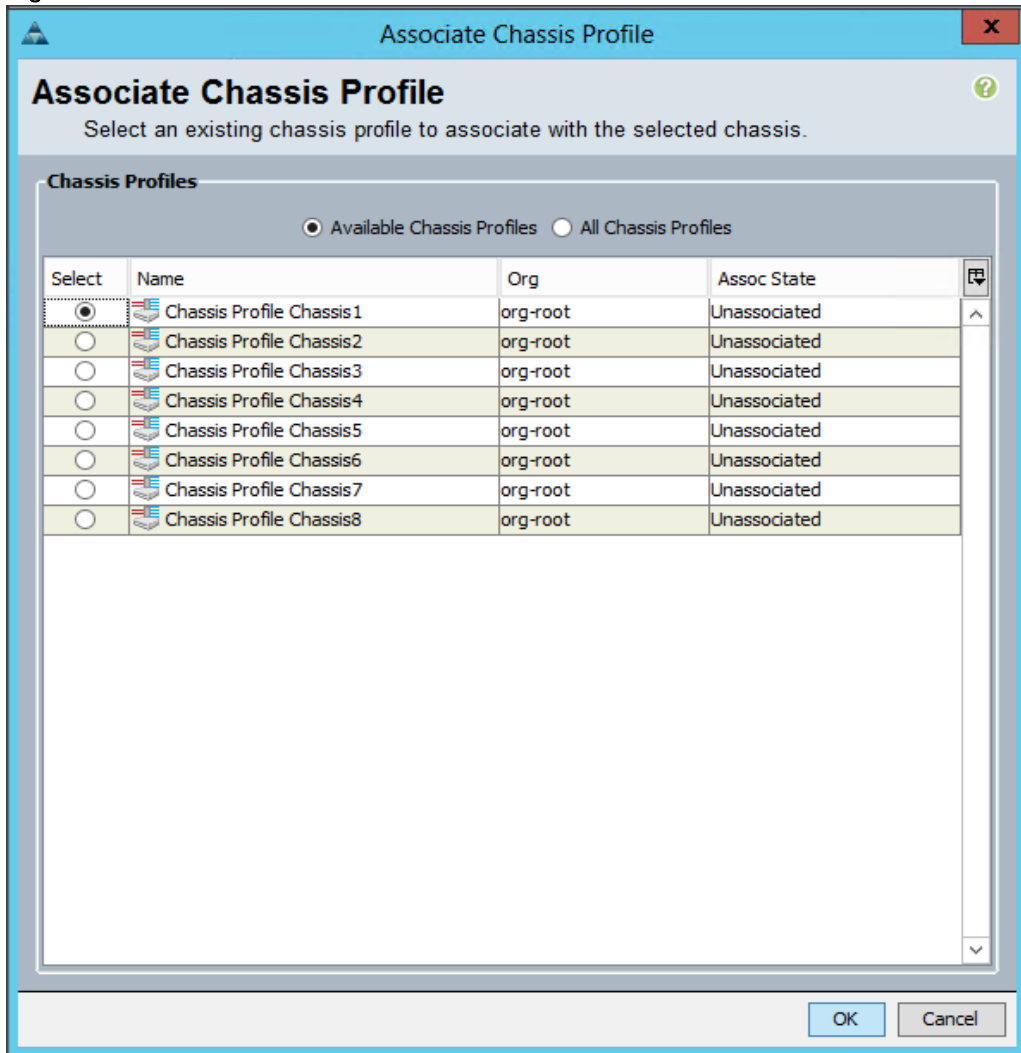
1. On the Cisco UCS Manager UI select the Equipment tab. Under Equipment expand Chassis.
2. Select the Chassis and click Associate Chassis Profile. (Figure 30)

Figure 30 Associate Chassis Profiles



3. Select "Chassis Profile Chassis 1" and click "OK". (Figure 31)

Figure 31 Associate Chassis Profile



4. Repeat steps 2 and 3 for the rest of the chassis.
5. Once the chassis profile is associated, only 24 disks will be assigned to each server node.
6. To verify that, go to Equipment→Chassis→ 1→Server 1. Click on the Inventory→Storage→Disks. Expand Storage controller SAS 1. (Figure 32)

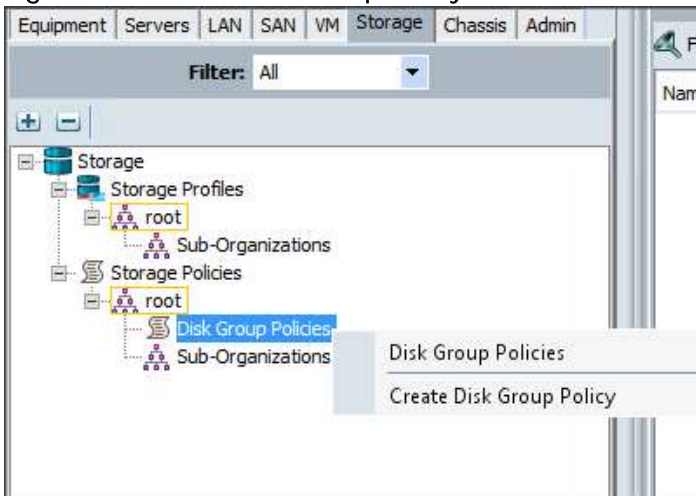
Figure 32 Storage Controller SAS 1

Name	Size (MB)	Serial	Operability	Drive State	Presence	Technology	Bootable
Disk 1	3814697	Z1223H70000C41074VE	Operable	Unconfigured Good	Equipped	HDD	False
Disk 2	3814697	Z1223HDM0000C41022YU	Operable	Unconfigured Good	Equipped	HDD	False
Disk 3	3814697	Z1211V3M0000C408CEUJ	Operable	Unconfigured Good	Equipped	HDD	False
Disk 4	3814697	Z1223D0Q0000C41031SG	Operable	Unconfigured Good	Equipped	HDD	False
Disk 5	3814697	Z1223FBN0000C41073RB	Operable	Unconfigured Good	Equipped	HDD	False
Disk 6	3814697	Z1211M7P0000C4095FFD	Operable	Unconfigured Good	Equipped	HDD	False
Disk 7	3814697	Z1211M7M0000C408JFEW	Operable	Unconfigured Good	Equipped	HDD	False
Disk 8	3814697	Z1223HQV0000C41073E9	Operable	Unconfigured Good	Equipped	HDD	False
Disk 9	3814697	Z1220SL30000C4099T1F	Operable	Unconfigured Good	Equipped	HDD	False
Disk 10	3814697	Z1223HQD0000C41075TF	Operable	Unconfigured Good	Equipped	HDD	False
Disk 11	3814697	Z1223H7V0000C41073ER	Operable	Unconfigured Good	Equipped	HDD	False
Disk 12	3814697	Z1223HEB0000C41073YV	Operable	Unconfigured Good	Equipped	HDD	False
Disk 13	3814697	Z1211M7B0000C408CFR	Operable	Unconfigured Good	Equipped	HDD	False
Disk 14	3814697	Z1221GC30000C409B7M	Operable	Unconfigured Good	Equipped	HDD	False
Disk 15	3814697	Z127PBE0000R5252Q5Y	Operable	Unconfigured Good	Equipped	HDD	False
Disk 16	3814697	Z1223FPG0000C41076PW	Operable	Unconfigured Good	Equipped	HDD	False
Disk 17	3814697	Z127PBD30000R525H2CT	Operable	Unconfigured Good	Equipped	HDD	False
Disk 18	3814697	Z127NFI20000R525674S	Operable	Unconfigured Good	Equipped	HDD	False
Disk 19	3814697	Z1211E90000C409MAHV	Operable	Unconfigured Good	Equipped	HDD	False
Disk 20	3814697	Z1223HDE0000C41074PG	Operable	Unconfigured Good	Equipped	HDD	False
Disk 21	3814697	Z1211G7P0000C409LJTD	Operable	Unconfigured Good	Equipped	HDD	False
Disk 22	3814697	Z127NVCY0000R52552EY	Operable	Unconfigured Good	Equipped	HDD	False
Disk 23	3814697	Z127P9S10000R5254H89	Operable	Unconfigured Good	Equipped	HDD	False
Disk 24	3814697	Z121FME50000C403T3VD	Operable	Unconfigured Good	Equipped	HDD	False

Creating a Storage Profile for Boot Drives

1. Go to Storage and expand Storage→ Storage Policies. Right click on Disk Group Policies and click Create Disk Group Policies. (Figure 33)

Figure 33 Create Disk Group Policy



2. In the Create Disk Policy window, configure the following parameters and click OK. (Figure 34)

- a. Name = “Boot_SSD”
- b. RAID Level = RAID 1 Mirrored
- c. Disk Group Configuration=Automatic

- d. Number of Drives=2
- e. Drive Type= SSD
- f. Use Remaining Disks = checked
- g. Strip Size = 64 KB
- h. Access Policy = Platform Default
- i. Read Policy = Read Ahead
- j. Write Cache Policy = Always Write Back
- a. IO Policy and Drive Cache = Platform Default

Figure 34 Create Disk Group Policy

Create Disk Group Policy

Name:

Description:

RAID Level:

Disk Group Configuration (Automatic) Disk Group Configuration (Manual)

Disk Group Configuration (Automatic)

Number of drives: [0-60]

Drive Type: Unspecified HDD SSD

Number of Dedicated Hot Spares: [0-60]

Number of Global Hot Spares: [0-60]

Min Drive Size (GB): [0-10240]

Use Remaining Disks:

Virtual Drive Configuration

Strip Size (KB):

Access Policy:

Read Policy: Platform Default Read Ahead Normal

Write Cache Policy: Platform Default Write Through Write Back Good Bbu Always Write Back

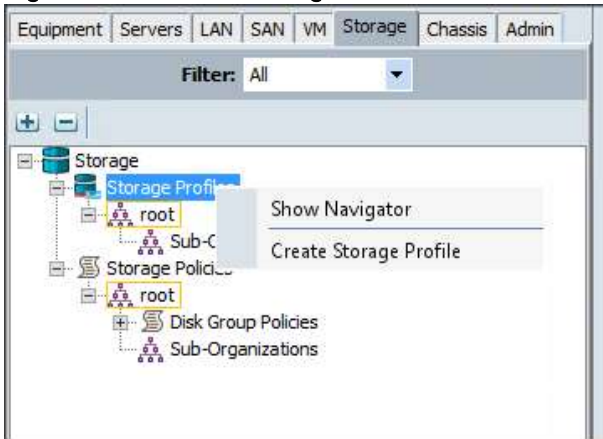
IO Policy: Platform Default Direct Cached

Drive Cache: Platform Default No Change Enable Disable

OK Cancel

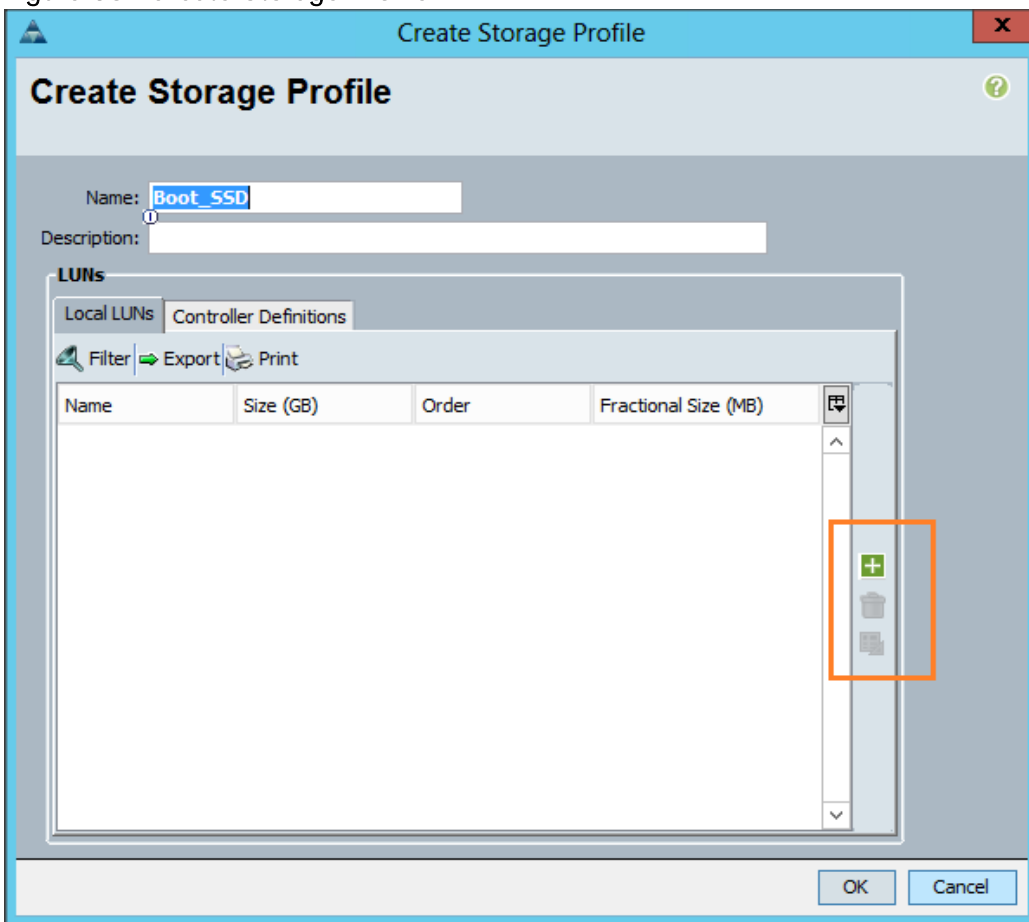
3. Click on the Storage tab. Right click on Storage Profile and click Create Storage Profile. (Figure 35)

Figure 35 Create Storage Profile



4. Enter "Boot_SSD" in the name field. Under Local LUNs click "+" to add local lun. (Figure 36)

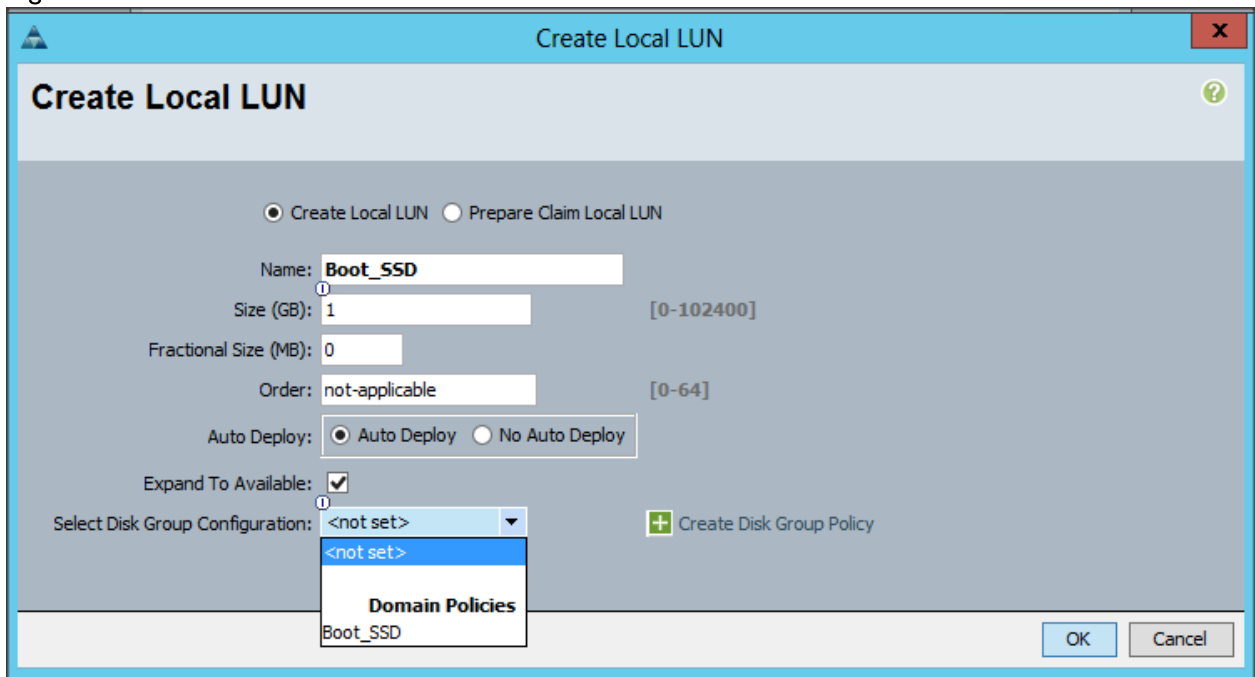
Figure 36 Create Storage Profile



5. In the Create Local LUN window, enter the name "Boot_SSD". (Figure 37)

6. Check the “Expand to Available” checkbox to use all available space.
7. Under Select Disk Group Configuration drop down list choose “Boot_SSD” created earlier and click “OK” and “OK” again to complete the configuration.

Figure 37 Create Local LUN



Creating Pools for Service Profile Templates

Creating MAC Address Pools

To create MAC address pools, complete the following steps:

1. Select the **LUN** 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 **pool** for the name of the MAC pool. (Figure 38)
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. (Figure 39)
10. Specify a size of the MAC address pool, which is sufficient to support the available server resources.
11. Click **OK**

Figure 38 Define Name and Description of MAC Pool

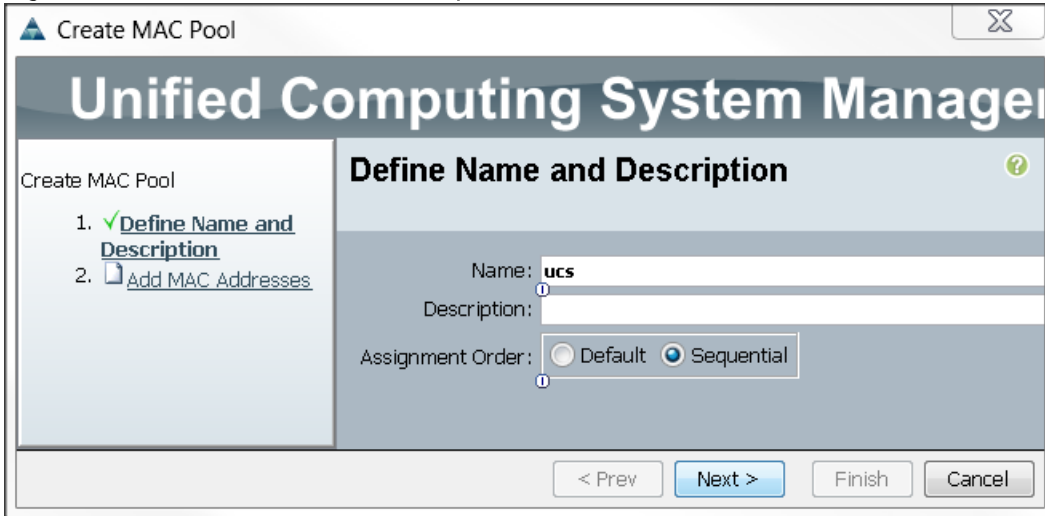
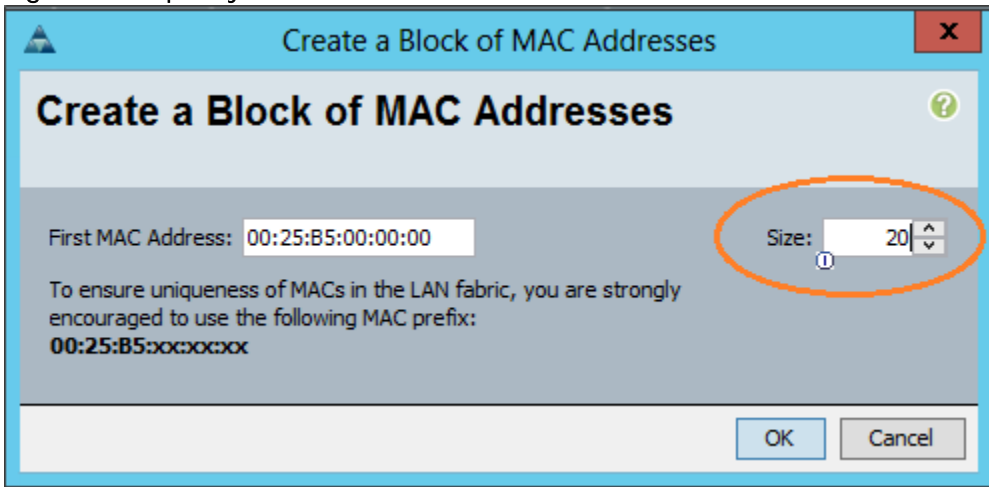
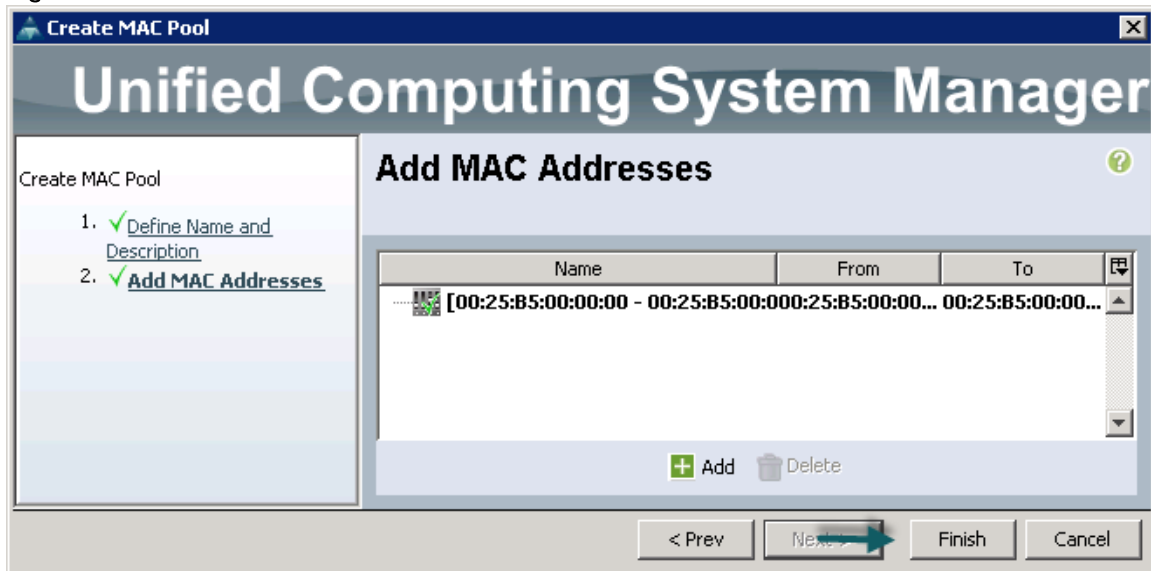


Figure 39 Specify first MAC Address and Size

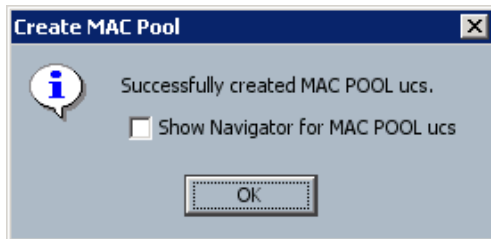


12. Click **Finish**. (Figure 40)

Figure 40 Add MAC Addresses



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



Creating a Server Pool

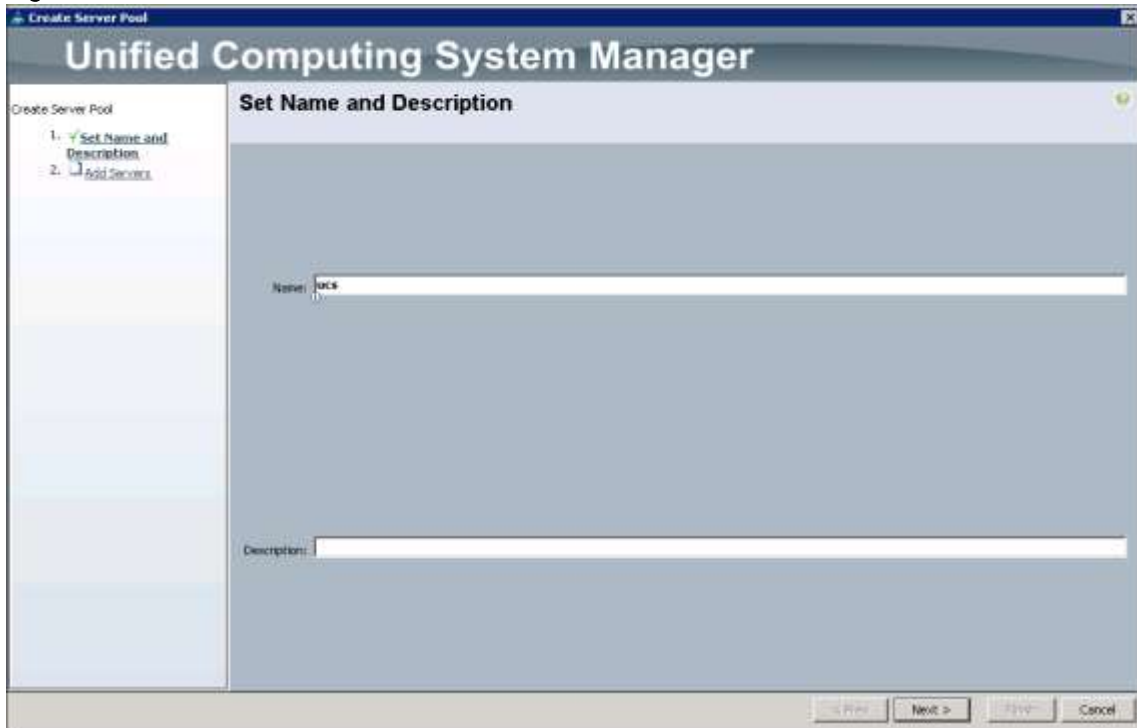
A server pool contains a set of servers. These servers typically share the same characteristics. Those characteristics can be their location in the chassis, or an attribute such as server type, amount of memory, local storage, type of CPU, or local drive configuration. You can manually assign a server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

To configure the server pool within the Cisco UCS Manager GUI, complete the following steps:

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. (Figure 41)**
6. **(Optional) enter a description for the organization.**

7. Click **Next >** to add the servers.

Figure 41 Name the Server Pool



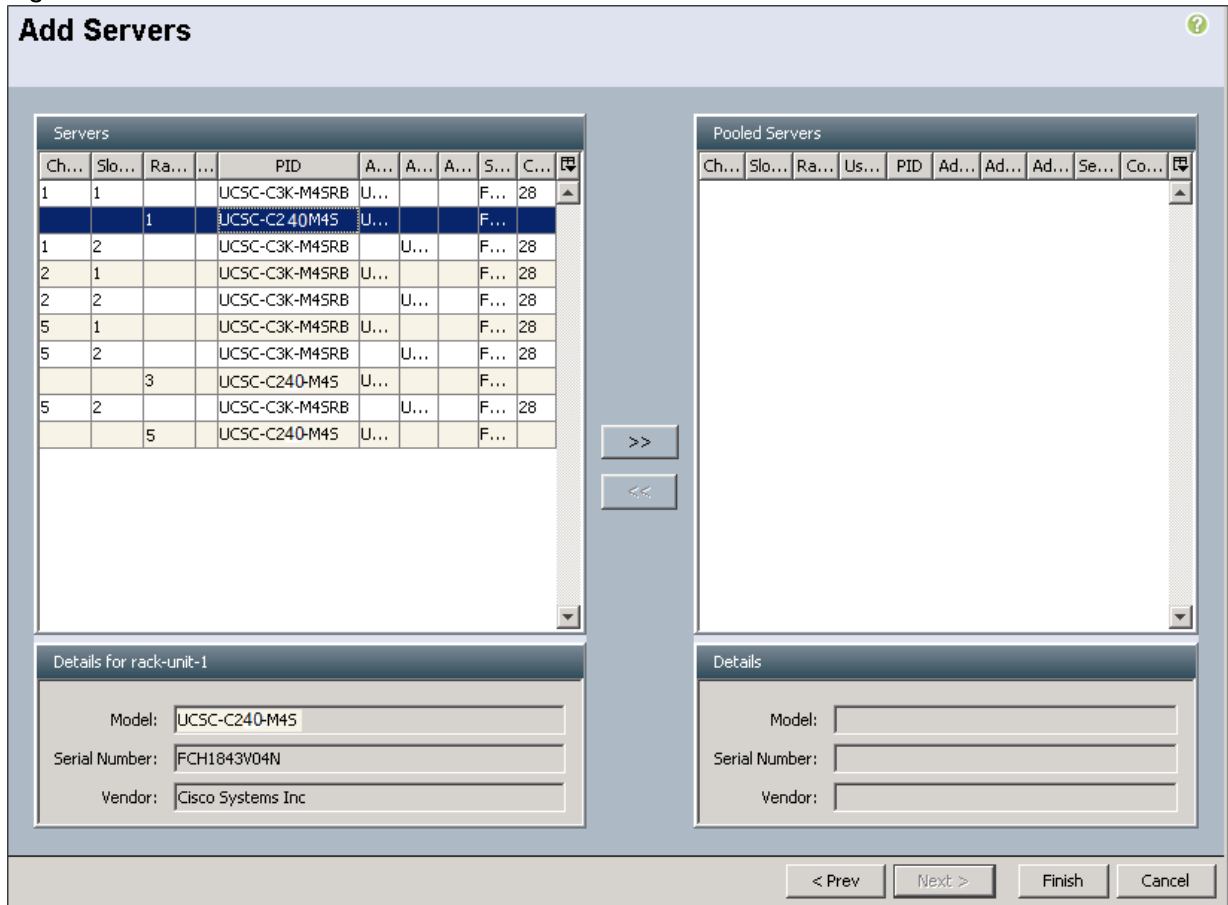
8. Select all the Cisco UCS S3260 Storage Server to be added to the server pool that was previously created (ucs), then Click **>>** to add them to the pool. (Figure 42)
9. Click **Finish**
10. Click **OK** and then click **Finish**

Figure 42 Add Server



11. Repeat steps 1 through 7 to create another server pool named Management.
12. Select three Cisco UCS C240 M4 Rack Servers to be added to the server pool named Management, then Click >> to add them to the pool. (Figure 43)

Figure 43 Add Servers Window



13. Click **Finish**

14. Click **OK** and then click **Finish**

Creating Policies for Service Profile Templates

Creating Host Firmware Package Policy

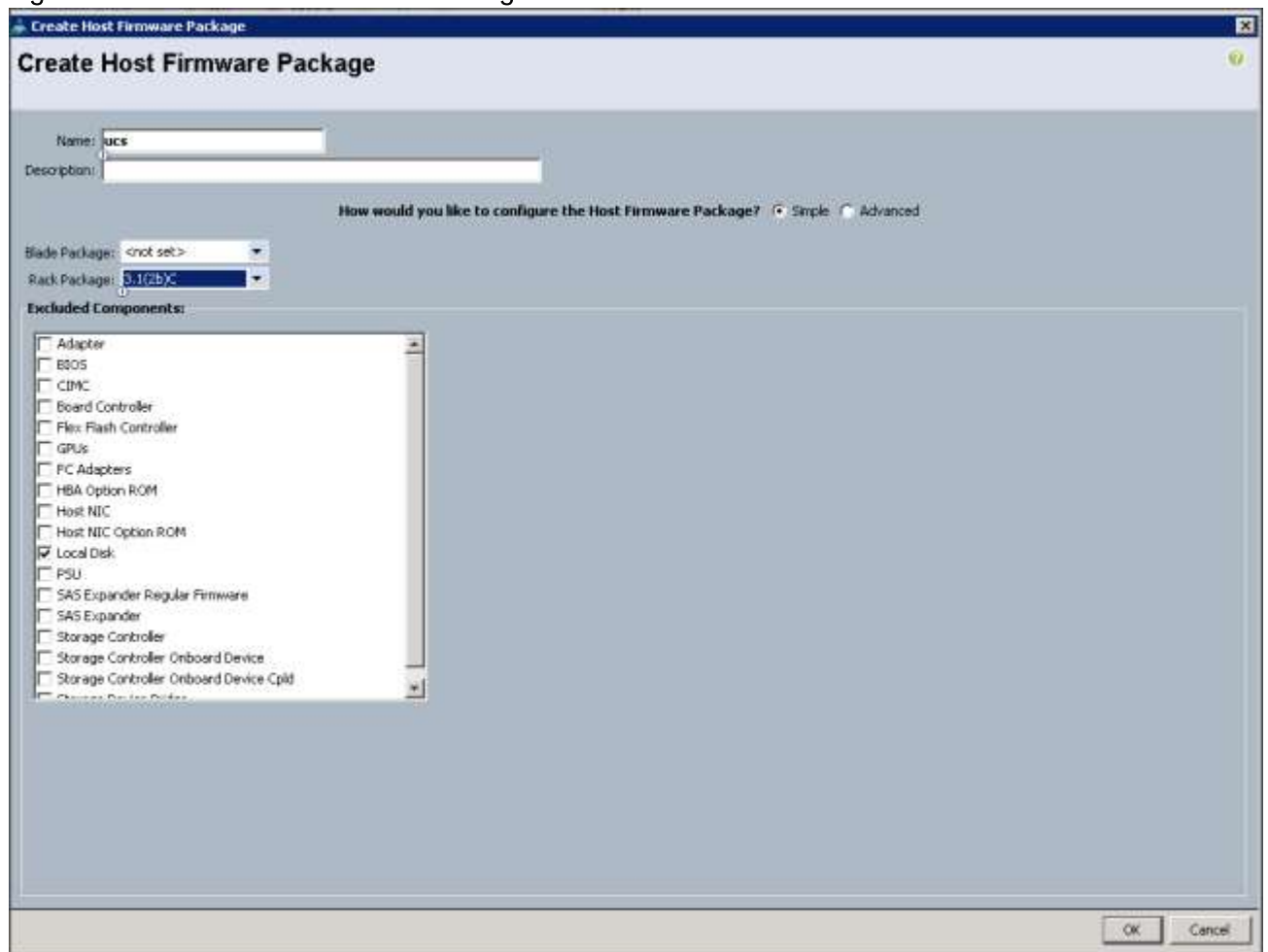
Firmware management policies allow the administrator to select the corresponding packages for a given server configuration. These include adapters, BIOS, board controllers, FC adapters, HBA options, and storage controller properties as applicable.

To create a firmware management policy for a given server configuration using the Cisco UCS Manager GUI, complete the following steps:

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 the required Host Firmware package name (ucs). (Figure 44)
6. Select `Simple` radio button to configure the Host Firmware package.
7. Select the appropriate Rack package that has been installed.
8. Click `OK` to complete creating the management firmware package
9. Click `OK`

Figure 44 Create Host Firmware Package Screen



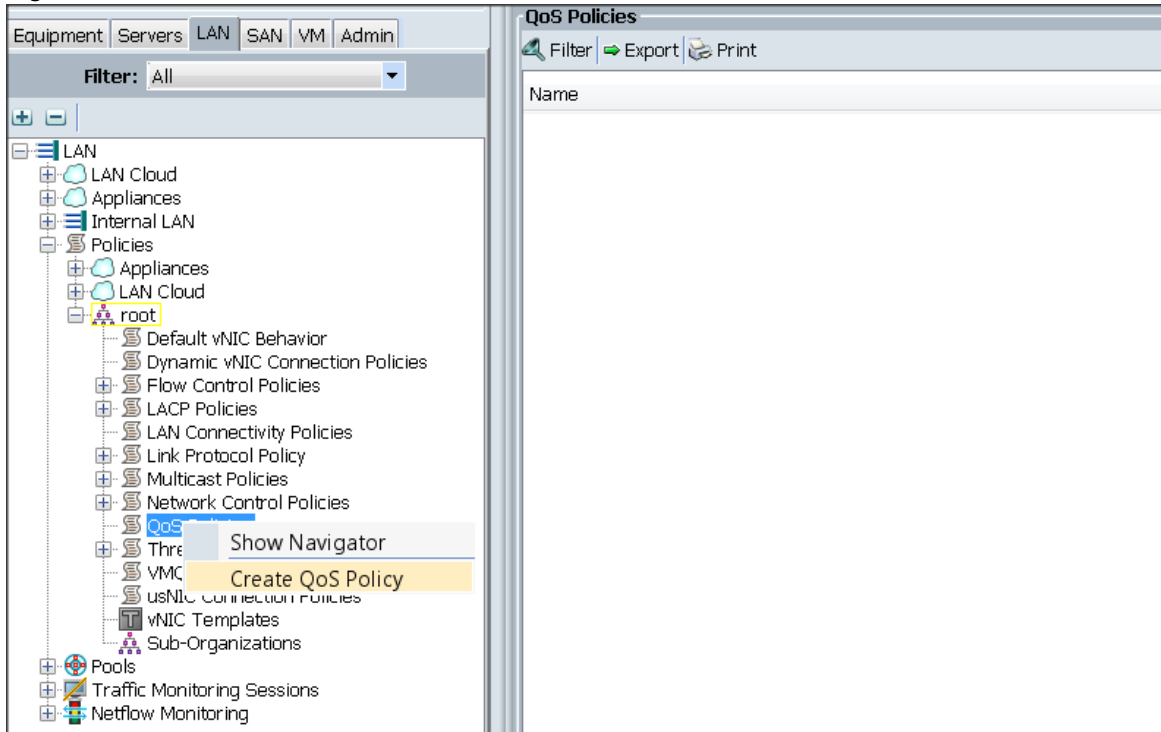
Creating QoS Policies

To create the QoS policy for a given server configuration using the Cisco UCS Manager GUI, complete the following steps:

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**. (Figure 45)

Figure 45 QoS Policies



5. Enter **Platinum** as the name of the policy. (Figure 46)
6. Select **Platinum** from the drop down menu.
7. Keep the **Burst (Bytes)** field set to default (10240).
8. Keep the **Rate (Kbps)** field set to default (line-rate).
9. Keep **Host Control** radio button set to default (none).
10. Once the pop-up window appears, click **OK** to complete the creation of the Policy.

Figure 46 Create QoS Policy

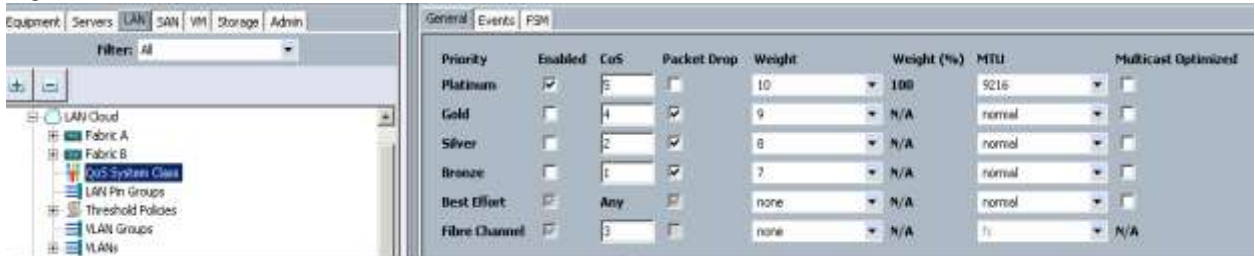


Setting Jumbo Frames

To set Jumbo frames and enable QoS, complete the following steps:

1. Select the **LAN** tab in the left pane in the UCSM GUI.
2. Select **LAN Cloud > QoS System Class.** (Figure 47)
3. In the right pane, select the **General** tab
4. In the **Platinum** row, enter 9216 for MTU.
5. Check the **Enabled** Check box next to **Platinum**
6. In the **Best Effort** row, select **none** for weight.
7. In the **Fiber Channel** row, select **none** for weight.
8. Click **Save Changes.**
9. Click **OK**

Figure 47 LAN General



Creating the Local Disk Configuration Policy

To create the local disk configuration policy in the Cisco UCS Manager GUI, complete the following steps:

1. Select the **Servers** tab on the left pane in the UCS Manager GUI.
2. Go to **Policies > root**.
3. Right-click **Local Disk Configuration Policies**.
4. Select **Create Local Disk Configuration Policy**.
5. Enter **ucs** as the local disk configuration policy name. (Figure 48)
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 48 Create Local Disk Configuration Policy

The screenshot shows a dialog box titled "Create Local Disk Configuration Policy". The fields are as follows:

- Name:** ucs
- Description:** (empty)
- Mode:** Any Configuration
- Protect Configuration:**
- FlexFlash State:** Disable Enable
- FlexFlash RAID Reporting State:** Disable Enable

At the bottom of the dialog are "OK" and "Cancel" buttons.

Creating a Server BIOS Policy

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

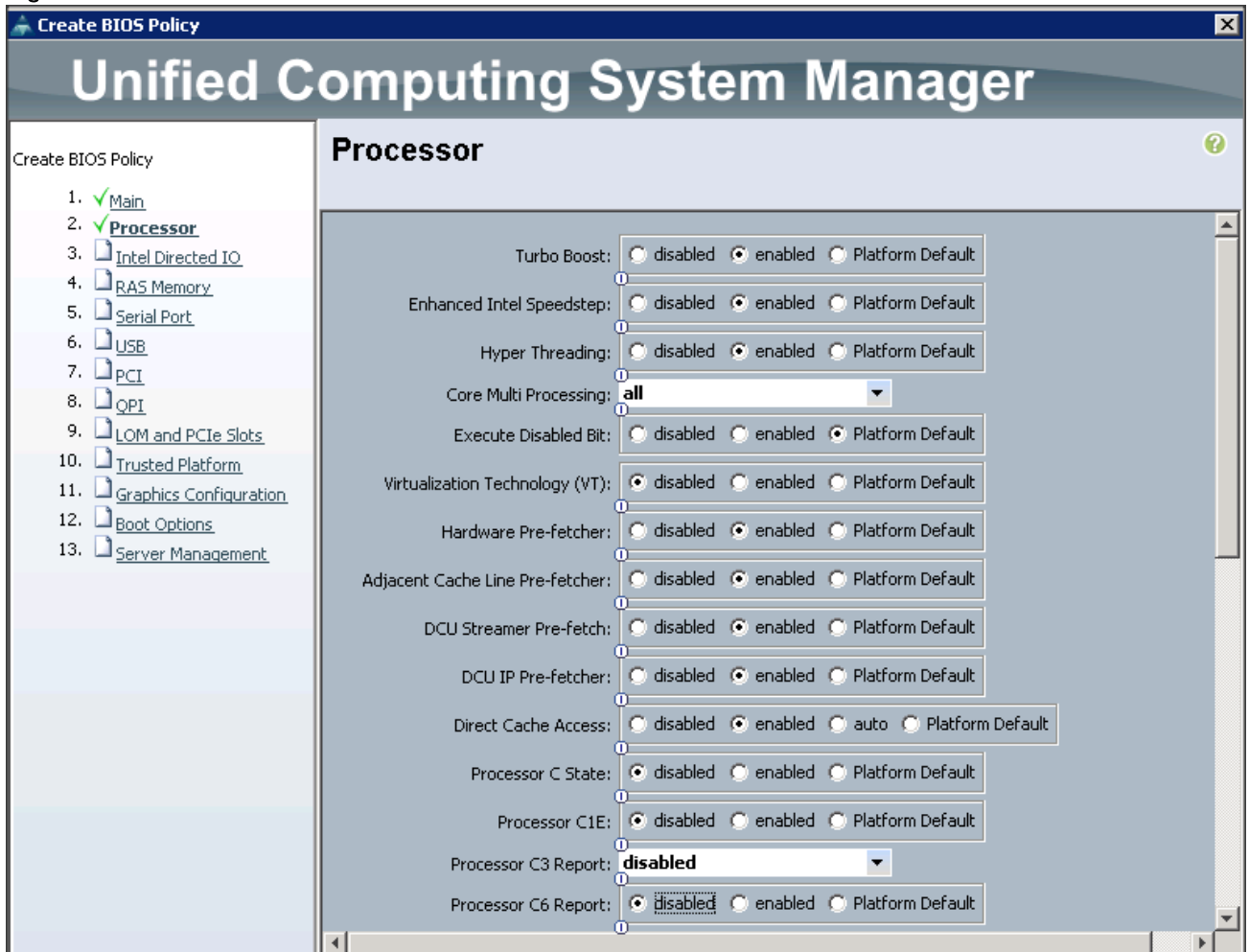


Note: *BIOS settings* can have a significant performance impact, *depending* on the workload and the *applications*. The BIOS settings listed in this section is for configurations optimized for best performance which can be adjusted based on the application, performance, and energy efficiency requirements.

To create a server BIOS policy using the Cisco UCS Manager GUI, complete the following steps:

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 (.ca).**
6. **Change the BIOS settings as shown in the following figures.**
7. **The only changes that need to be made are in the Processor (Figure 49) and RAS Memory settings (Figure 50).**

Figure 49 Processor



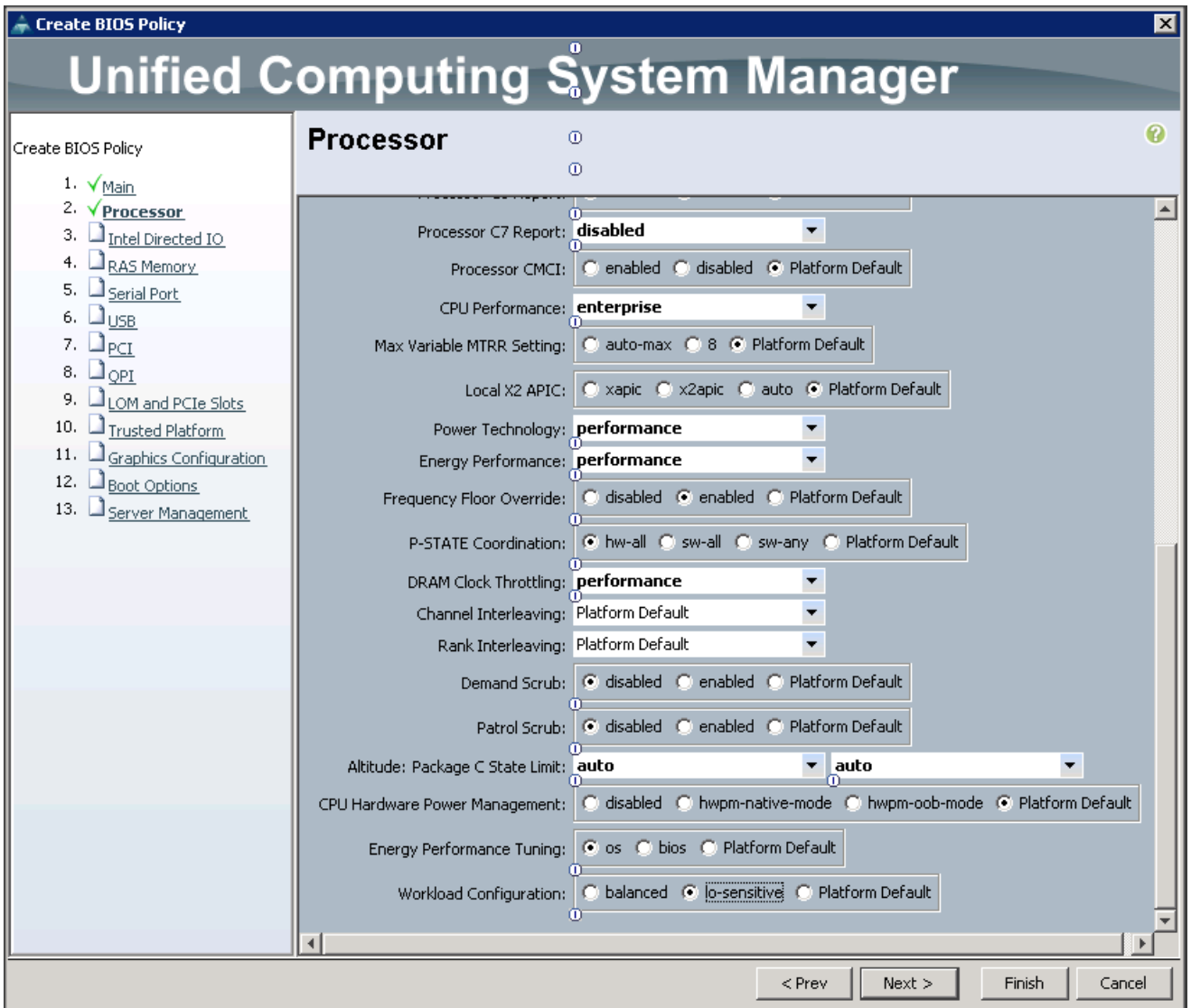
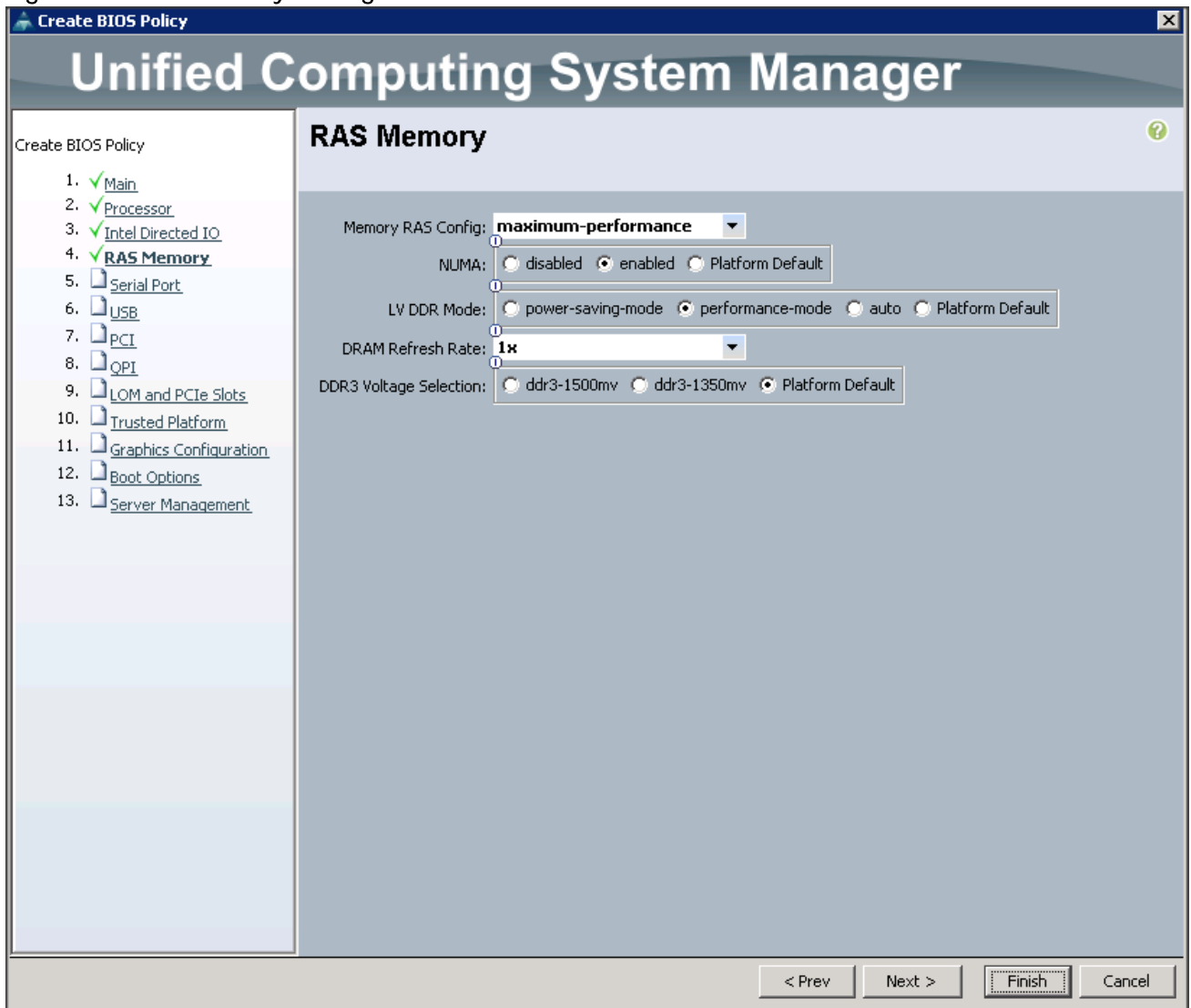


Figure 50 RAS Memory Settings

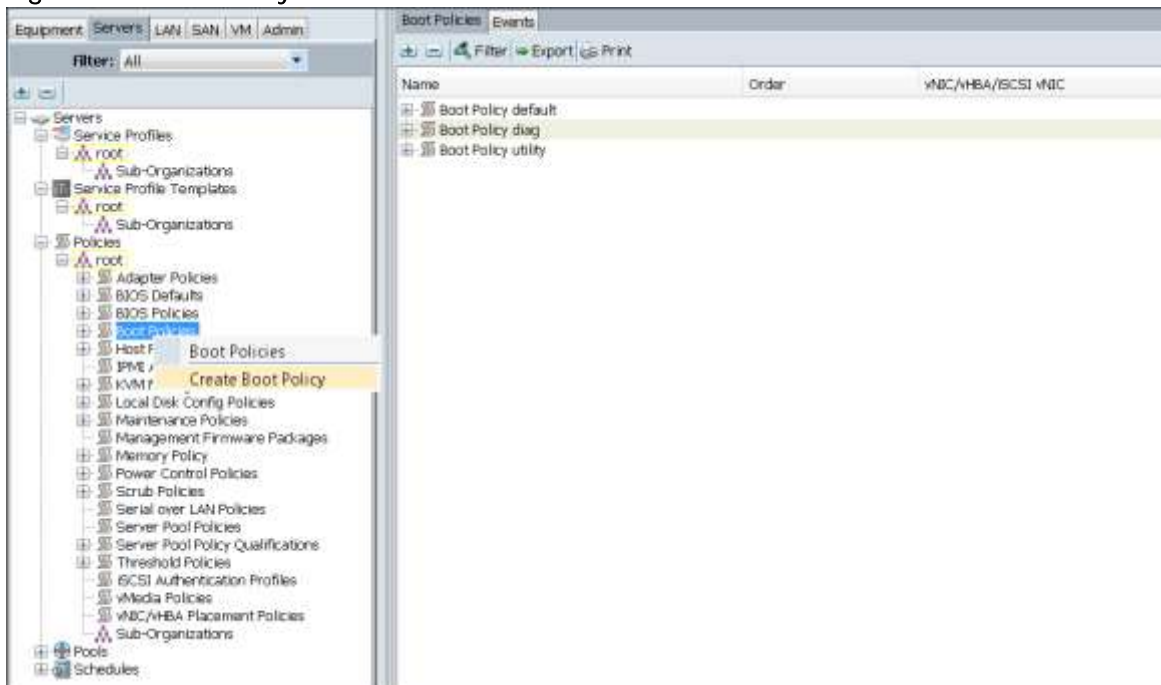


Creating the Boot Policy

To create boot policies within the Cisco UCS Manager GUI, complete the following steps:

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 51)**

Figure 51 Boot Policy Screen

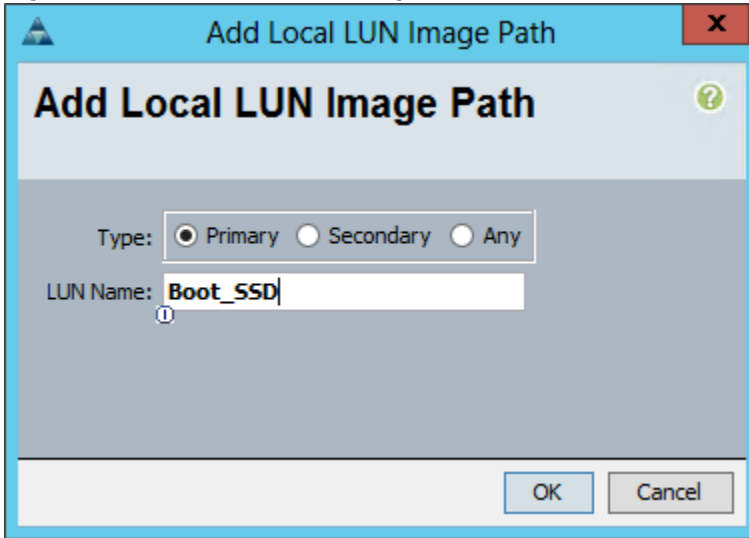


5. Enter `boot` as the boot policy name.
6. (Optional) enter a description for the boot policy.
7. Keep the Reboot on Boot Order Change check box unchecked.
8. Keep Enforce vNIC/vHBA/iSCSI Name check box checked.
9. Keep Boot Mode Default (Legacy).
10. Expand Local Devices and select Add Local Lun.
11. In the Add Local LUN Image Path window, select Primary and enter the Name "Boot_SSD" that was created earlier during storage profile creation step. (Figure 52)



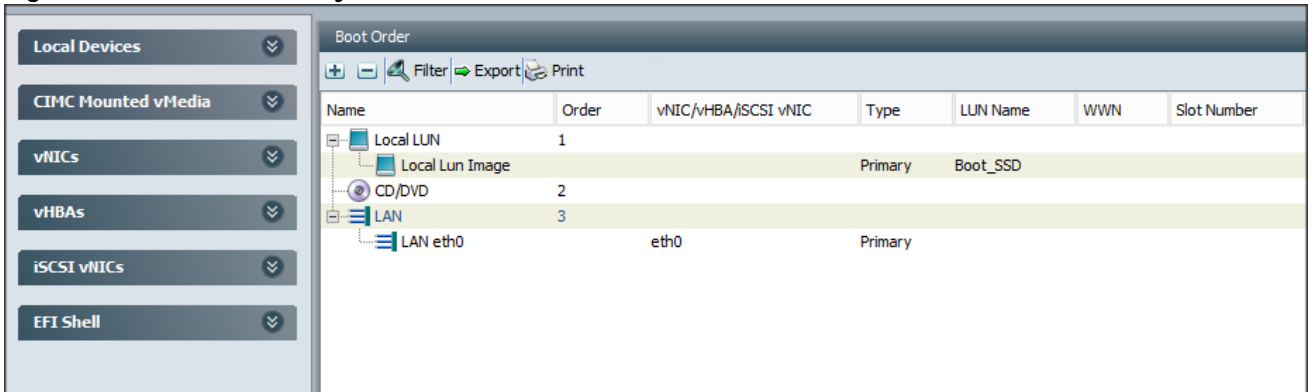
Note: The LUN name must match with the LUN name created earlier.

Figure 52 Add Local LUN Image Path



12. Expand Local Devices > Add CD/DVD and select Add Local CD/DVD. (Figure 53)
13. Expand vNICs and select Add LAN Boot and enter eth0.
14. Click OK to add the Boot Policy.
15. Click OK.

Figure 53 Add Boot Policy



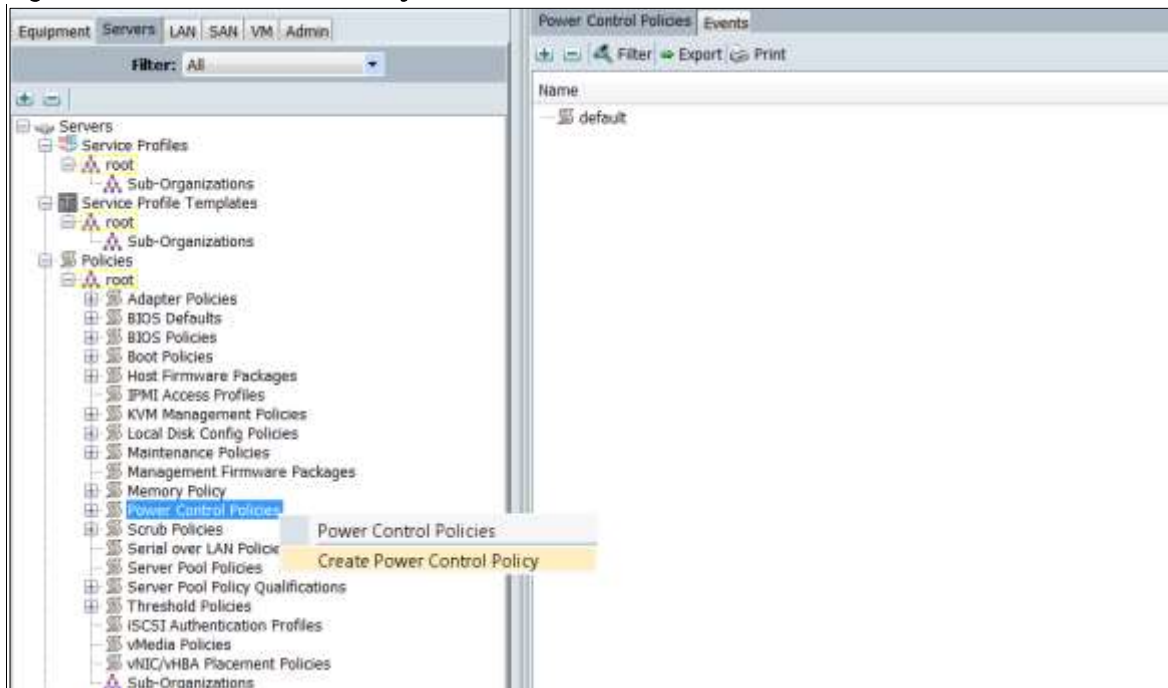
Creating Power Control Policy

To create Power Control policies within the Cisco UCS Manager GUI, complete the following steps:

1. Select the **Servers** tab in the left pane in the UCS Manager GUI.
2. Select **Policies > root**.
3. Right-click the **Power Control Policies**. (Figure 54)

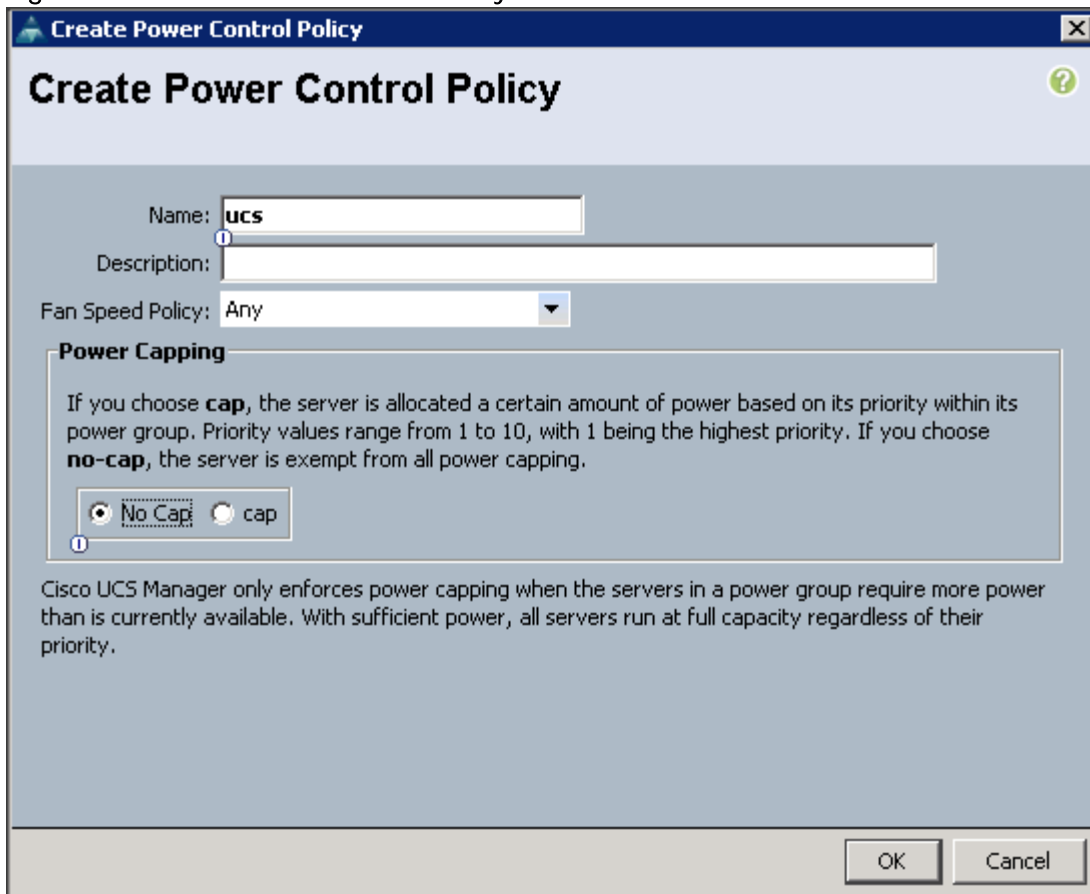
4. Select Create Power Control Policy.

Figure 54 Power Control Policy



5. Enter `local` as the Power Control policy name. (Figure 55)
6. (Optional) enter a description for the boot policy.
7. Select Performance for Fan Speed Policy.
8. Select No cap for Power Capping selection.
9. Click OK to create the Power Control Policy.
10. Click OK

Figure 55 Create Power Control Policy Screen

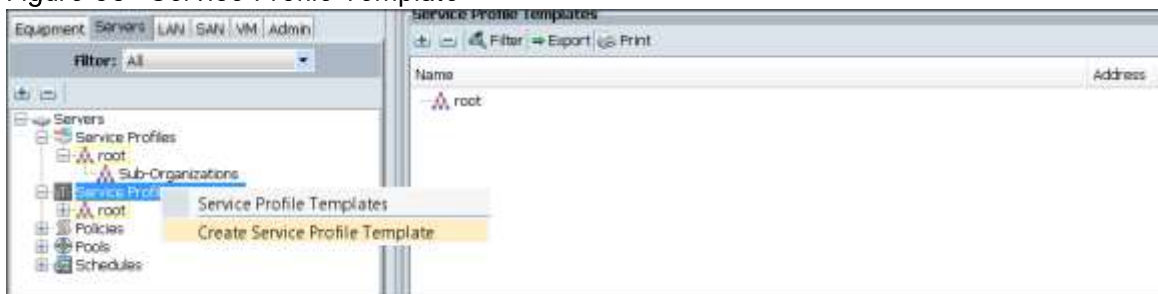


Creating a Service Profile Template

To create a Service Profile Template, complete the following steps:

1. Select the **Servers** tab in the left pane in the UCSM GUI.
2. Right-click **Service Profile Templates**.
3. Select **Create Service Profile Template**. (Figure 56)

Figure 56 Service Profile Template

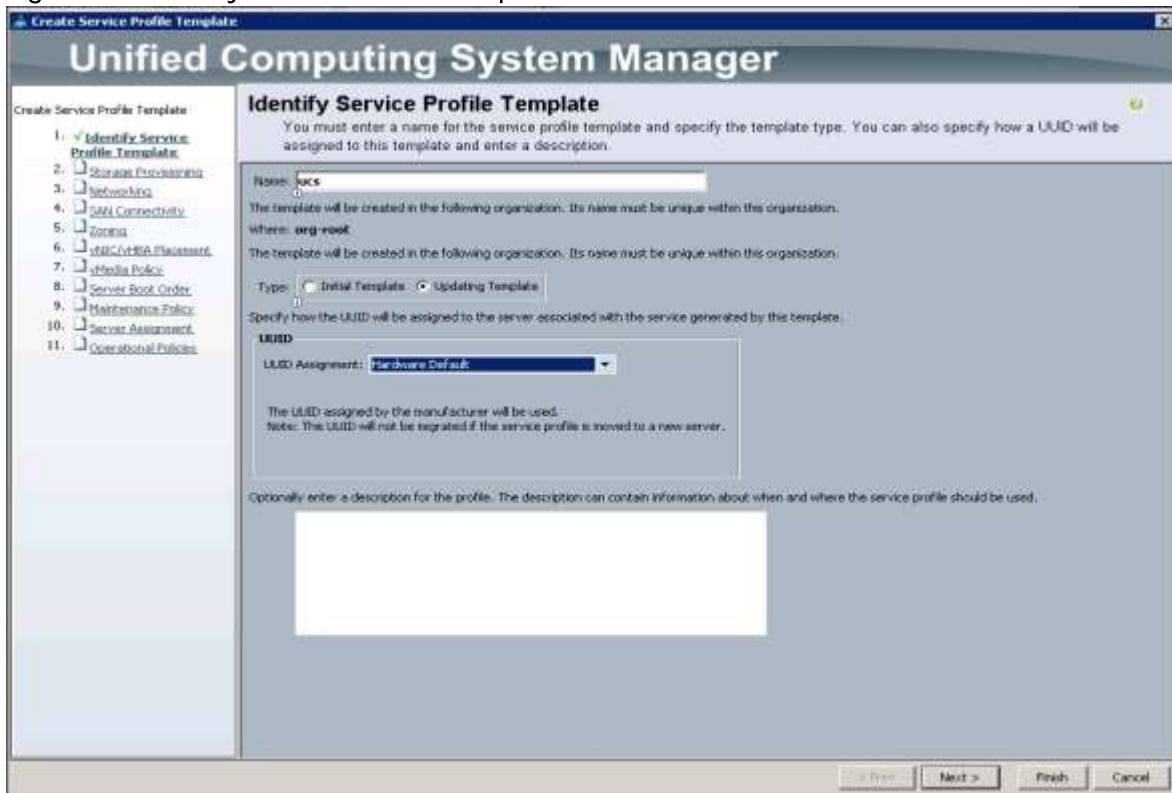


The Create Service Profile Template window appears. (Figure 57)

To identify the service profile template, complete the following steps:

4. Name the service profile template as `org-root`. Select the **Updating Template** radio button.
5. In the **UUID** section, select **Hardware Default** as the UUID pool.
6. Click **Next** to continue to the next section.

Figure 57 Identify Service Profile Template

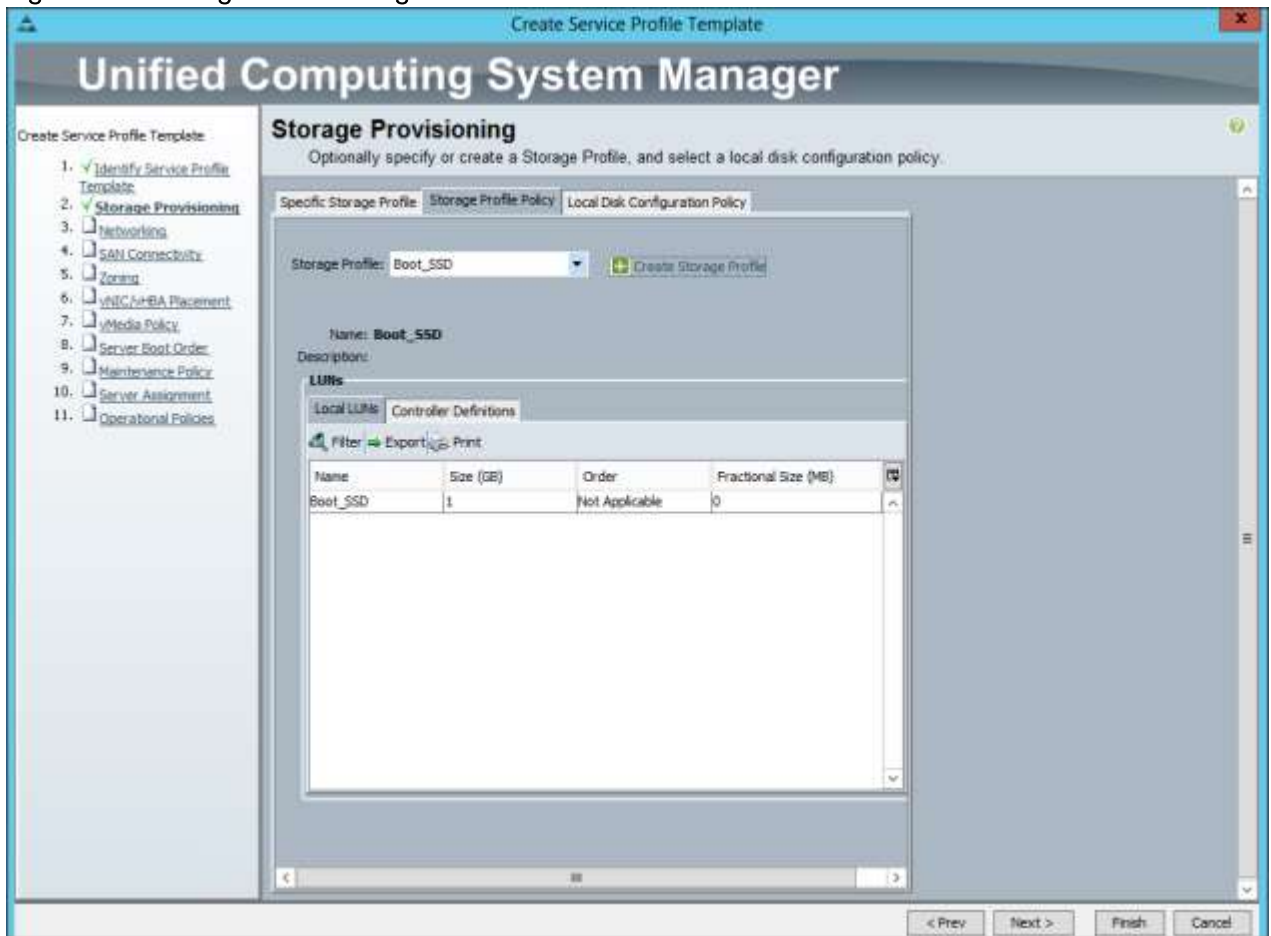


Configuring the Storage Provisioning for the Template

To configure storage policies, complete the following steps:

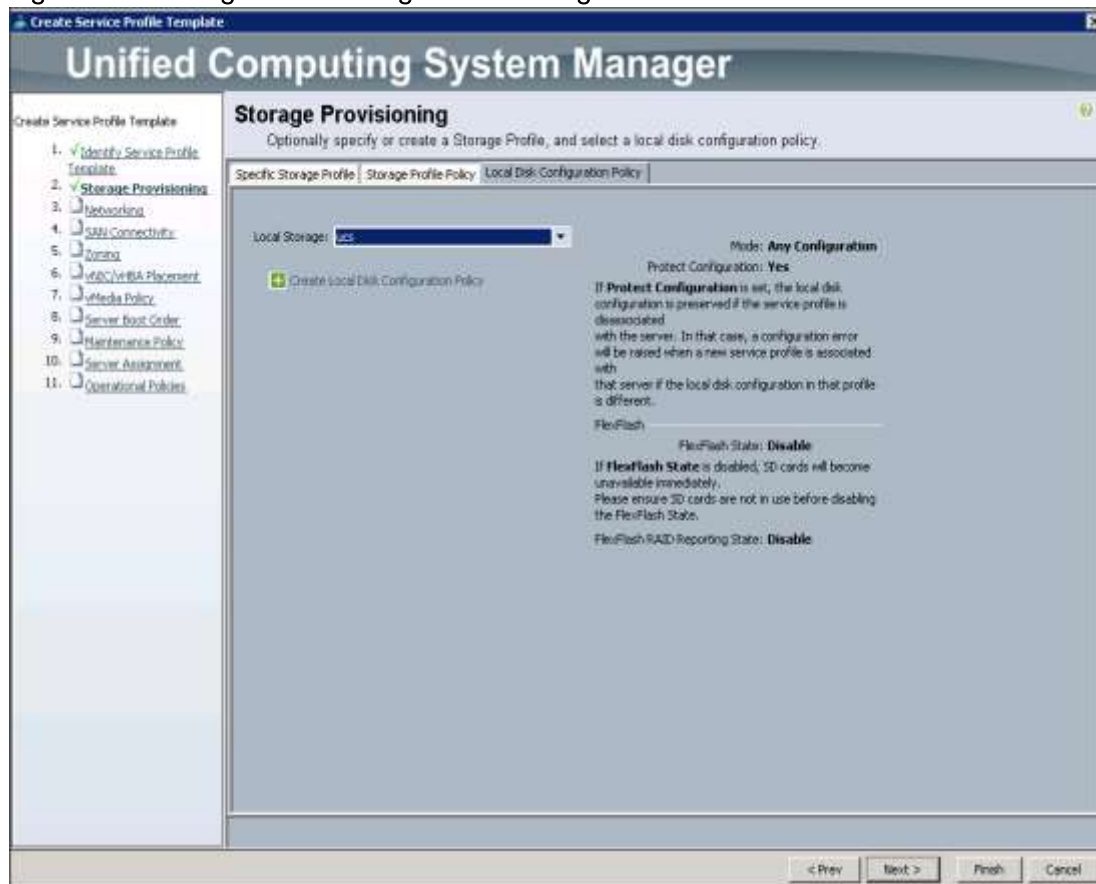
1. Go to **Storage Profile Policy** tab, and select **Boot_SSD** from the drop down list. (Figure 58)

Figure 58 Storage Provisioning



2. Go to the Local Disk Configuration Policy tab, and select ... for the Local Storage. (Figure 59)
3. Click Next > to continue to the next section.

Figure 59 Storage Provisioning /Local Storage



4. Click Next once the Networking window appears, then to go to the next section.

Configuring Network Settings for the Template

1. Keep the `Dynamic vNIC Connection Policy` field at the default. (Figure 60)
2. Select 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 60 Networking



4. The Create vNIC window displays. Name the vNIC eth0. (Figure 61)
5. Select eth0 in the Mac Address Assignment pool.
6. Select the Fabric A radio button and check the Enable failover check box for the Fabric ID.
7. Check the VLAN76 check box for VLANs and select the Native VLAN radio button
8. Select MTU size as 9000
9. Select adapter policy as Linux.
10. Select QoS Policy as Platinum.
11. Keep the Network Control Policy as Default.
12. Click OK

Figure 61 Create vNIC

Create vNIC

Create vNIC

Name:

Use vNIC Template:

MAC Address

MAC Address Assignment:

[+ Create MAC Pool](#)

The MAC address will be automatically assigned from the selected pool.

Fabric ID: Fabric A Fabric B Enable Failover

VLAN in LAN cloud will take the precedence over the Appliance Cloud when there is a name clash.

VLANs

[Filter](#) [Export](#) [Print](#)

Select	Name	Native VLAN
<input type="checkbox"/>	default	<input type="radio"/>
<input checked="" type="checkbox"/>	vlan76	<input checked="" type="radio"/>

[+ Create VLAN](#)

CDN Source: vNIC Name User Defined

MTU:

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: [+ Create LAN Pin Group](#)

Operational Parameters

Adapter Performance Profile

Adapter Policy: [+ Create Ethernet Adapter Policy](#)

QoS Policy: [+ Create QoS Policy](#)

Network Control Policy: [+ Create Network Control Policy](#)

Connection Policies

Dynamic vNIC usNIC VMQ

Dynamic vNIC Connection Policy: [+ Create Dynamic vNIC Connection Policy](#)

Figure 62 Networking LAN



13. Click **Next >** to continue with SAN Connectivity. (Figure 62)

14. Select **no vHBAs** for How would you like to configure SAN Connectivity? (Figure 63)

Figure 63 SAN Connectivity



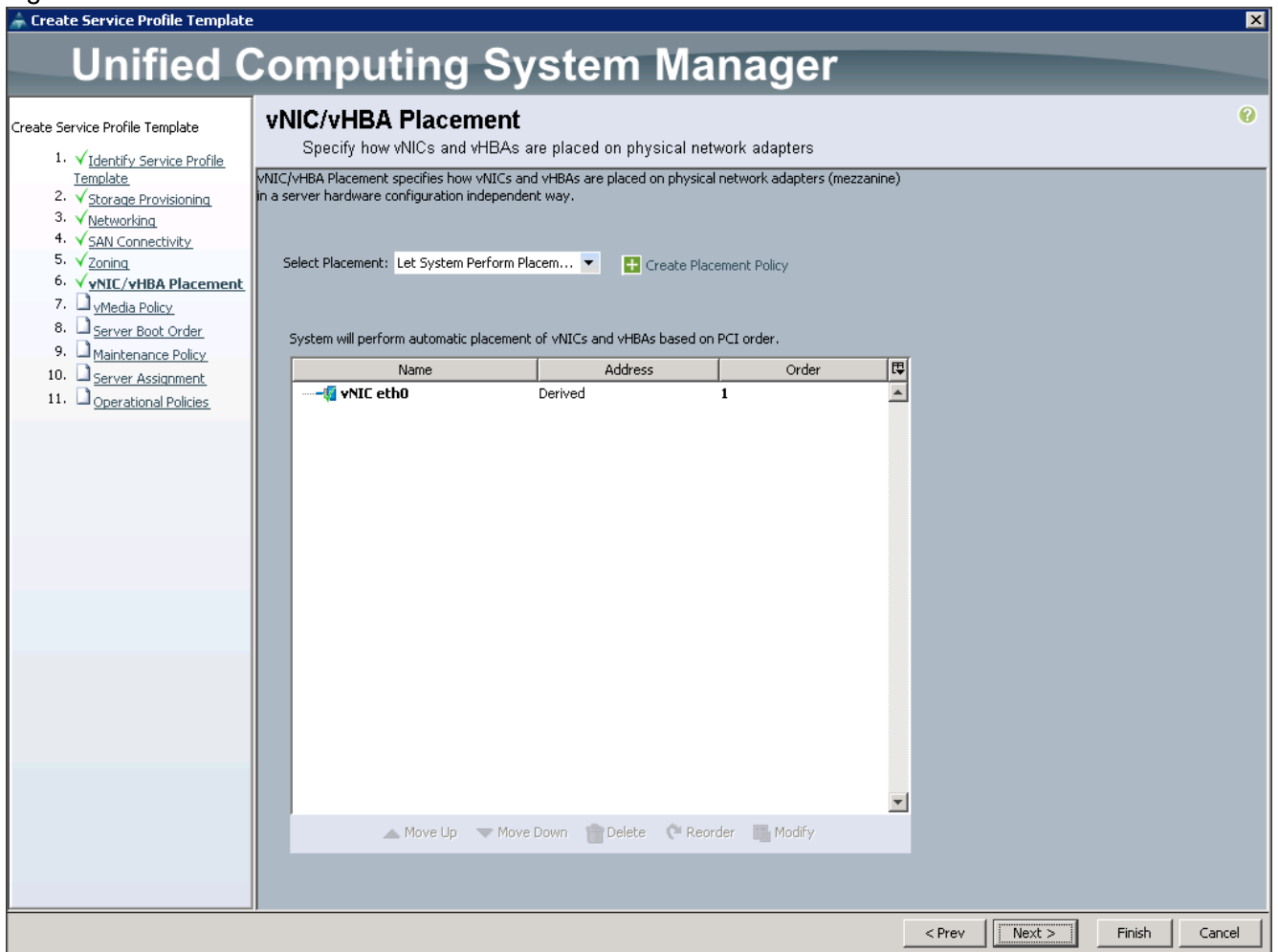
15. Click **Next >** to continue with Zoning. (Figure 64)

Figure 64 Zoning



16. Click **Next >** to continue with vNIC/vHBA placement. (Figure 65)

Figure 65 vNIC/vHBA Placement

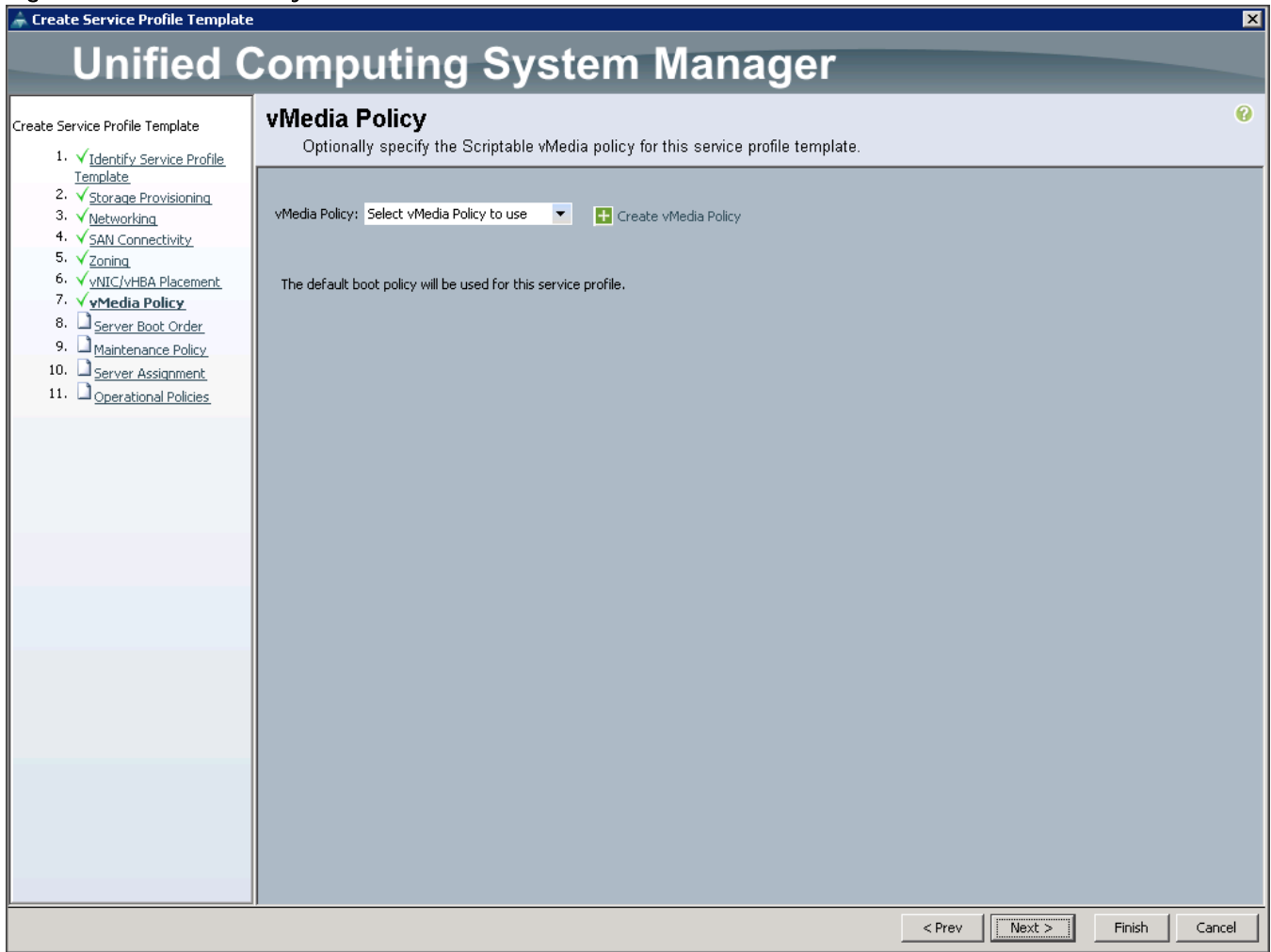


17. Click **Next** to configure vMedia Policy.

Configuring the vMedia Policy for the Template

1. Click **Next**. When the vMedia Policy window appears, to go to the next section. (Figure 66)

Figure 66 vMedia Policy

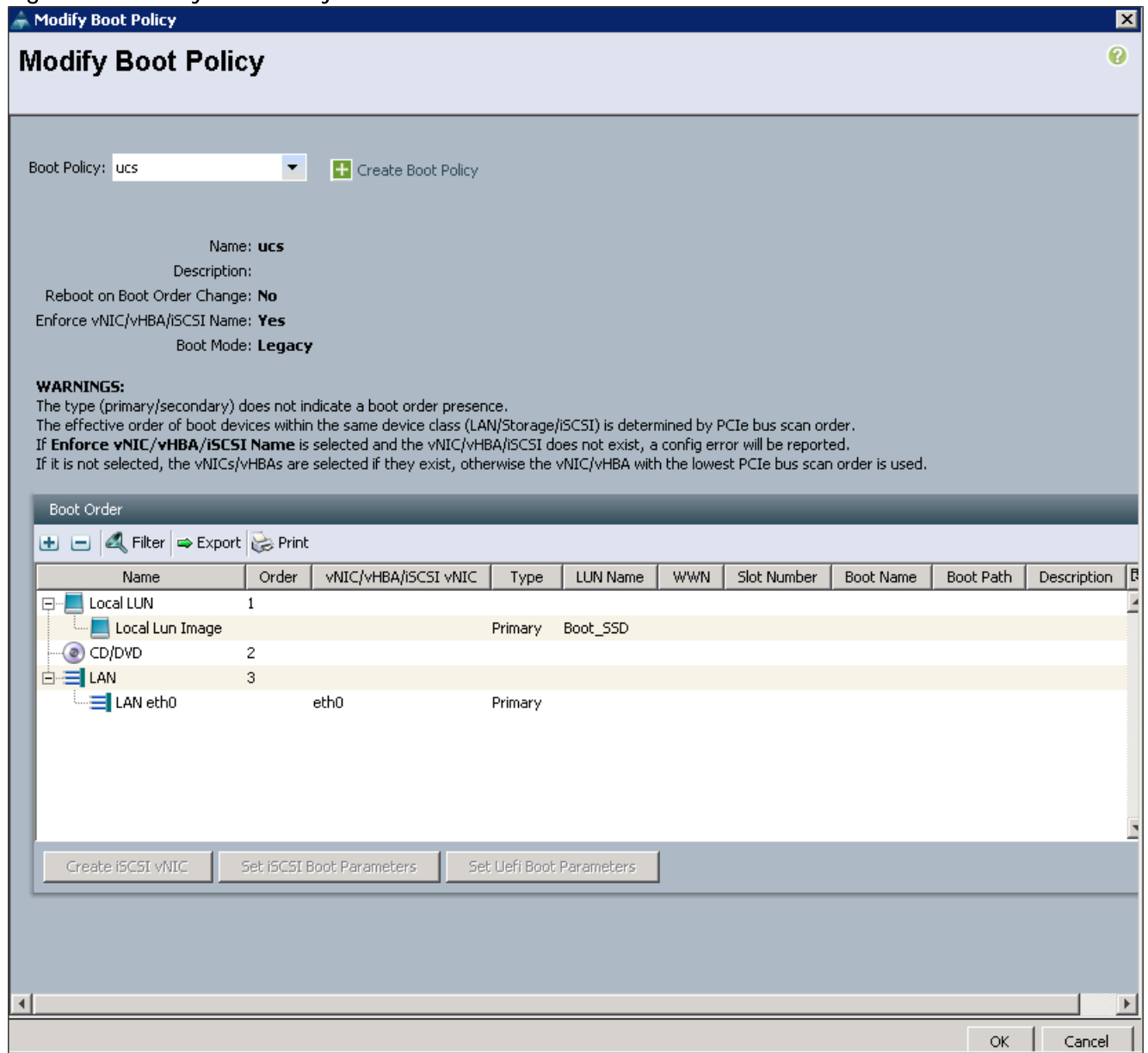


Configuring Server Boot Order for the Template

To set the boot order for the servers, complete the following steps:

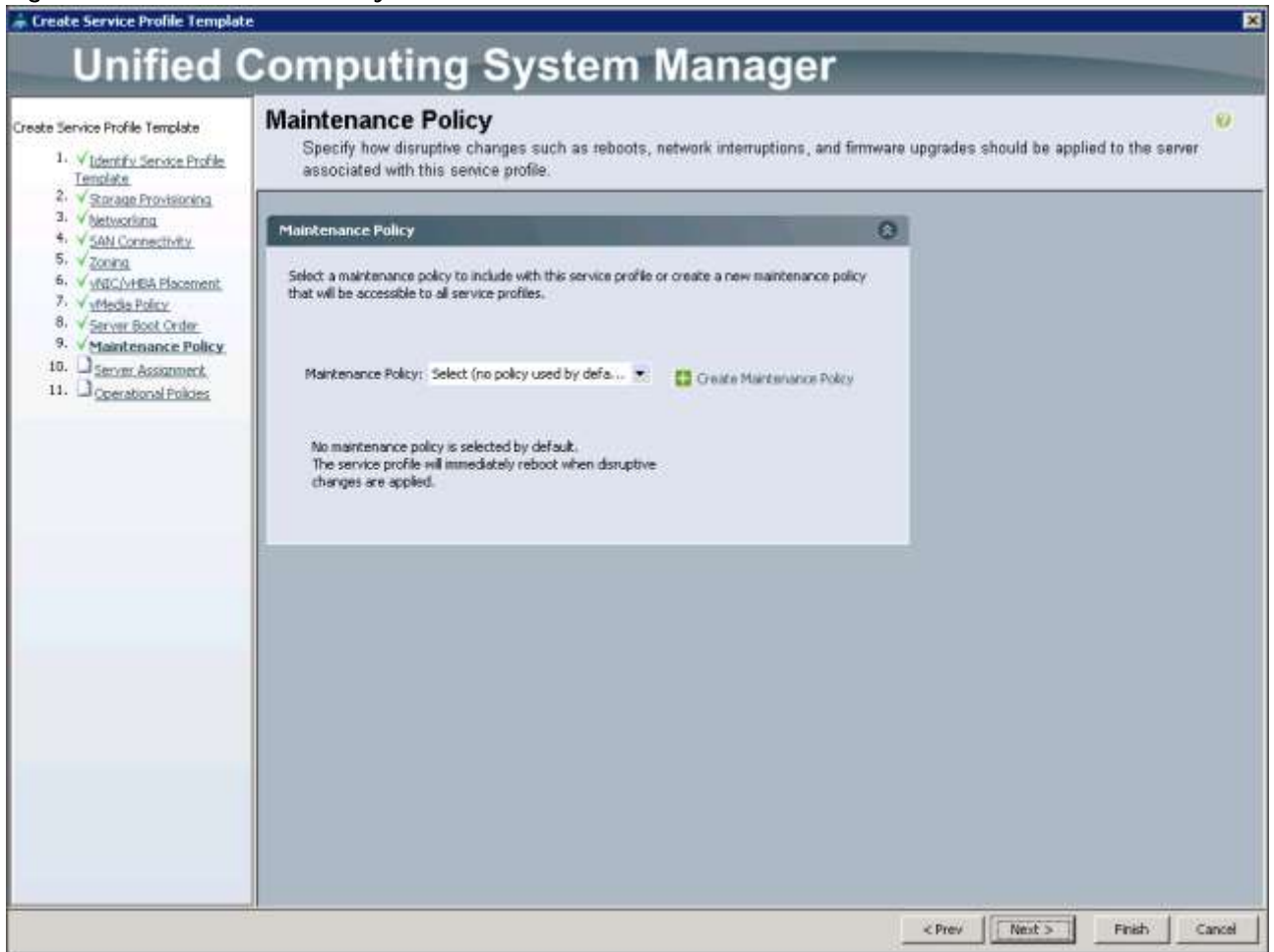
1. **Select ... in the Boot Policy name field. (Figure 67)**
2. **Review to make sure that all of the boot devices were created and identified.**
3. **Verify that the boot devices are in the correct boot sequence.**
4. **Click OK**
5. **Click Next to continue to the next section.**

Figure 67 Modify Boot Policy



6. In the Maintenance Policy window, apply the maintenance policy. (Figure 68)
7. Keep the Maintenance policy at no policy used by default. Click **Next** to continue to the next section.

Figure 68 Maintenance Policy

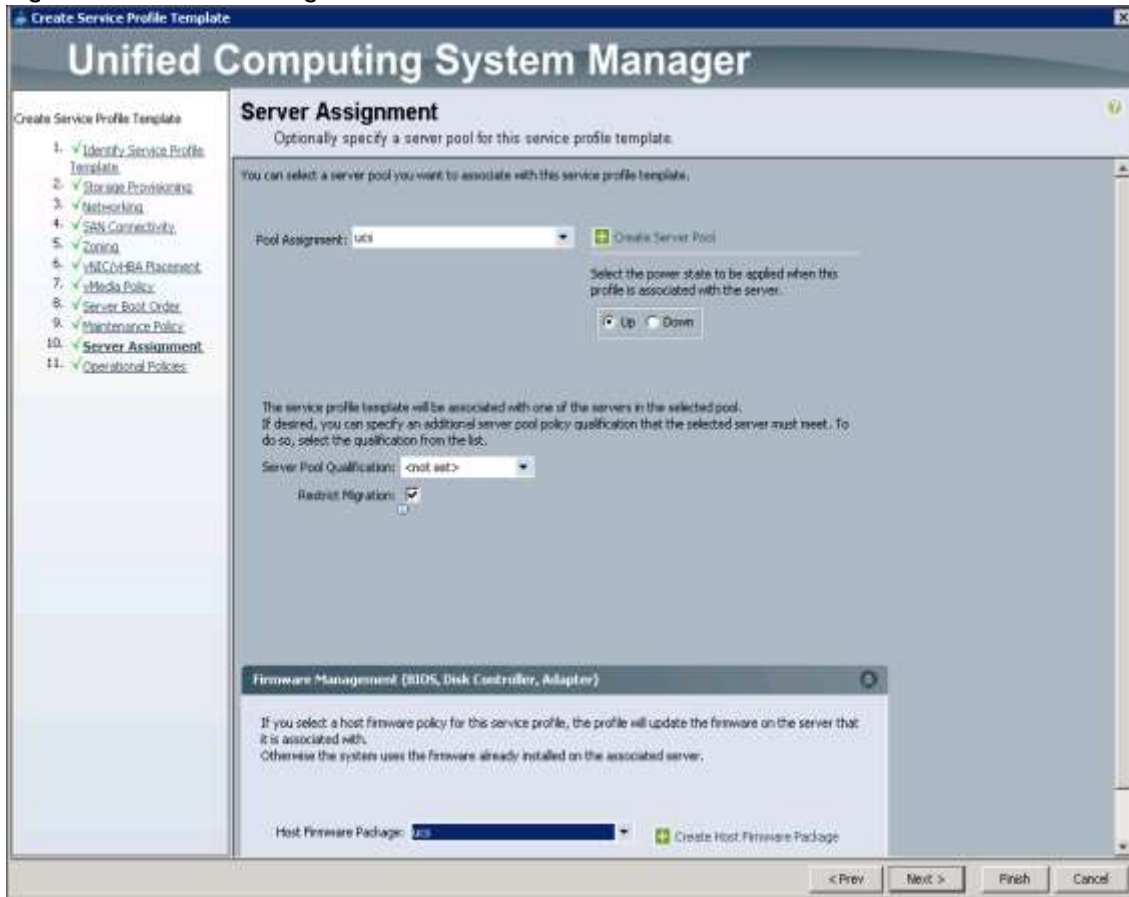


Configuring Server Assignment for the Template

In the Server Assignment window, to assign the servers to the pool, complete the following steps:

1. **Select ...:** for the Pool Assignment field. (Figure 69)
2. Select the power state to be up.
3. Keep the Server Pool Qualification field set to <not set>.
4. Check the Restrict Migration check box.
5. Select ucs in Host Firmware Package.

Figure 69 Server Assignment

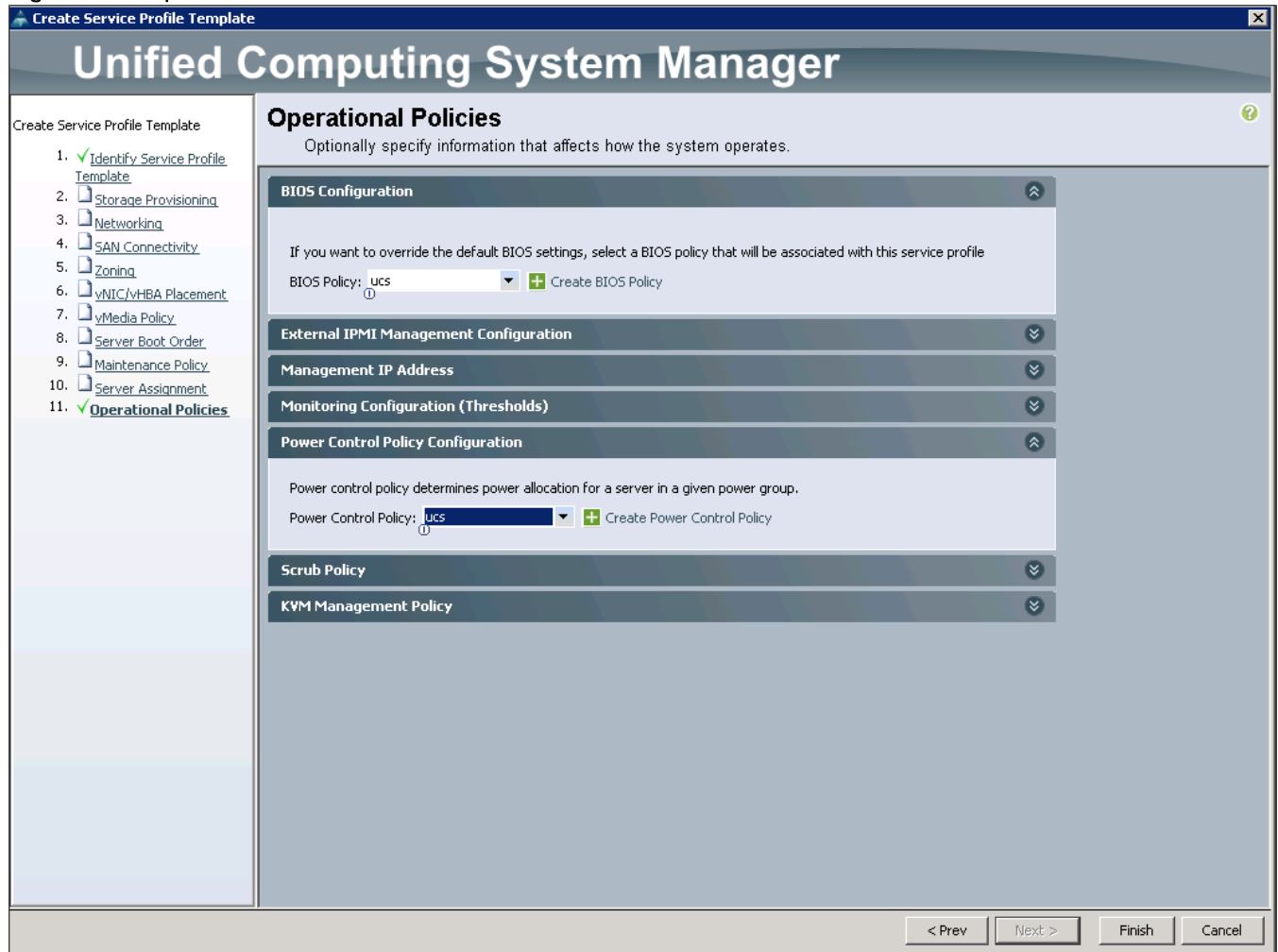


Configuring Operational Policies for the Template

In the Operational Policies Window (Figure 70), complete the following steps:

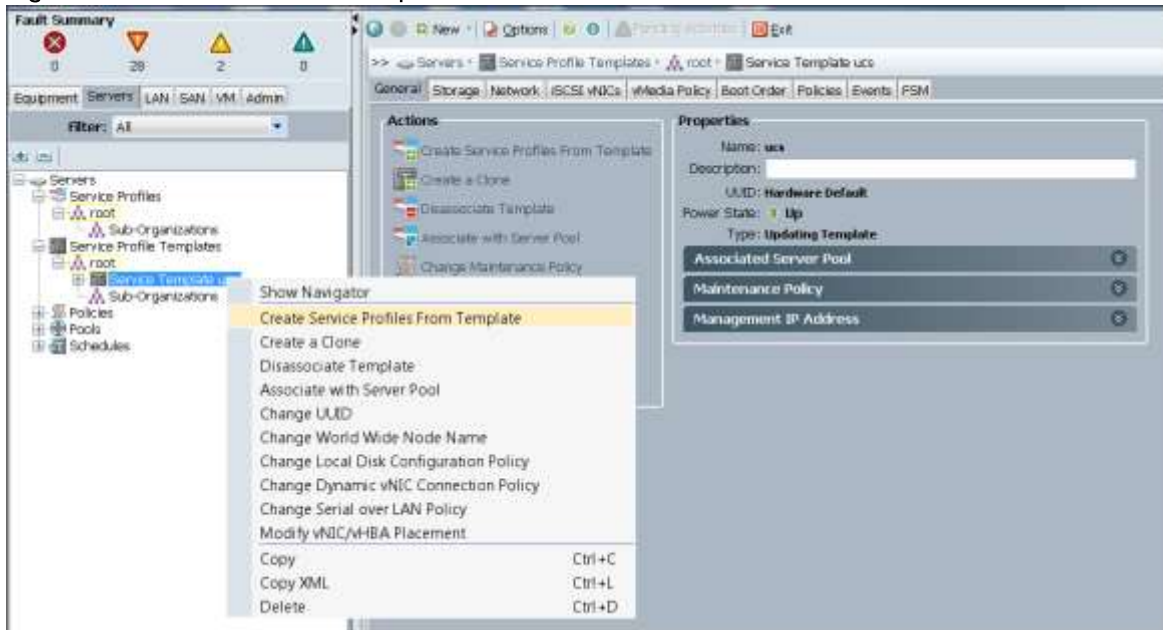
1. Select `..:..` in the BIOS Policy field.
2. Select `..:..` in the Power Control Policy field.

Figure 70 Operational Policies



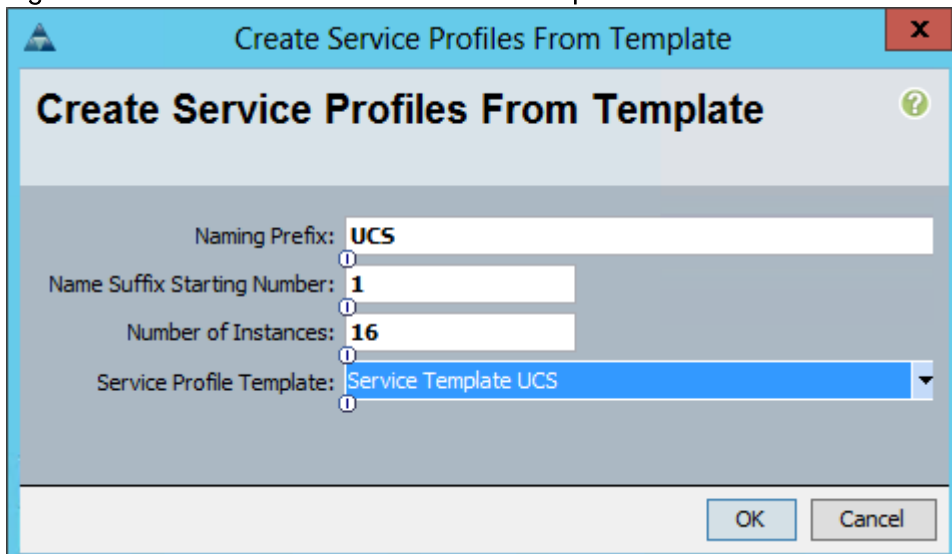
3. Click **Finish** to create the Service Profile template.
4. Click **OK** in the pop-up window to proceed.
5. Select the **Servers** tab in the left pane of the UCS Manager GUI. (Figure 71)
6. Go to **Service Profile Templates > root**.
7. Right-click **Service Profile Templates ucs**.
8. Select **Create Service Profiles From Template**.

Figure 71 Service Profile Templates



The Create Service Profiles from Template window appears. (Figure 72)

Figure 72 Create Service Profiles from Templates



9. Click OK.

Association of the Service Profiles will take place automatically.

The final Cisco UCS Manager window is shown in Figure 73 below.

Figure 73 UCS Manager Server Setup

Name	Chassis ID	PID	Model	User Label	Cores	Cores Enabled	Memory	Adapters	NICs	HBAs	Overall Status	Operability	Power State	Assoc
Server 1	1	UCSC-C3K-M45R8	Cisco UCS C360PH		28	28	262144	1	6	0	OK	Operable	On	Ass
Server 2	1	UCSC-C3K-M45R8	Cisco UCS C360PH		28	28	262144	1	6	0	OK	Operable	On	Ass
Server 1	2	UCSC-C3K-M45R8	Cisco UCS C360PH		28	28	262144	1	6	0	OK	Operable	On	Ass
Server 2	2	UCSC-C3K-M45R8	Cisco UCS C360PH		28	28	262144	1	6	0	OK	Operable	On	Ass
Server 1	3	UCSC-C3K-M45R8	Cisco UCS C360PH		28	28	262144	1	6	0	OK	Operable	On	Ass
Server 2	3	UCSC-C3K-M45R8	Cisco UCS C360PH		28	28	262144	1	6	0	OK	Operable	On	Ass
Server 1	4	UCSC-C3K-M45R8	Cisco UCS C360PH		28	28	262144	1	6	0	OK	Operable	On	Ass
Server 2	4	UCSC-C3K-M45R8	Cisco UCS C360PH		28	28	262144	1	6	0	OK	Operable	On	Ass

Creating Service Profile Templates for Hadoop Management Nodes

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.

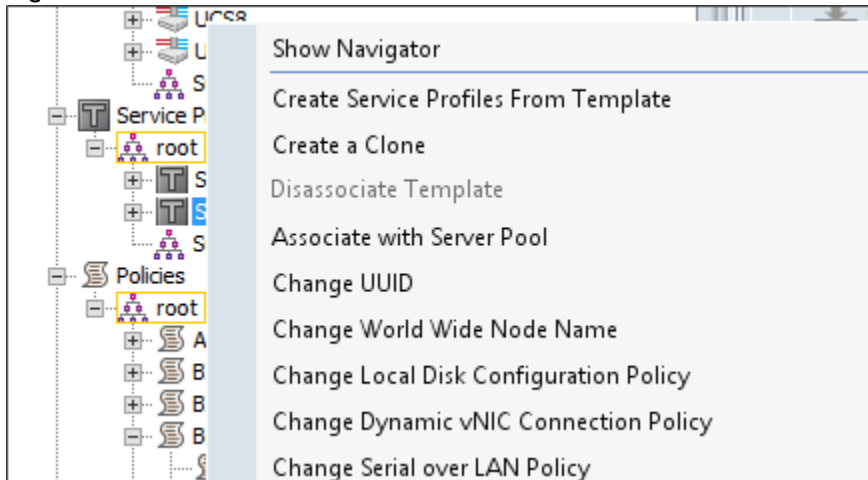
To configure an organization within the Cisco UCS Manager GUI, complete the following steps:

1. Click on Servers tab, go to Service Profile Template → root.
2. Right click on root and select Create Organization from the options.
3. Enter UCS-C240 as the name for the organization.
4. Click Ok.

Cloning the Template for Hadoop Management Nodes

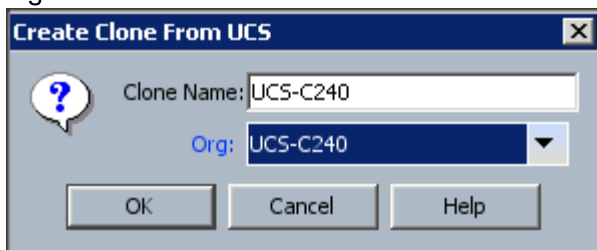
5. Click on Servers tab, go to Service Profile Template → root.
6. Right click on the existing template UCS and click Create a Clone. (Figure 74)

Figure 74 Create a Clone



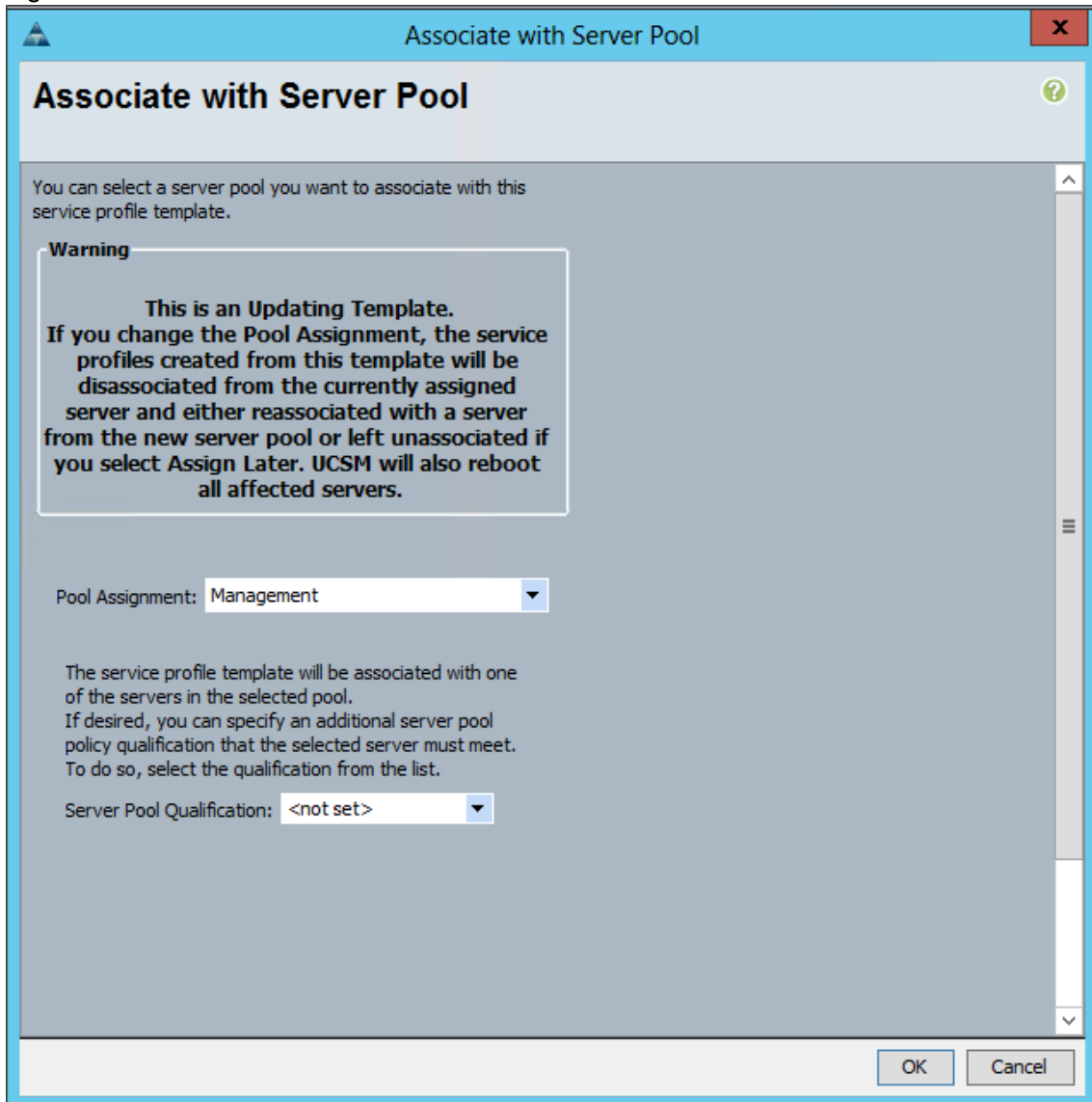
7. In the Clone Name, enter UCS-C240 and from the Org drop down list choose UCS-C240 and click OK. (Figure 75)

Figure 75 Create a Clone



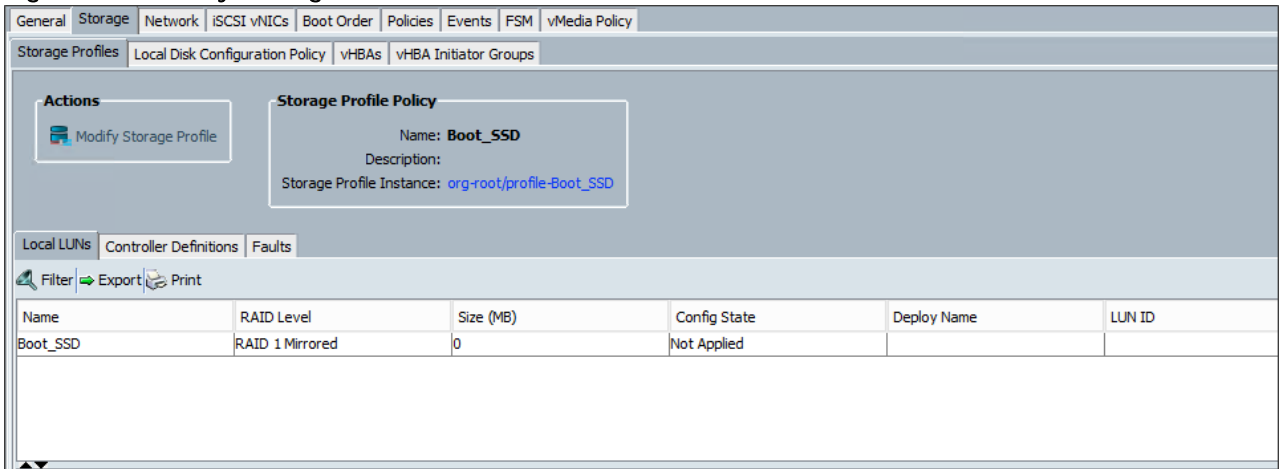
8. Go to root → Sub-Organization → UCS-C240 and select the Service Template UCS-C240.
9. In the right window general tab click Associate with Server pool. (Figure 76)
10. In the Pool Assignment drop down list choose Management and click OK.

Figure 76 Associate with Server Pool



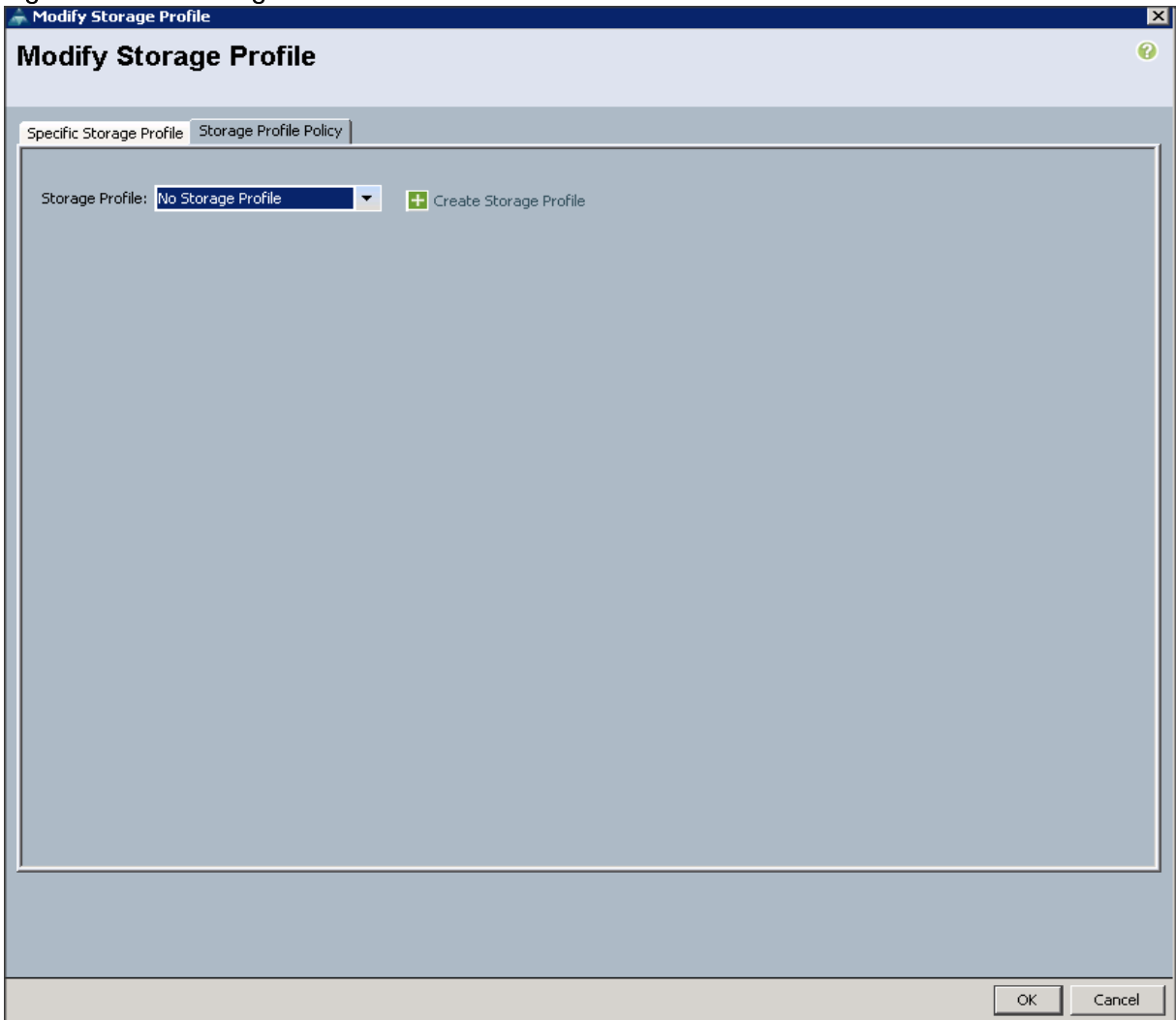
11. In the right window select the Storage tab and click Modify Storage Profile. (Figure 77)

Figure 77 Modify Storage Profile



12. From the Storage profile drop down list choose No Storage Profile and click OK. (Figure 78)

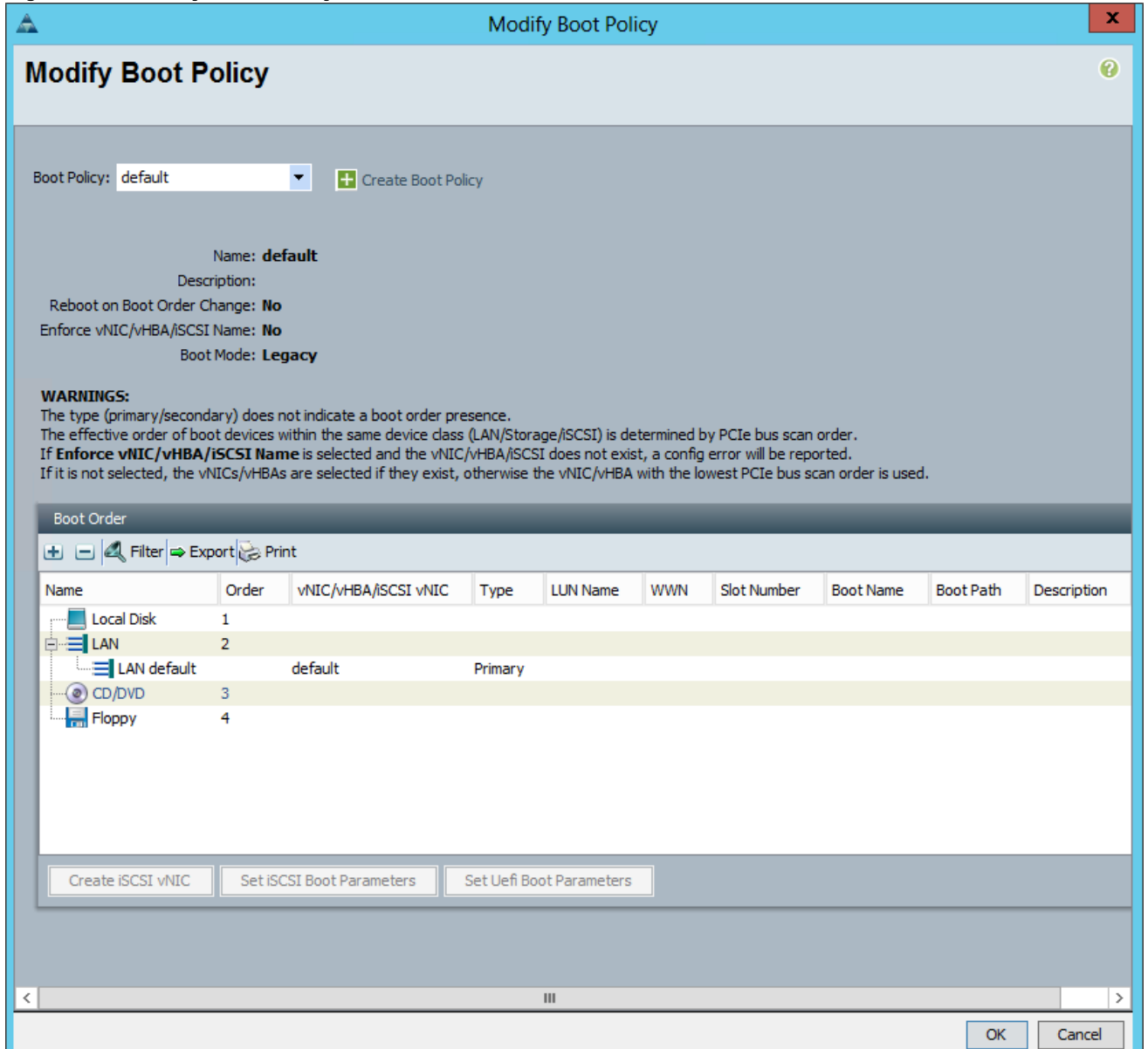
Figure 78 No Storage Profile



13. Select the Boot Order tab and click Modify Boot Policy.

14. From the Boot Policy drop down list choose Default and click OK. (Figure 79)

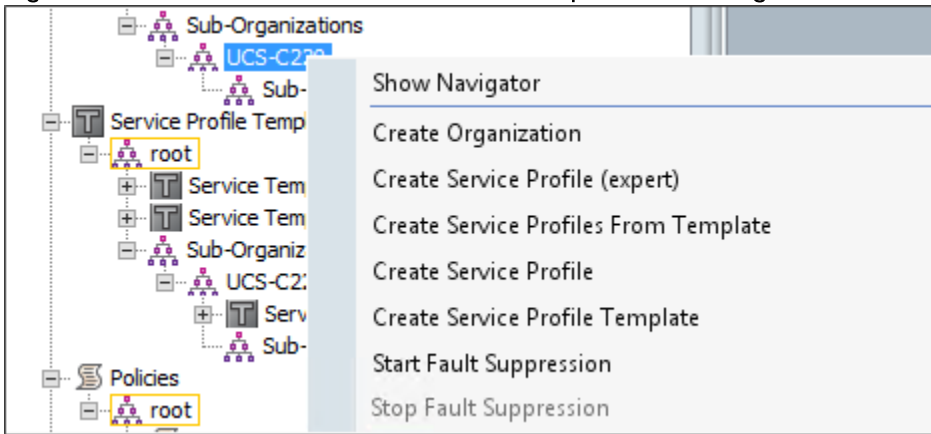
Figure 79 Modify Boot Policy



Creating Service Profile from Template

1. Go to Servers → Service Profiles → root → Sub-Organization → UCS-C240.
2. Right click and select Create Service Profiles from Template. (Figure 80)

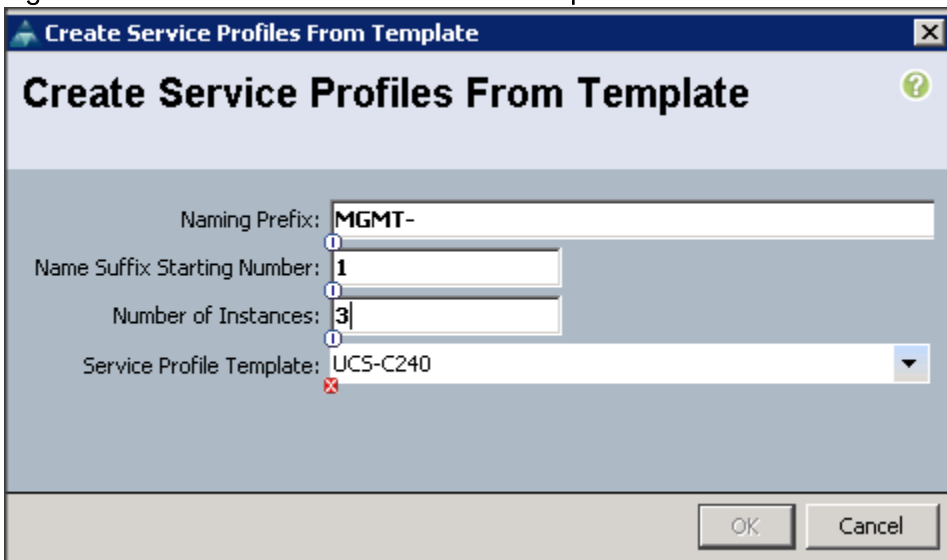
Figure 80 Create Service Profiles from Template for Management nodes



In the Create Service Profiles from Template screen: (Figure 81)

- Naming Prefix enter MGMT-
- Name Suffix Starting Number 1
- Number of Instances 3
- Service Profile Template UCS-C240 and click OK.

Figure 81 Create Service Profiles from Template



The service profile will be applied to the three Management UCS-C240 M4 Rack Server nodes.

Installing Red Hat Enterprise Linux 7.2

The following section provides detailed procedures for installing Red Hat Enterprise Linux 7.2 using Software RAID (OS based Mirroring) on Cisco UCS C240 M4 Rack Servers. There are multiple ways to install the Red Hat Linux operating system. The installation procedure described in this deployment guide uses KVM console and virtual media from Cisco UCS Manager.



Note: This requires RHEL 7.2 DVD/ISO for the installation.

Installing Red Hat Enterprise Linux 7.2 on Management Nodes

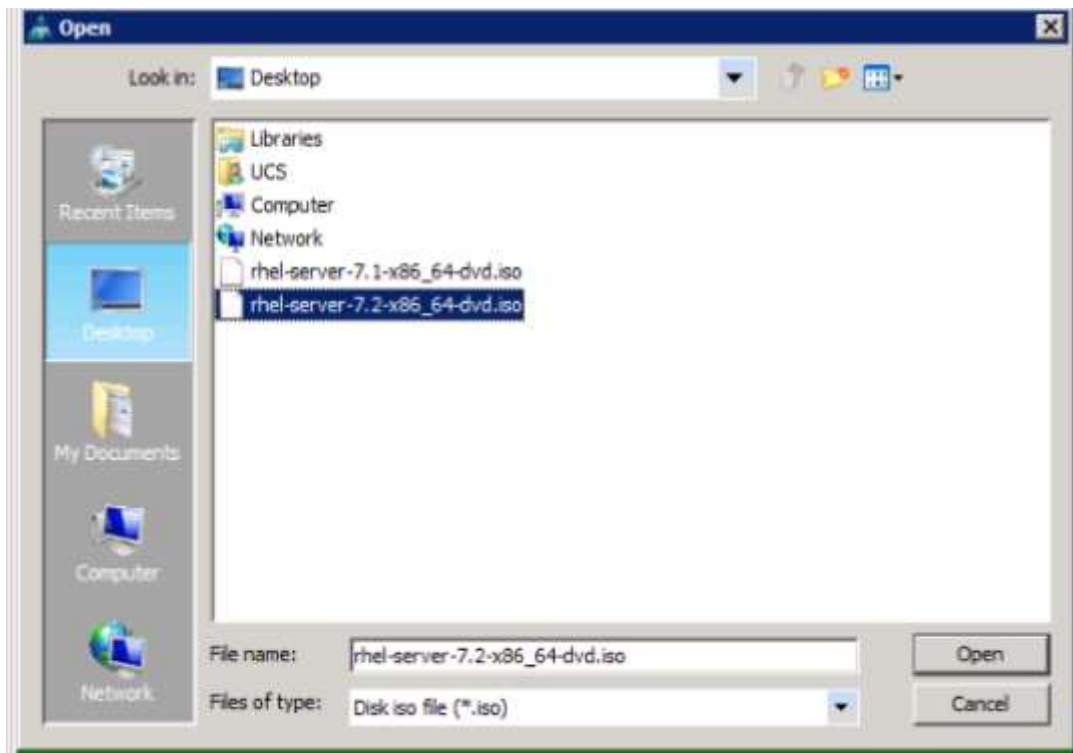
To install the Red Hat Linux 7.2 operating system, complete the following steps:

1. Log in to the Cisco UCS 6332 Fabric Interconnect and launch the Cisco UCS Manager application.
2. Select the **Equipment** tab as shown in Figure 82
3. In the navigation pane expand **Rack-Mounts** and then **Servers**
4. Right click on the server and select **KVM Console**
5. In the KVM window, select the **Virtual Media** tab.

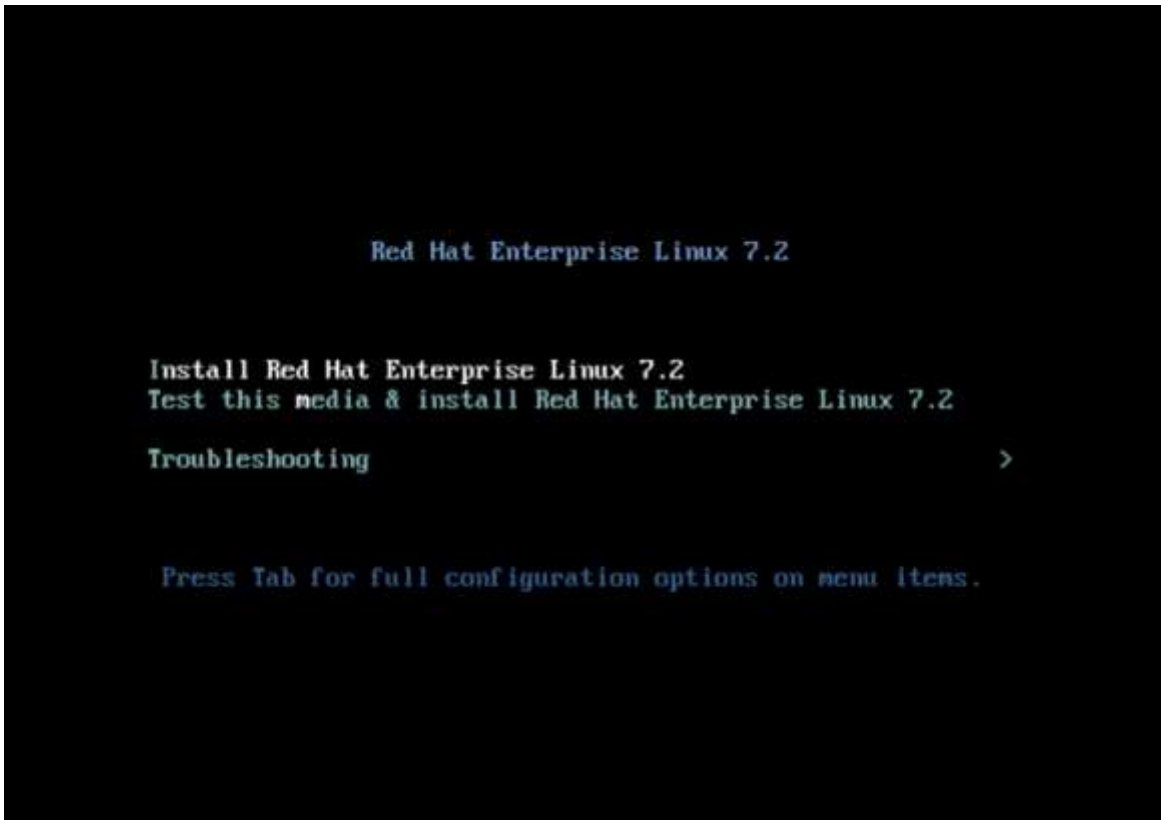
Figure 82 KVM Console



6. Click the **Activate Virtual Devices** found in the **Virtual Media** tab. (Figure 83)



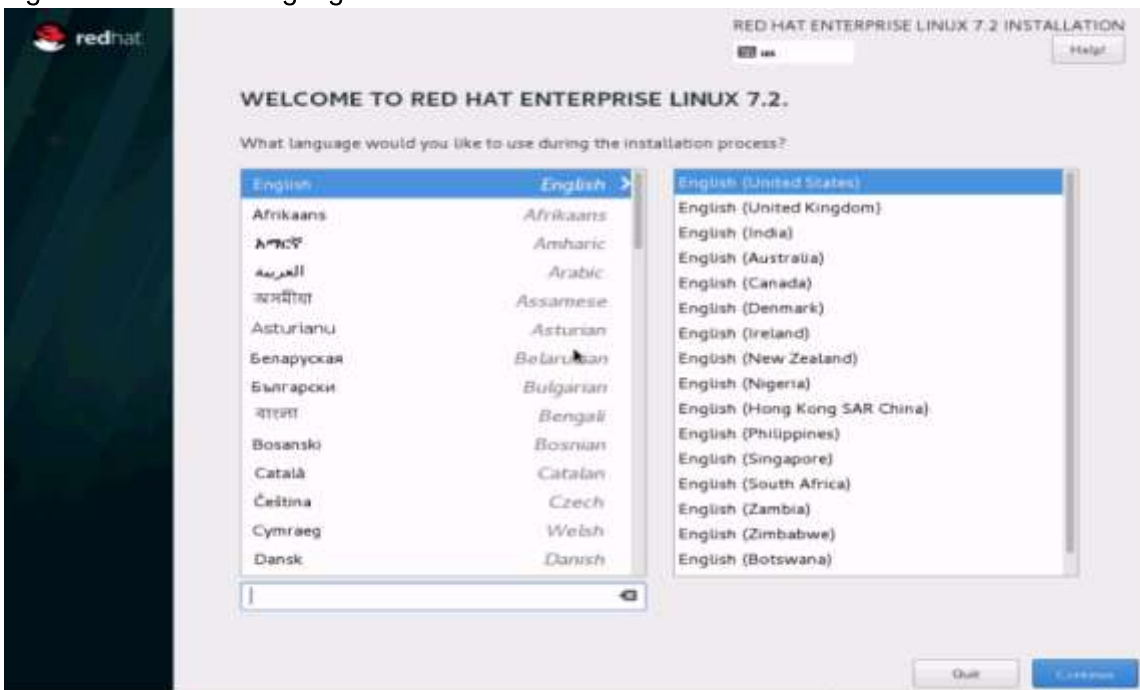
10. In the KVM window, select the KVM tab to monitor during boot.
11. In the KVM window, select the `Macros > Static Macros > Ctrl-Alt-Del` button in the upper left corner.
12. Click `OK`
13. Click `OK` to reboot the system.
14. On reboot, the machine detects the presence of the Red Hat Enterprise Linux Server 7.2 install media.
15. Select the Install or Upgrade an Existing System.



16. Skip the Media test and start the installation.

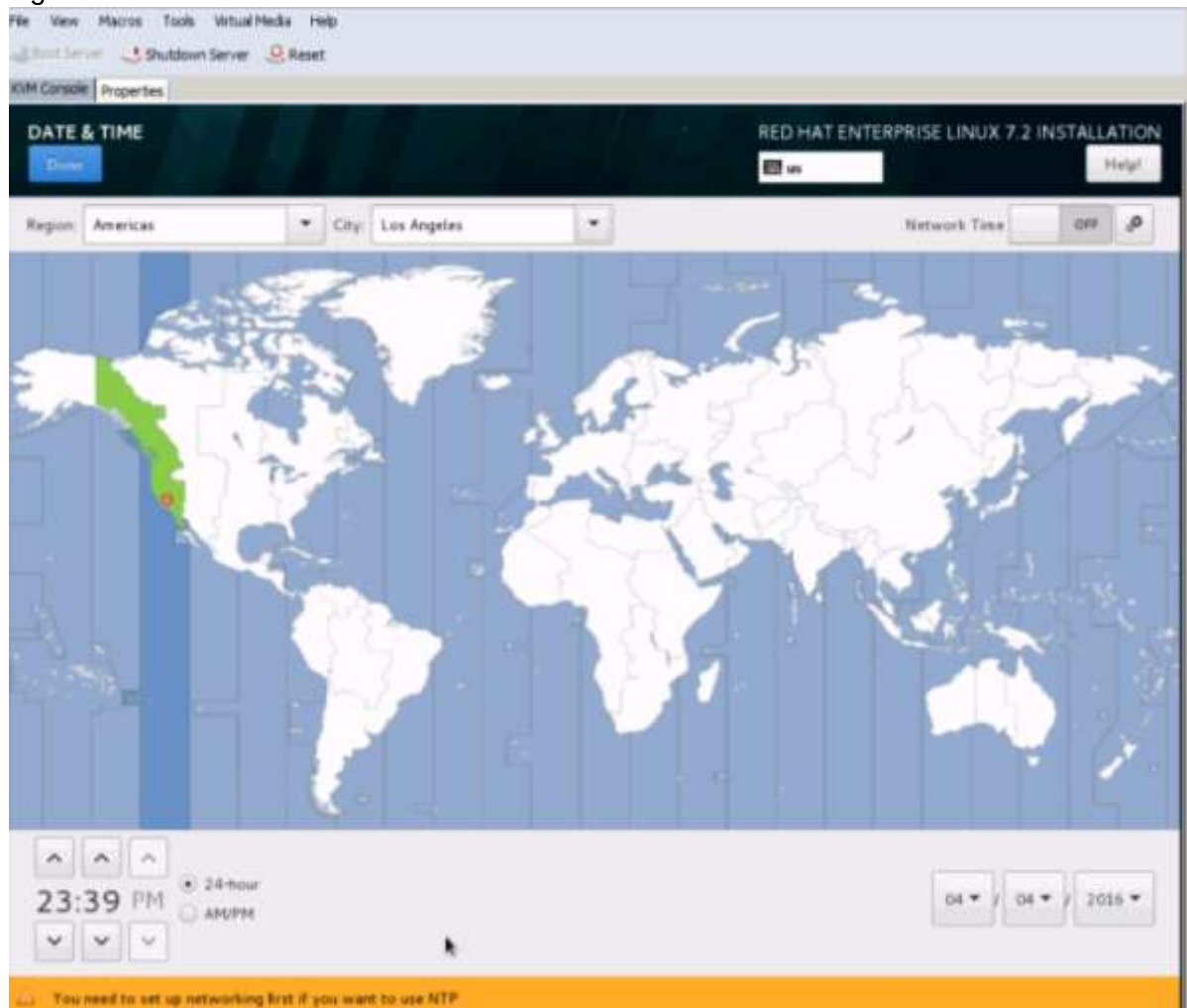
17. Select language of installation (Figure 85), and click Continue.

Figure 85 Select Language Window



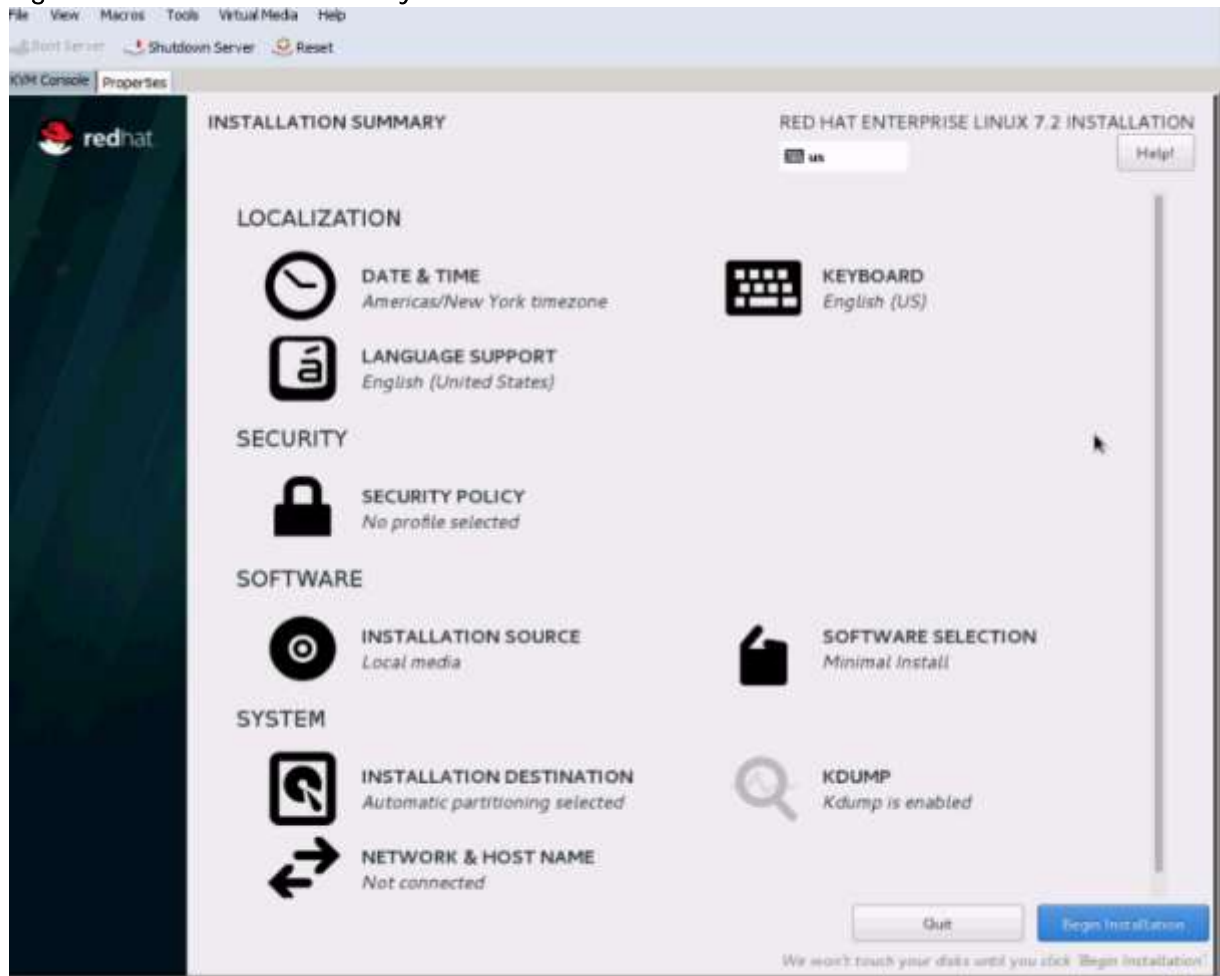
18. Select Date and time as shown in Figure 86

Figure 86 Date and Time Window



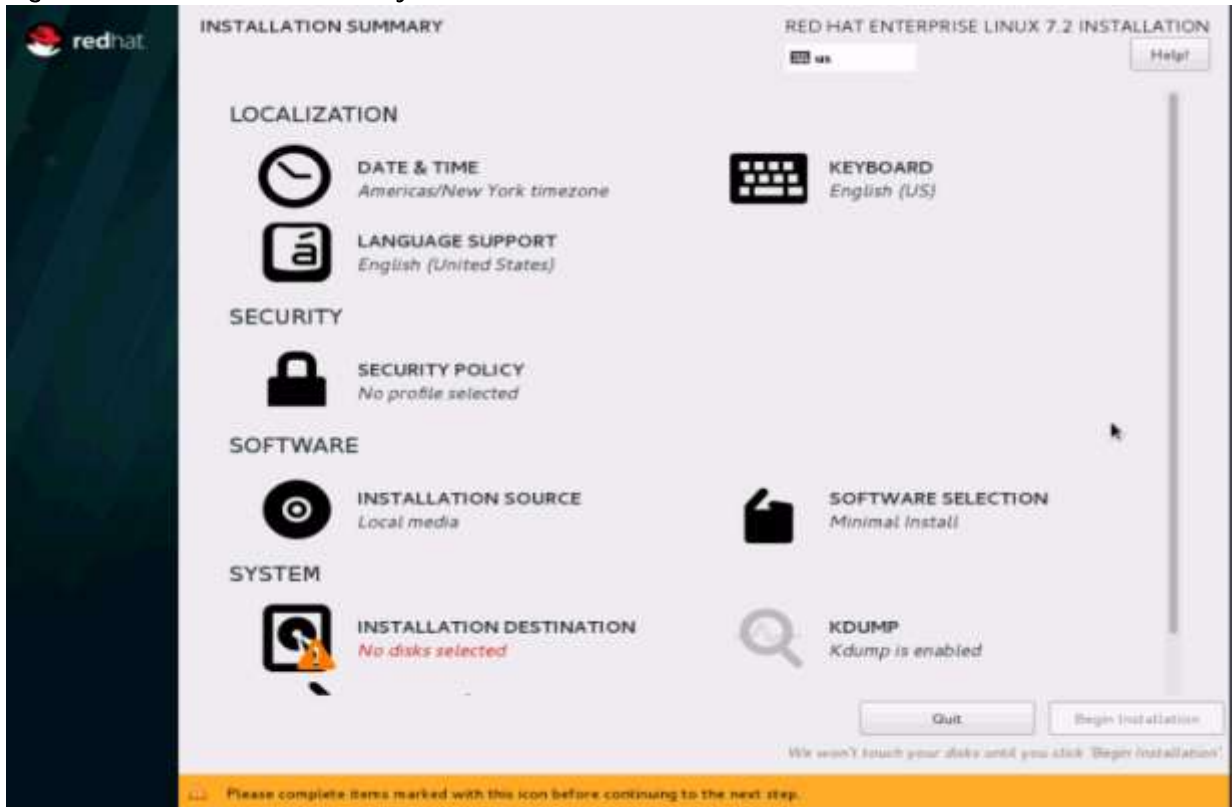
19. Select the location on the map, set the time and click Done:

Figure 87 Installation Summary Window



20. Click on Installation Destination, shown above in Figure 87

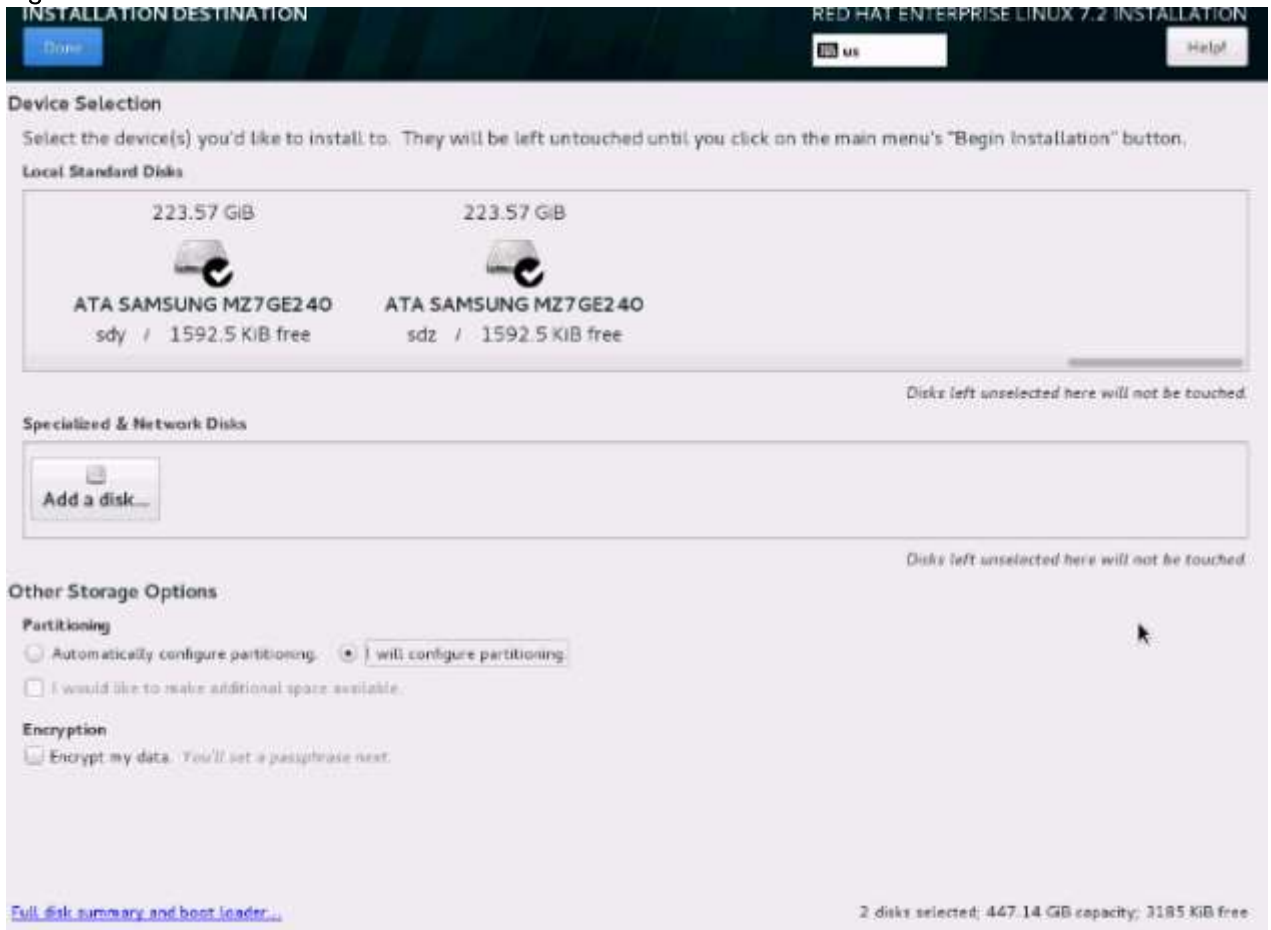
Figure 88 Installation Summary Window



A Caution symbol appears next to Installation Destination as shown in Figure 88 above.

21. This opens the Installation Destination window displaying the boot disks. This is shown in Figure 89 below.
22. Make the selection, and choose "I will configure partitioning." Click Done.

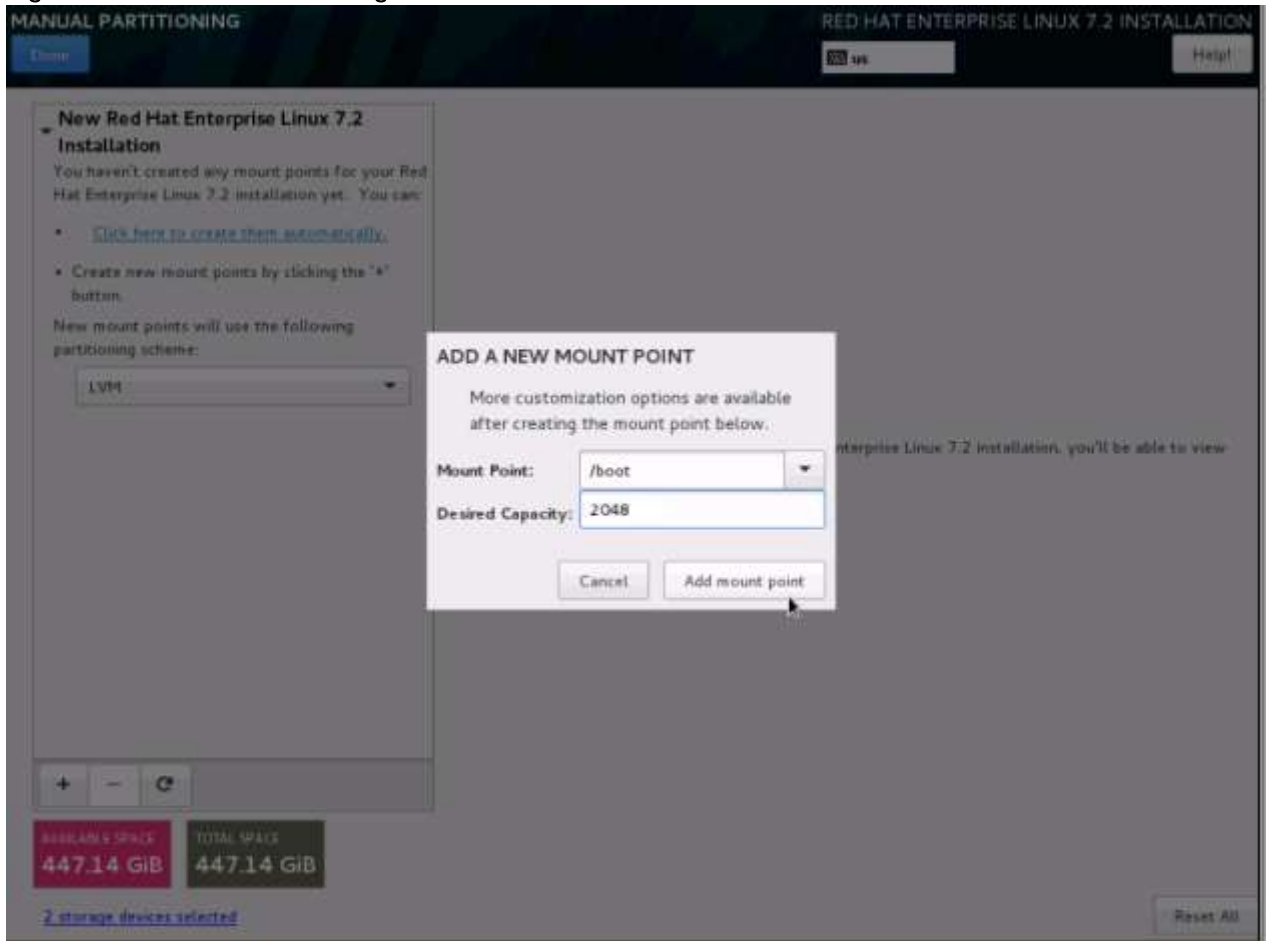
Figure 89 Installation Destination Window



This opens the new window for creating the partitions, as shown in Figure 90.

23. Click on the + sign to add a new partition as shown below, boot partition of size 2048 MB.

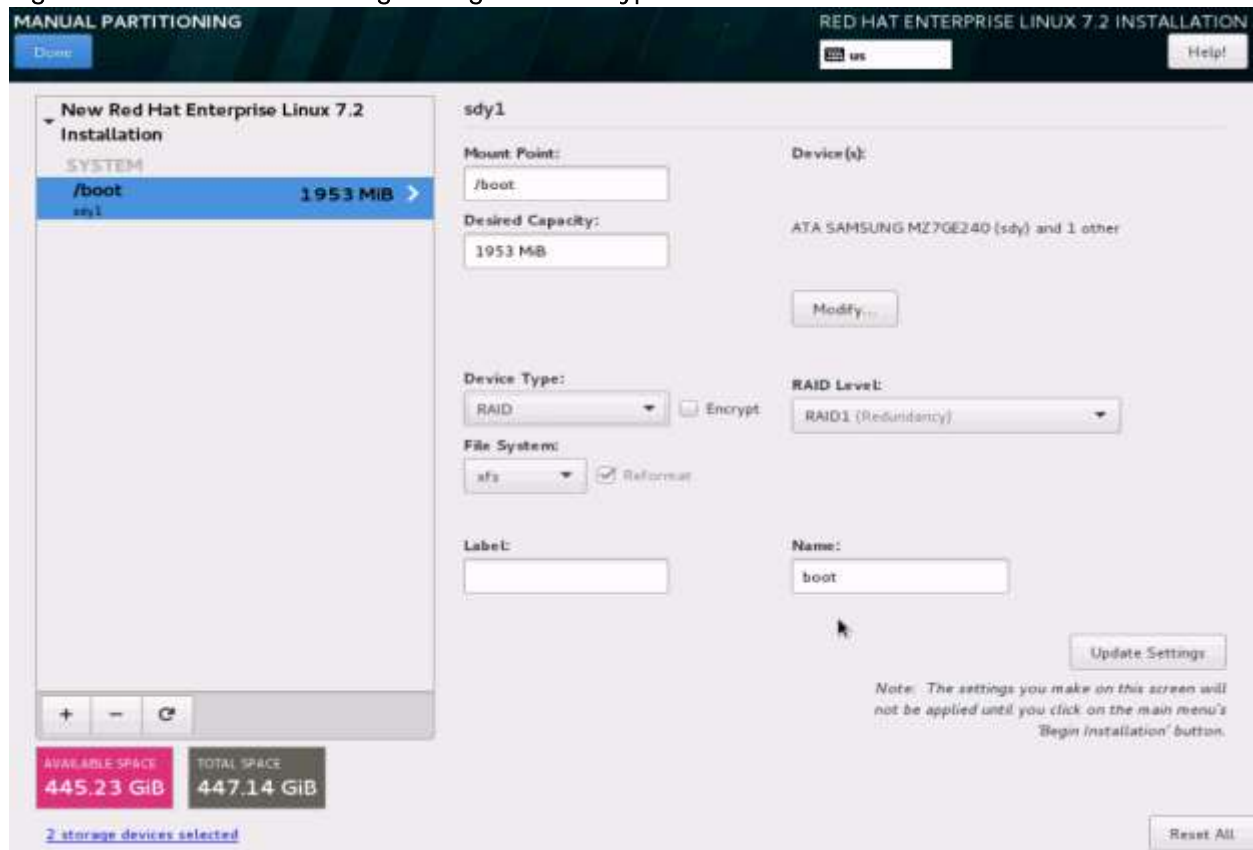
Figure 90 Manual Partitioning



24. Click Add Mount Point to add the partition.

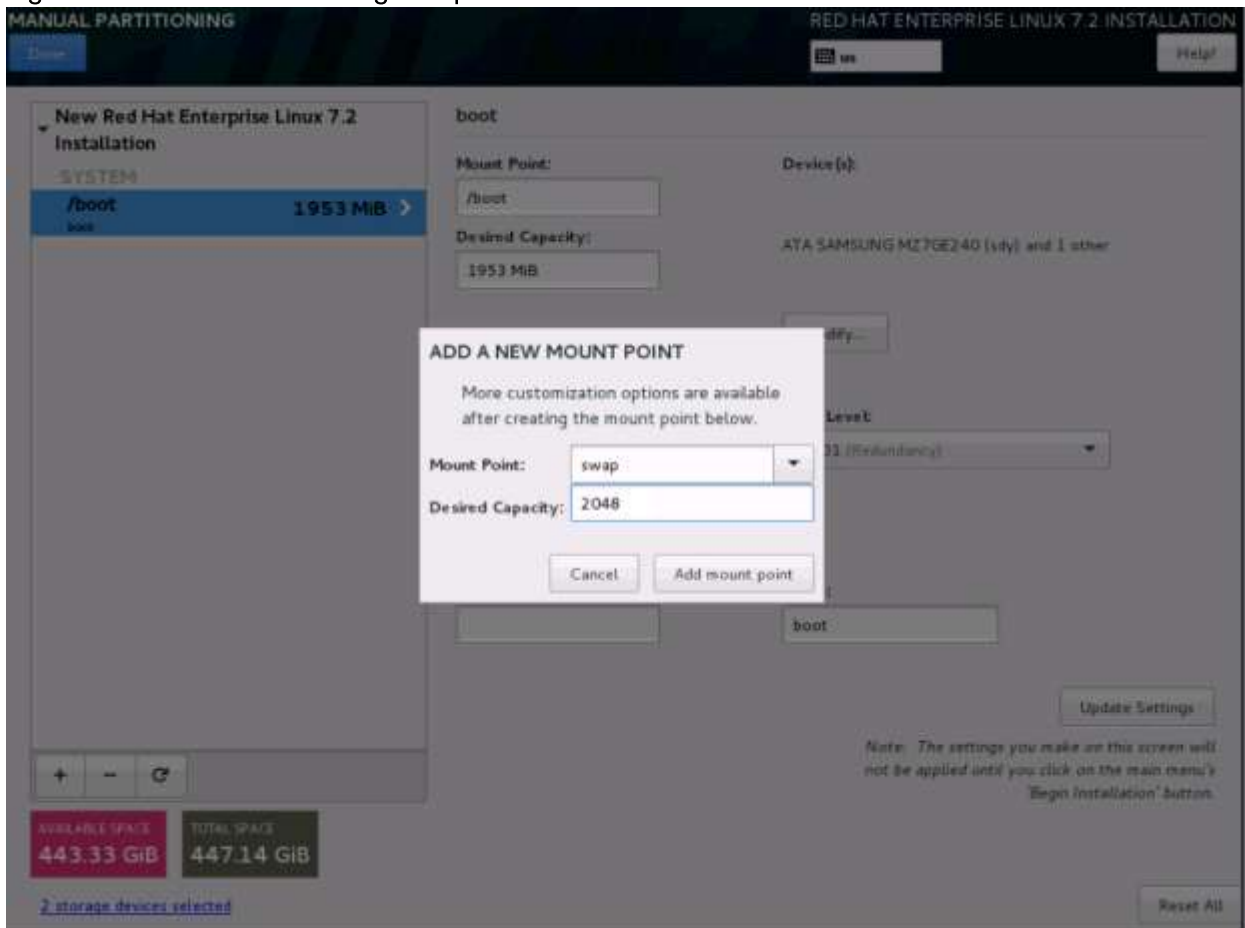
The screen refreshes to show the added Mount Point (Figure 91).

Figure 91 Manual Partitioning/Change Device Type



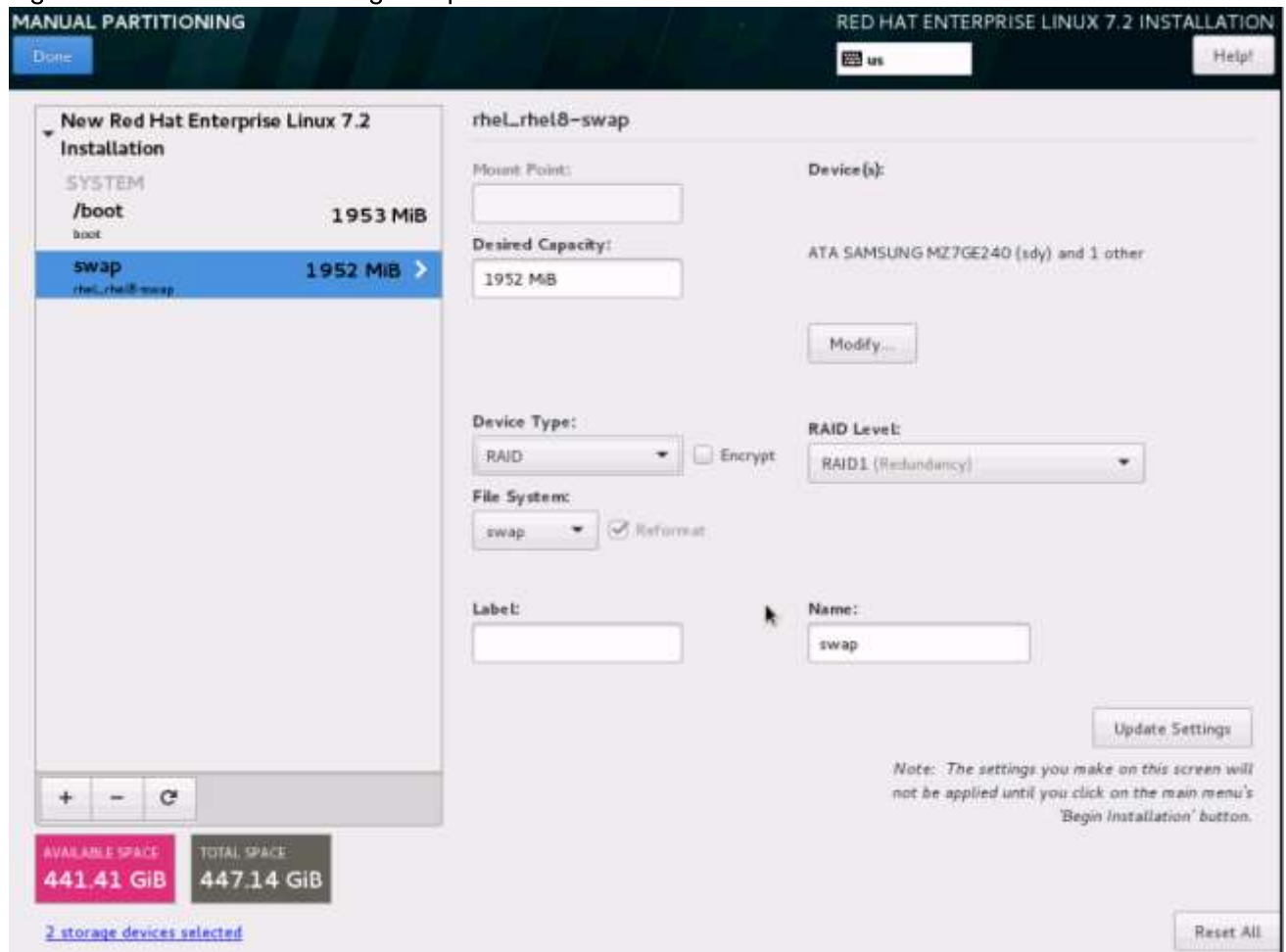
25. Change the Device type to RAID and make sure the RAID Level is RAID1 (Redundancy).
26. Click on Update Settings to save the changes.
27. Click on the + sign to create the swap partition of size 2048 MB as shown in Figure 92 below.

Figure 92 Manual Partitioning/Swap



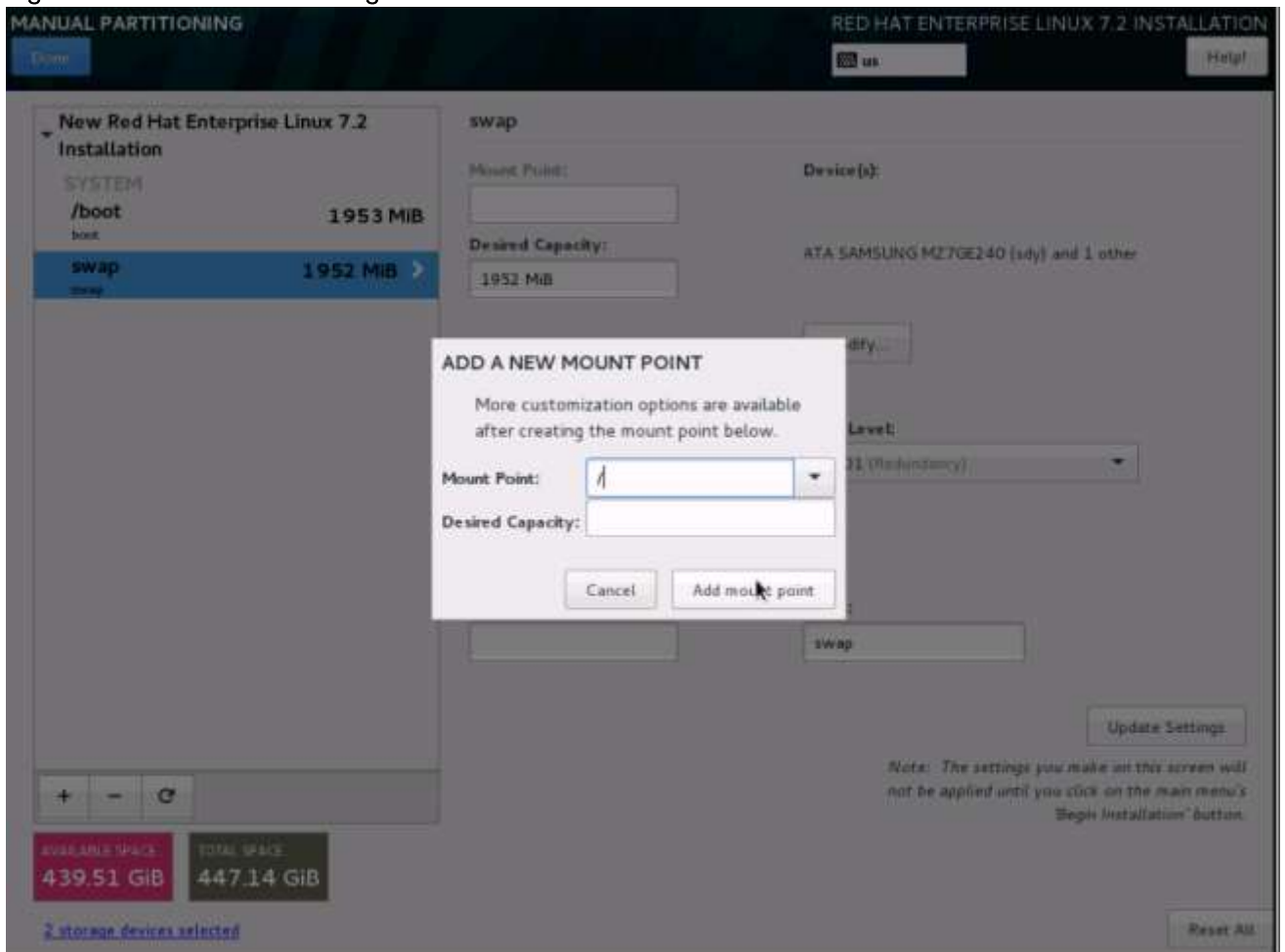
28. Change the Device type to RAID and RAID level to RAID1 (Redundancy) and click on Update Settings.

Figure 93 Manual Partitioning/Swap



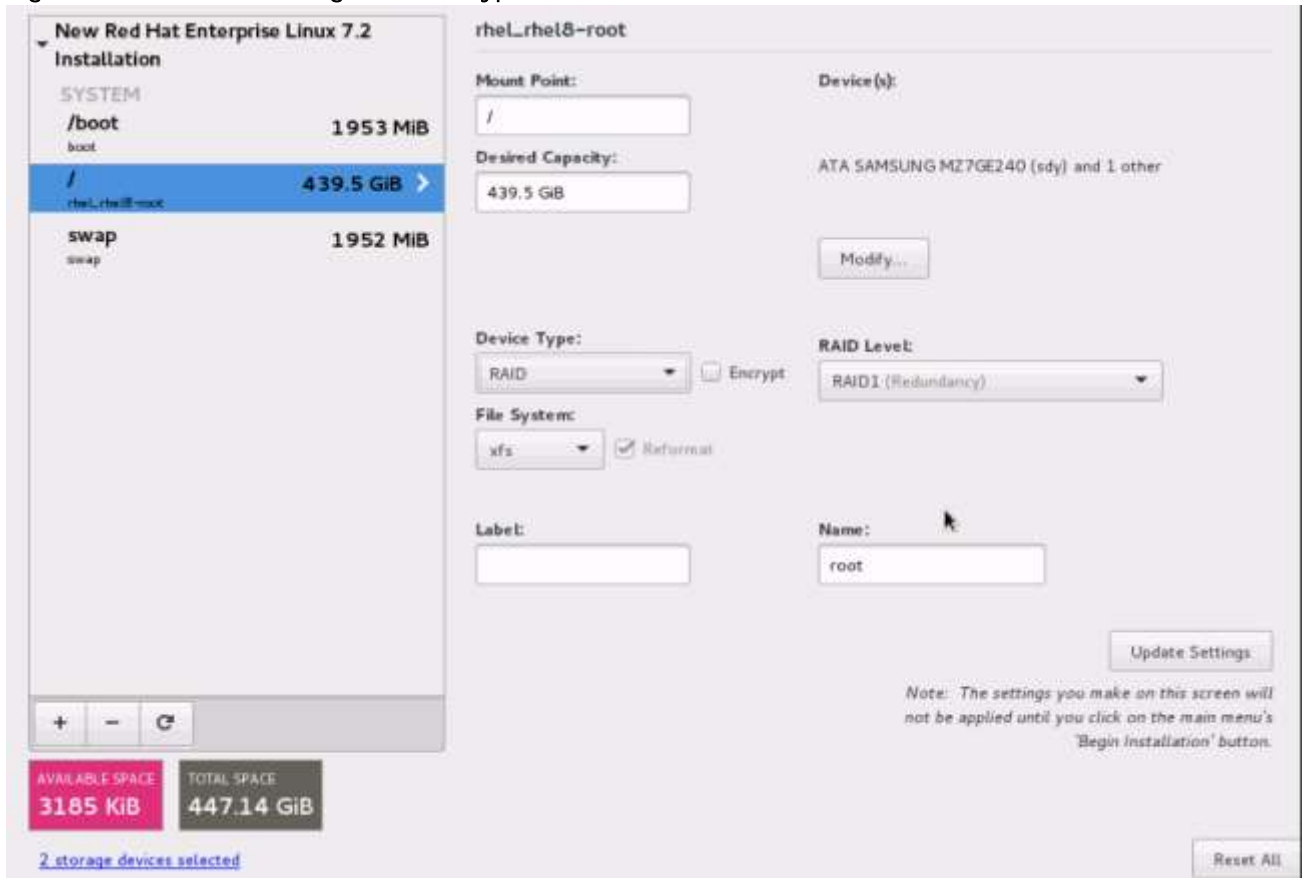
29. Click + to add the / partition. The size can be left empty so it uses the remaining capacity and click Add Mountpoint. (Figure 94).

Figure 94 Manual Partitioning/Add A New Mount Point



30. In the next window (Figure 95), change the Device type to RAID and RAID level to RAID1 (Redundancy). Click Update Settings.

Figure 95 Partition/Change Device Type to RAID



31. Click Done to go back to the main screen and continue the Installation.

The Installation screen opens (Figure 96).

32. Click on Software Selection.

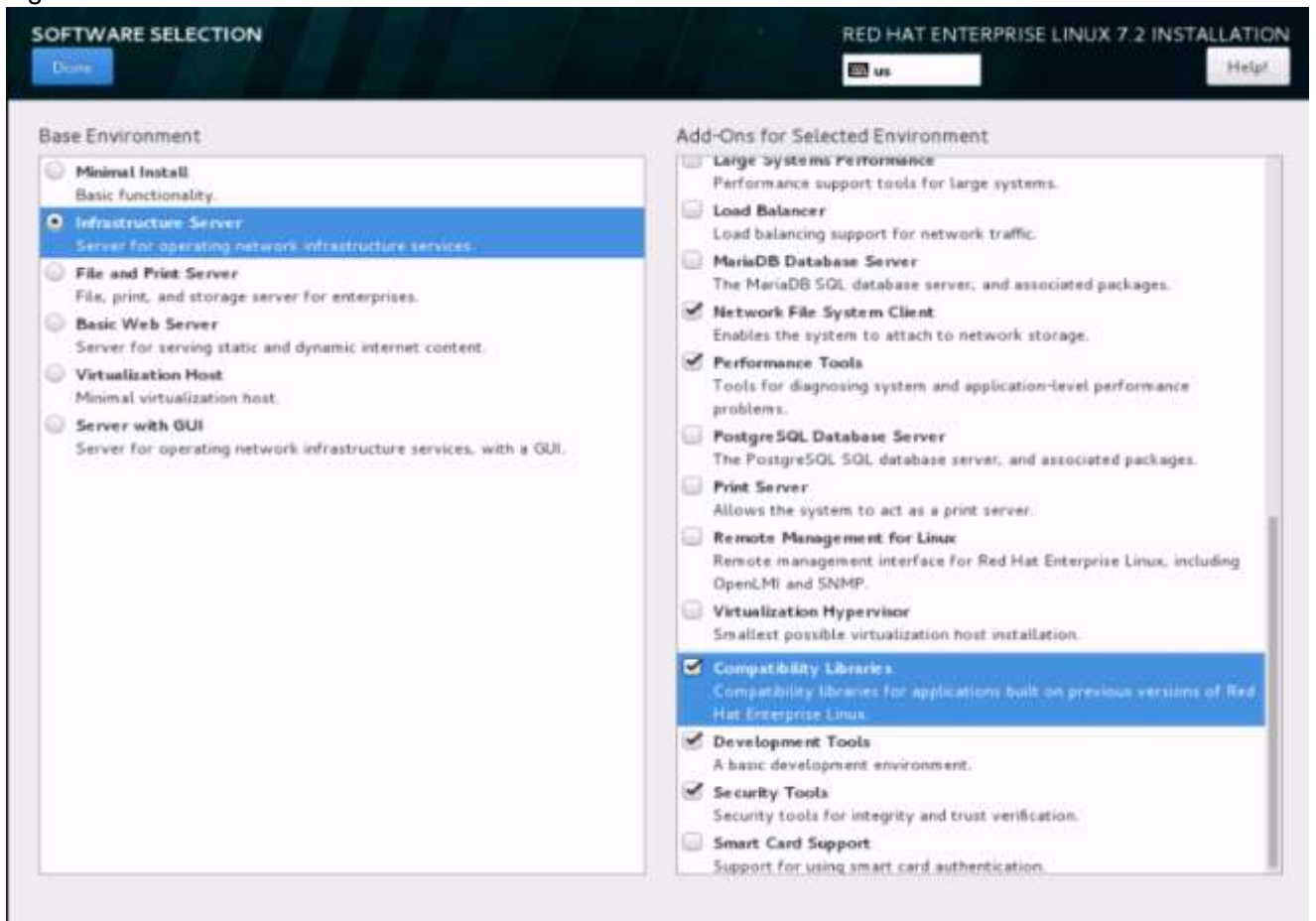
Figure 96 Installation Summary Window



The Software Selection screen opens (Figure 97).

33. Select Infrastructure Server and select the Add-Ons as noted below. Click Done.

Figure 97 Software Selection



The Installation Summary window returns (Figure 98).

34. Click on Network and Hostname.

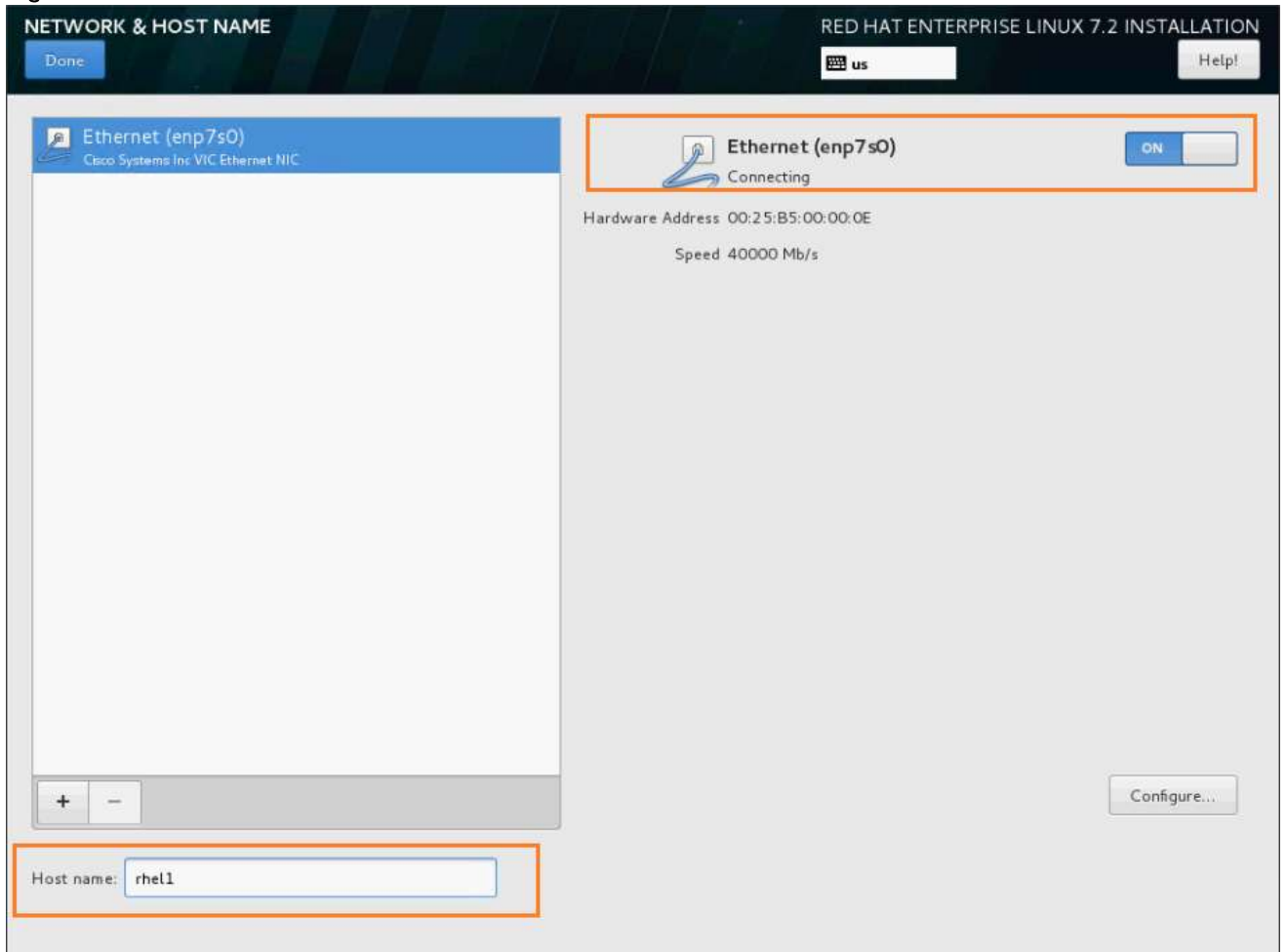
Figure 98 Network and Host Name Window



Configure Hostname and Networking for the Host.

35. Type in the hostname as shown below. (Figure 99)

Figure 99 Network and Host Name



36. Click on Configure to open the Network Connectivity window (Figure 100).
37. Click on IPV4Settings.

Figure 100 Network Connectivity Window

The screenshot shows a window titled "Editing enp7s0". At the top, there is a text field for "Connection name:" containing "enp7s0". Below this is a tabbed interface with tabs for "General", "Ethernet", "802.1x Security", "DCB", "IPv4 Settings" (which is selected and highlighted), and "IPv6 Settings". Under the "IPv4 Settings" tab, there is a "Method:" dropdown menu set to "Manual". Below the method menu is a section titled "Addresses" containing a table with three columns: "Address", "Netmask", and "Gateway". The table has one row highlighted in blue. To the right of the table are "Add" and "Delete" buttons. Below the table are three text input fields for "DNS servers:", "Search domains:", and "DHCP client ID:". There is a checkbox labeled "Require IPv4 addressing for this connection to complete" which is currently unchecked. At the bottom right of the "Addresses" section is a "Routes..." button. At the very bottom of the window are "Cancel" and "Save" buttons.

38. Change the Method to Manual and click Add. Figure 101 shows the Add Details pop up window.
39. Enter the IP Address, Netmask and Gateway details. Click Add after each addition.

Figure 101 Add IP Address, Netmask and Gateway Details

Editing enp7s0

Connection name: enp7s0

General Ethernet 802.1x Security DCB **IPv4 Settings** IPv6 Settings

Method: Manual

Addresses

Address	Netmask	Gateway	
172.16.46.11	24	172.16.46.1	Add
			Delete

DNS servers:

Search domains:

DHCP client ID:

Require IPv4 addressing for this connection to complete

Routes...

Cancel Save

40. Click Save.

41. Update the hostname and turn Ethernet ON. Click Done to return to the main menu.

The Installation Summary window opens (Figure 102).

42. Click Begin Installation in the main menu.

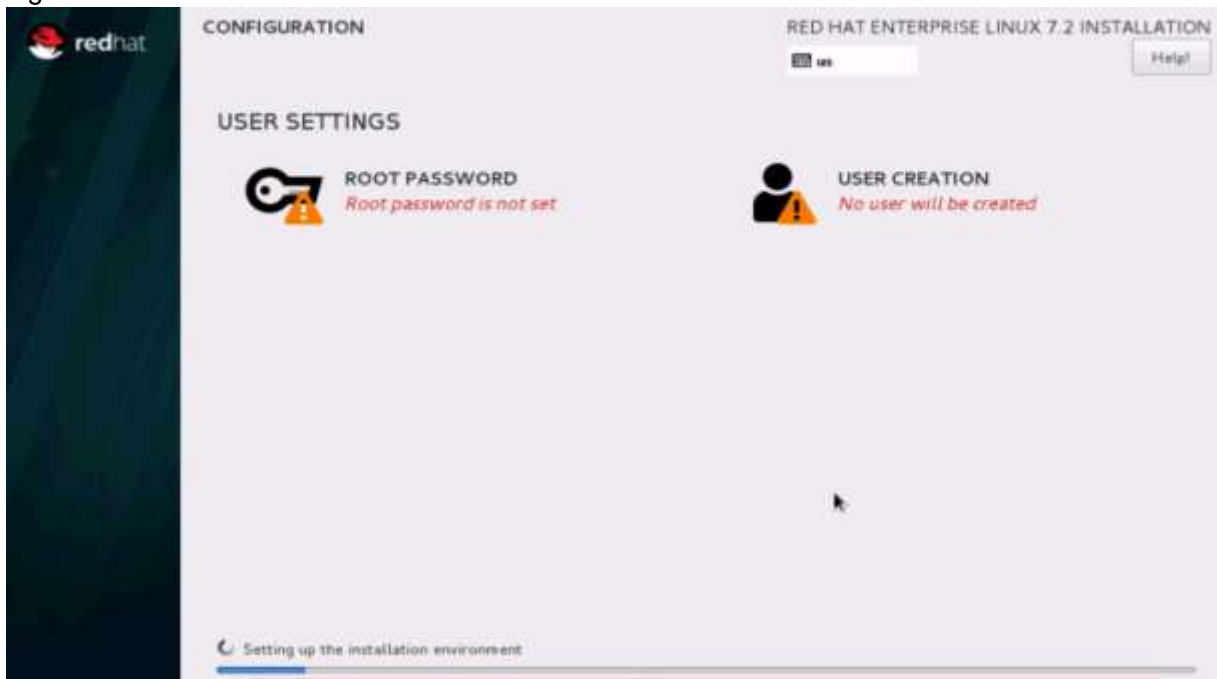
Figure 102 Installation Summary Window



A new window opens (Figure 103).

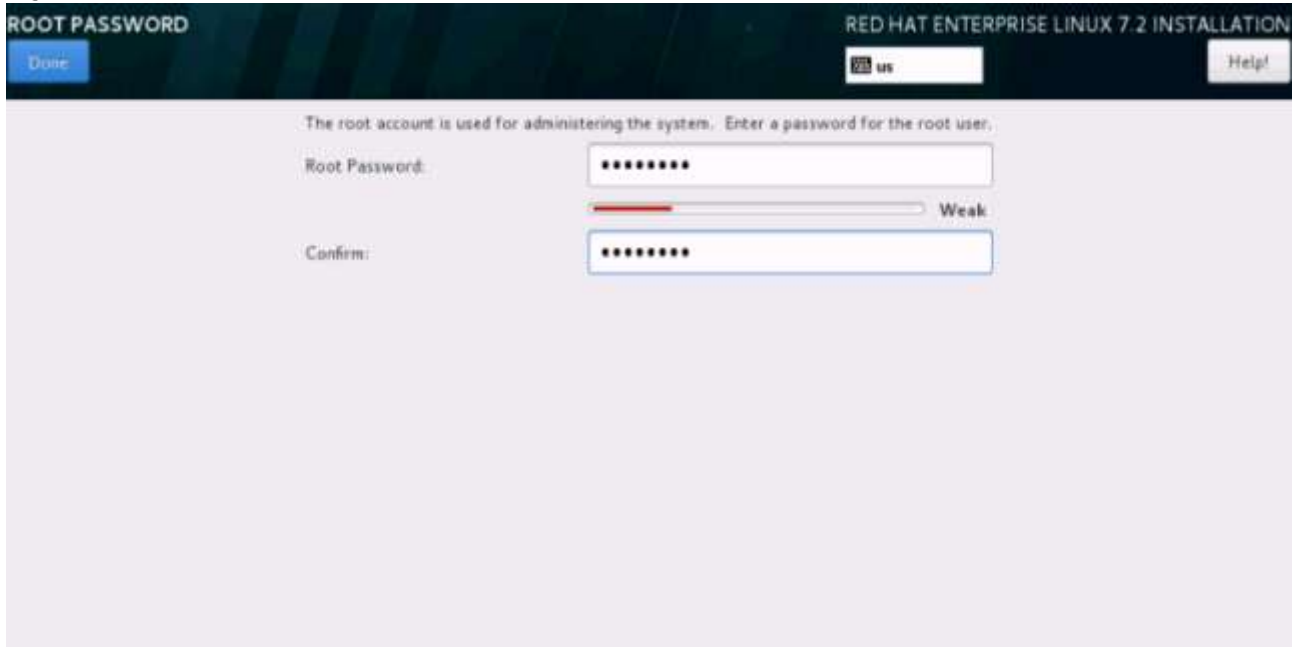
43. Select **Root Password** in the User Settings.

Figure 103 Select Root Password



44. On the next screen (Figure 104), enter the **Root Password** and click **Done**.

Figure 104 Enter the Root Password



A progress window will open (Figure 105).

Figure 105 Progress Bar



45. Once the installation is complete reboot the system.
46. Repeat steps 1 to 45 to install Red Hat Enterprise Linux 7.2 on other Management Nodes.



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

Installing Red Hat Enterprise Linux 7.2 on Data Nodes

The following section provides detailed procedures for installing Red Hat Enterprise Linux 7.2 on Cisco UCS S3260 Storage Servers. There are multiple ways to install the Red Hat Linux operating system. The installation procedure described in this deployment guide uses KVM console and virtual media from Cisco UCS Manager.

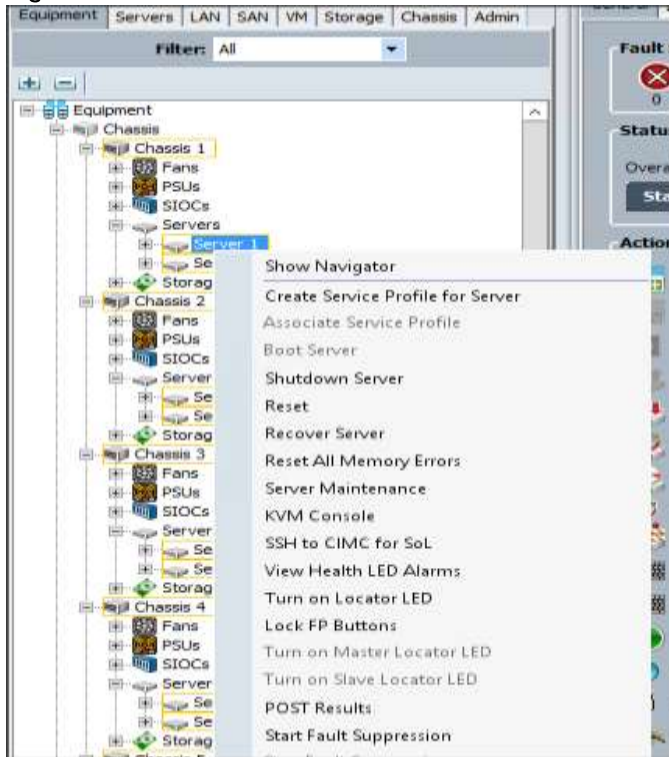


Note: This requires RHEL 7.2 DVD/ISO for the installation

To install the Red Hat Linux 7.2 operating system, complete the following steps:

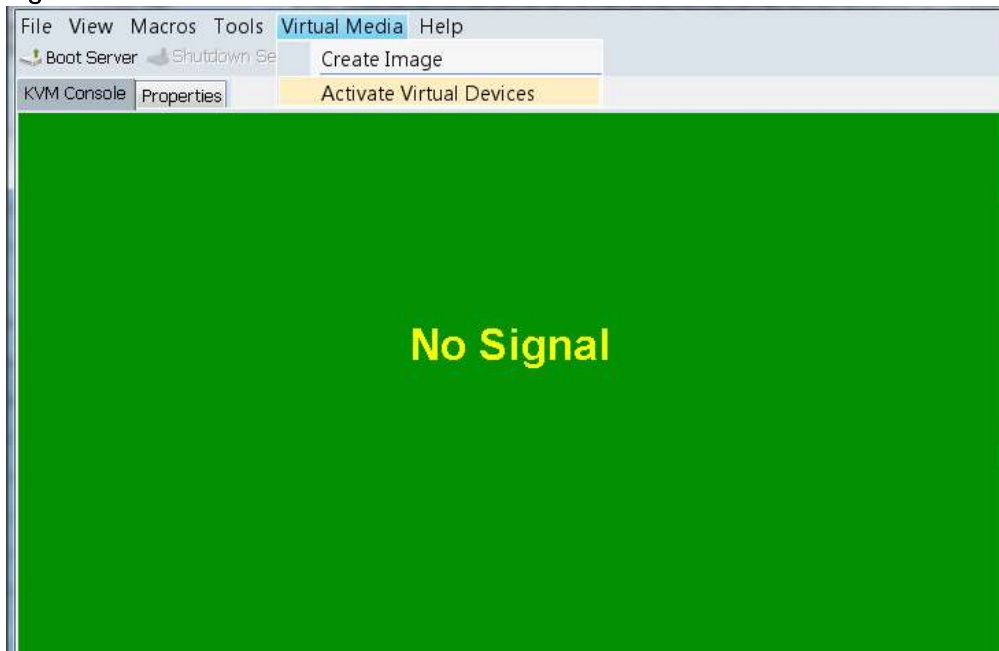
1. **Log in to the Cisco UCS 6332 Fabric Interconnect and launch the Cisco UCS Manager application.**
2. **Select the `Equipment` tab.**
3. **In the navigation pane expand `Chassis` and then `Servers`**
4. **Right click on the server and select `KVM Console`. (Figure 106)**
5. **In the KVM window, select the `Virtual Media` tab.**

Figure 106 KVM Console



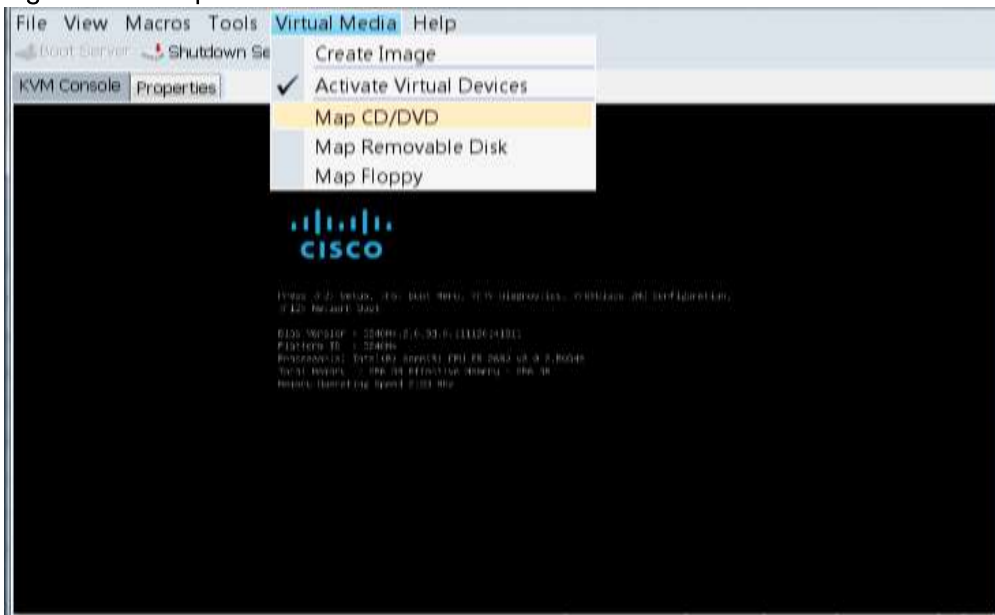
6. Click the **Activate Virtual Devices** found in the **Virtual Media** tab. (Figure 107)

Figure 107 Activate Virtual Devices



7. In the KVM window, select the **Virtual Media** tab and click the **Map CD/DVD**. (Figure 108)

Figure 108 Map CD/DVD



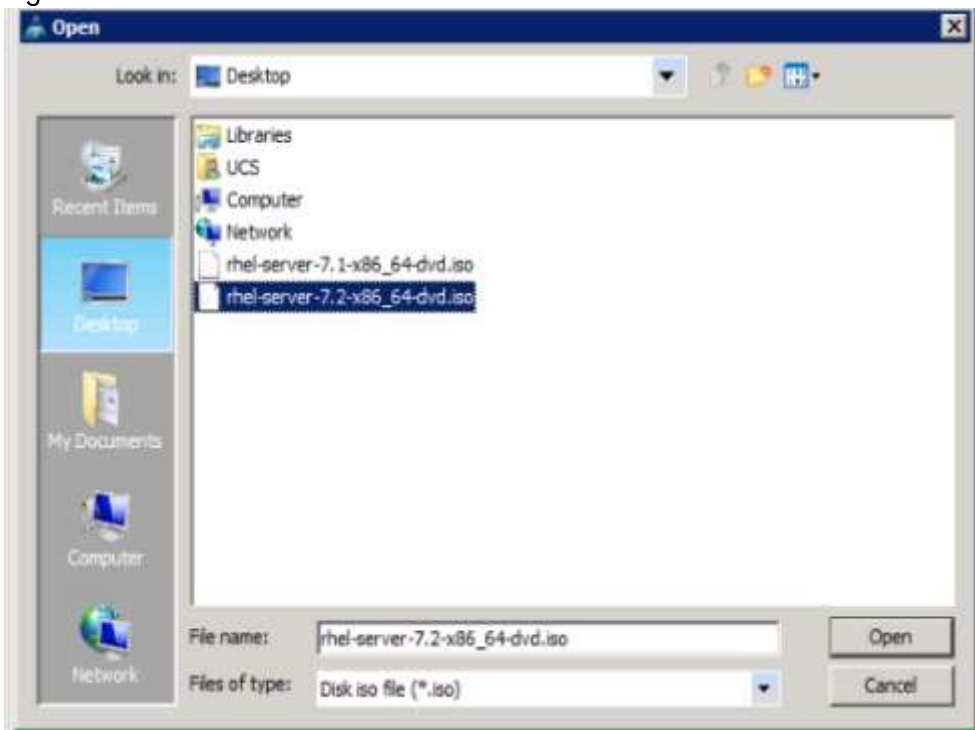
8. Browse to the Red Hat Enterprise Linux Server 7.2 installer ISO image file.



Note: The Red Hat Enterprise Linux 7.2 DVD is assumed to be on the client machine.

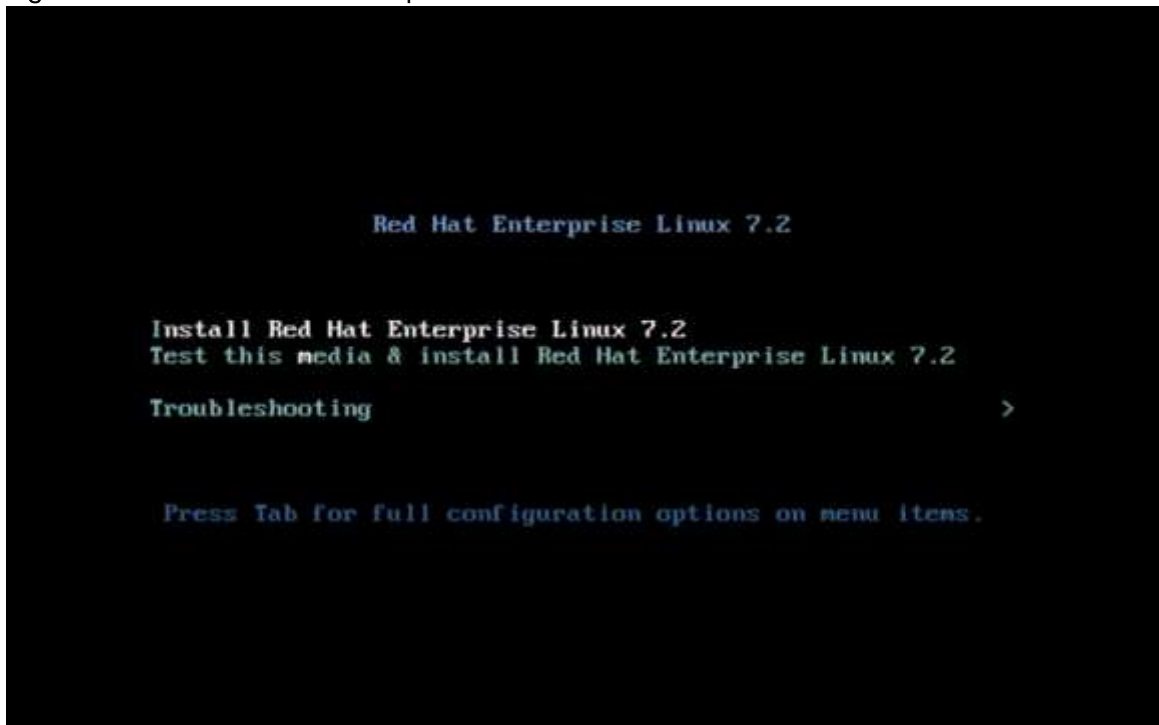
9. Click Open to add the image to the list of virtual media. (Figure 109)

Figure 109 Select the rhel-server



10. In the KVM window, select the KVM tab to monitor during boot.
11. In the KVM window, select the `Macros > Static Macros > Ctrl-Alt-Del` button in the upper left corner.
12. Click `OK`
13. Click `OK` to reboot the system.
14. On reboot, the machine detects the presence of the Red Hat Enterprise Linux Server 7.2 install media.
15. When you see the Install Red Hat screen, press `tab` for full configuration options. Figure 110

Figure 110 Install Red Hat Enterprise Linux 7.2



16. The `vmlinuz initrd` command pops up, Figure 111

Figure 111 vmlinuz initrd Command

```
Red Hat Enterprise Linux 7.2

Install Red Hat Enterprise Linux 7.2
Test this media & install Red Hat Enterprise Linux 7.2

Troubleshooting >

> vmlinuz initrd=initrd.img inst.stage2=hd:LABEL=RHEL-7.2\x20Server.x86_64 quiet dd_
```

17. Add a space, type `no`, then press enter.

```
[ 6.639033] i8042: No controller found
[ OK ] Started Show Plymouth Boot Screen.
[ OK ] Reached target Paths.
[ OK ] Reached target Basic System.
[ OK ] Created slice system-driver\x2updates.slice.
Starting Driver Update Disk UI on tty1...
[ OK ] Started Show Plymouth Boot Screen.
[ OK ] Reached target Paths.
[ OK ] Reached target Basic System.
[ OK ] Created slice system-driver\x2updates.slice.
Starting Driver Update Disk UI on tty1...
DD: starting interactive mode

(Page 1 of 0) Driver disk device selection
 /DEVICE  TYPE      LABEL      UUID
# to select, 'r'-refresh, or 'c'-continue: r
```

18. Type `r` and press enter. Now verify the Redhat 7.2 iso is mounted.

```

[ 6.639033] i8042: No controller found
[ OK ] Started Show Plymouth Boot Screen.
[ OK ] Reached target Paths.
[ OK ] Reached target Basic System.
[ OK ] Created slice system-driver\x2dupdates.slice.
Starting Driver Update Disk UI on tty1...
[ OK ] Started Show Plymouth Boot Screen.
[ OK ] Reached target Paths.
[ OK ] Reached target Basic System.
[ OK ] Created slice system-driver\x2dupdates.slice.
Starting Driver Update Disk UI on tty1...
DD: starting interactive mode

(Page 1 of 0) Driver disk device selection
 /DEVICE TYPE LABEL UUID
# to select, 'r'-refresh, or 'c'-continue: r

(Page 1 of 1) Driver disk device selection
 /DEVICE TYPE LABEL UUID
1) sr0 iso9660 RHEL-7.2\x20Server.x 2015-10-30-11-11-49-00
# to select, 'r'-refresh, or 'c'-continue:

```

19. Next, unmount the Redhat 7.2 iso from the virtual media, and mount the Megaraid 7.2 iso image. Figure 112

Figure 112 Virtual Media

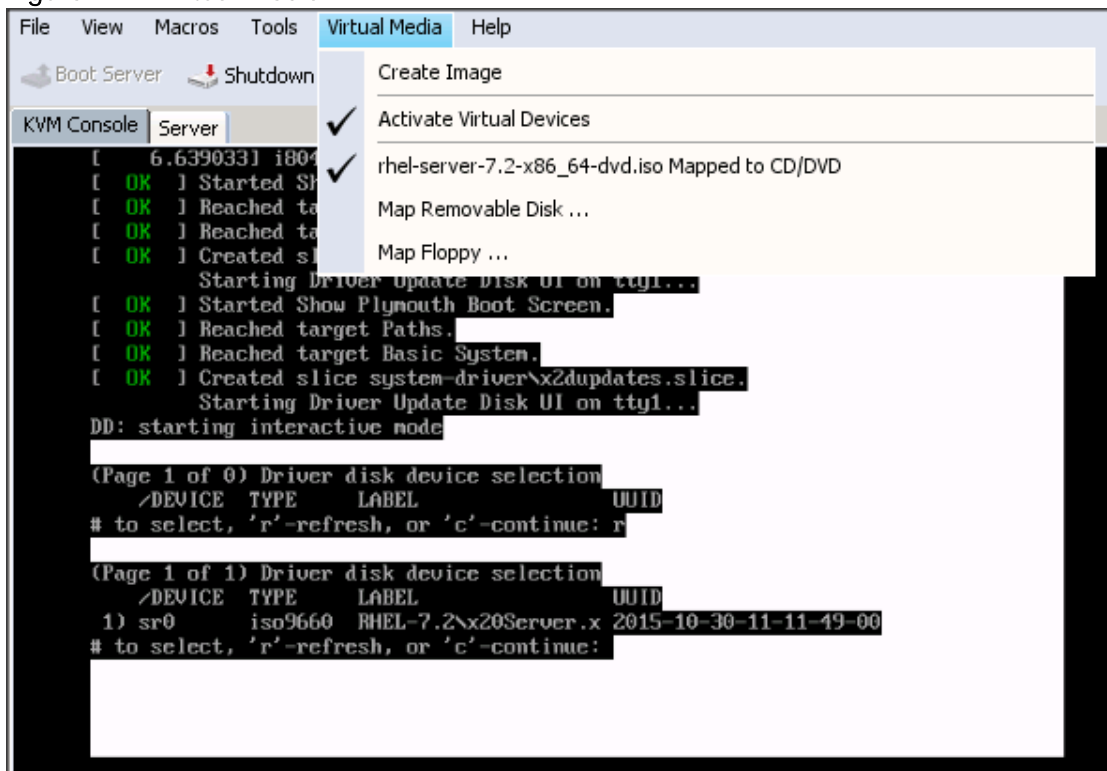
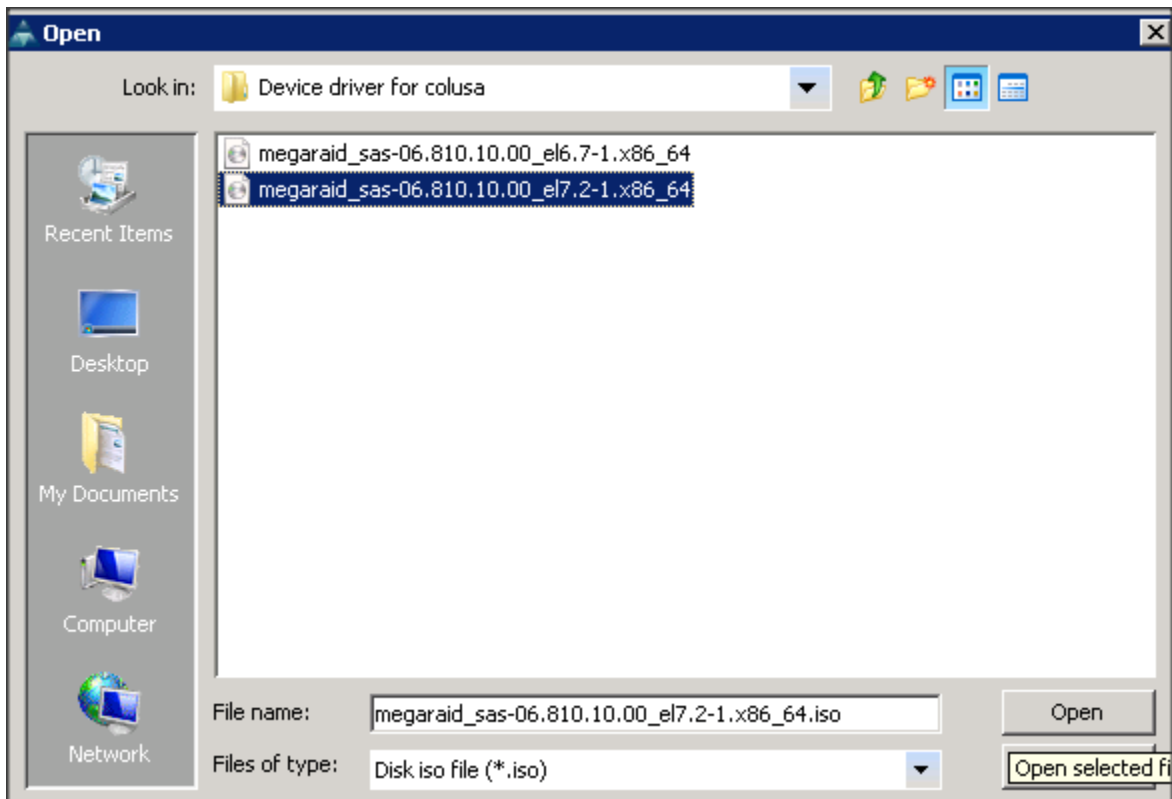
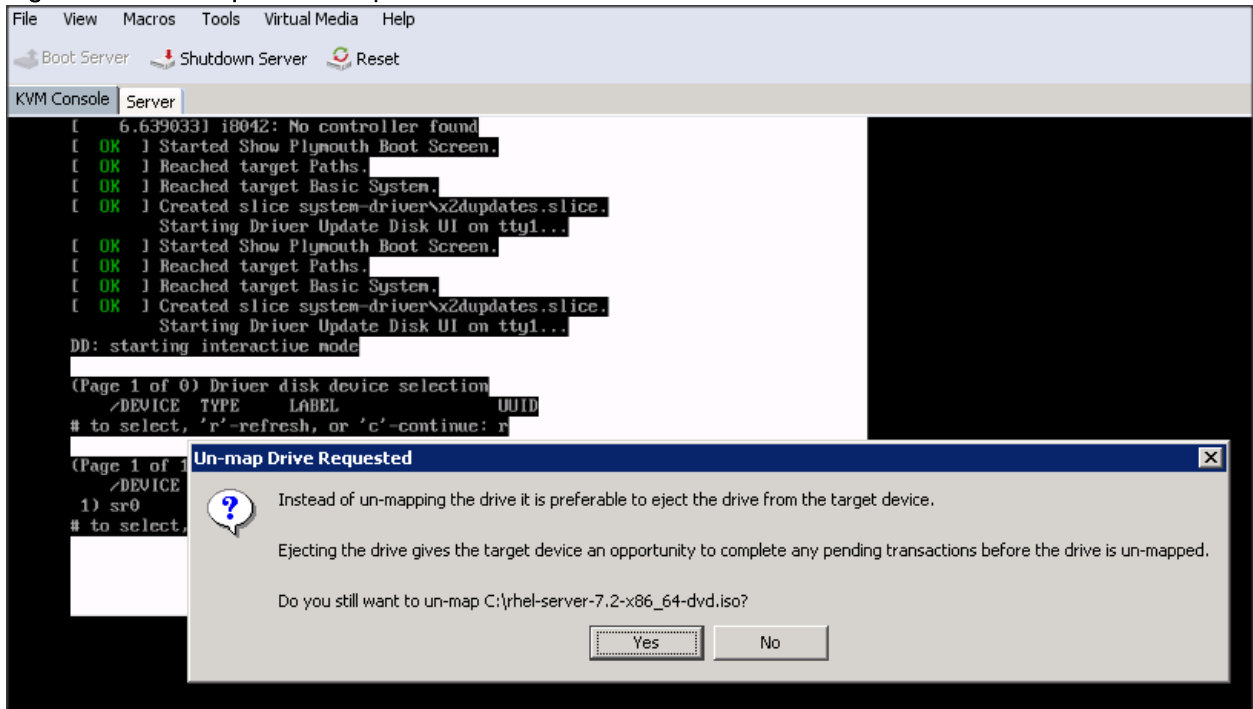


Figure 113 Un Map Drive Requested



20. After mounting the Megaraid iso, type r again to see the megaraid iso. Figure 114

Figure 114 Megaraid ISO

```

File  View  Macros  Tools  Virtual Media  Help
Boot Server  Shutdown Server  Reset
KVM Console  Server
[ 6.639033] i8042: No controller found
[ OK ] Started Show Plymouth Boot Screen.
[ OK ] Reached target Paths.
[ OK ] Reached target Basic System.
[ OK ] Created slice system-driver\x2dupdates.slice.
Starting Driver Update Disk UI on tty1...
[ OK ] Started Show Plymouth Boot Screen.
[ OK ] Reached target Paths.
[ OK ] Reached target Basic System.
[ OK ] Created slice system-driver\x2dupdates.slice.
Starting Driver Update Disk UI on tty1...
DD: starting interactive node
(Page 1 of 0) Driver disk device selection
 /DEVICE  TYPE  LABEL  UUID
# to select, 'r'-refresh, or 'c'-continue: r
(Page 1 of 1) Driver disk device selection
 /DEVICE  TYPE  LABEL  UUID
1) sr0    iso9660  RHEL-7.2\x20Server.x 2015-10-30-11-11-49-00
# to select, 'r'-refresh, or 'c'-continue: r
(Page 1 of 1) Driver disk device selection
 /DEVICE  TYPE  LABEL  UUID
1) sr0    iso9660  CDROM  2016-01-19-15-52-03-00
# to select, 'r'-refresh, or 'c'-continue: _

```

21. Type ` and press enter to see the drivers. Figure 115

Figure 115 See the Drivers

```

File  View  Macros  Tools  Virtual Media  Help
Boot Server  Shutdown Server  Reset
KVM Console  Server
[ 6.639033] i8042: No controller found
[ OK ] Started Show Plymouth Boot Screen.
[ OK ] Reached target Paths.
[ OK ] Reached target Basic System.
[ OK ] Created slice system-driver\x2dupdates.slice.
Starting Driver Update Disk UI on tty1...
[ OK ] Started Show Plymouth Boot Screen.
[ OK ] Reached target Paths.
[ OK ] Reached target Basic System.
[ OK ] Created slice system-driver\x2dupdates.slice.
Starting Driver Update Disk UI on tty1...
DD: starting interactive node
(Page 1 of 0) Driver disk device selection
 /DEVICE  TYPE  LABEL  UUID
# to select, 'r'-refresh, or 'c'-continue: r
(Page 1 of 1) Driver disk device selection
 /DEVICE  TYPE  LABEL  UUID
1) sr0    iso9660  RHEL-7.2\x20Server.x 2015-10-30-11-11-49-00
# to select, 'r'-refresh, or 'c'-continue: r
(Page 1 of 1) Driver disk device selection
 /DEVICE  TYPE  LABEL  UUID
1) sr0    iso9660  CDROM  2016-01-19-15-52-03-00
# to select, 'r'-refresh, or 'c'-continue: 1_

```

22. Type `^` to check the box and select the drivers. Press enter. Figure 116

Figure 116 Check the box

```
File View Macros Tools Virtual Media Help
Boot Server Shutdown Server Reset
KVM Console Server
[ 6.639033] i8042: No controller found
[ OK ] Started Show Plymouth Boot Screen.
[ OK ] Reached target Paths.
[ OK ] Reached target Basic System.
[ OK ] Created slice system-driver\x2dupdates.slice.
Starting Driver Update Disk UI on tty1...
[ OK ] Started Show Plymouth Boot Screen.
[ OK ] Reached target Paths.
[ OK ] Reached target Basic System.
[ OK ] Created slice system-driver\x2dupdates.slice.
Starting Driver Update Disk UI on tty1...
DD: starting interactive node
(Page 1 of 0) Driver disk device selection
 /DEVICE TYPE LABEL UUID
# to select, 'r'-refresh, or 'c'-continue: r
(Page 1 of 1) Driver disk device selection
 /DEVICE TYPE LABEL UUID
1) sr0 iso9660 RHEL-7.2\x20Server.x 2015-10-30-11-11-49-00
# to select, 'r'-refresh, or 'c'-continue: r
(Page 1 of 1) Driver disk device selection
 /DEVICE TYPE LABEL UUID
1) sr0 iso9660 CDROM 2016-01-19-15-52-03-00
# to select, 'r'-refresh, or 'c'-continue: 1
DD: Examining /dev/sr0
mount: /dev/sr0 is write-protected, mounting read-only
(Page 1 of 1) Select drivers to install
1) [ ] /media/DD-1/rpms/x86_64/kmod-megaraid_sas-06.810.10.00_el7.2-1.x86_64.rpm
# to toggle selection, or 'c'-continue:
```


Figure 117

23. Once the box is checked, type :: to continue, and press enter.

Figure 118 Megaraid is mounted

```
File View Macros Tools Virtual Media Help
Boot: Server Shutdown Server Reset

KVM Console Server

[ 6.639033] i8042: No controller found
[ OK ] Started Show Plymouth Boot Screen.
[ OK ] Reached target Paths.
[ OK ] Reached target Basic System.
[ OK ] Created slice system-driver\x2dupdates.slice.
Starting Driver Update Disk UI on tty1...
[ OK ] Started Show Plymouth Boot Screen.
[ OK ] Reached target Paths.
[ OK ] Reached target Basic System.
[ OK ] Created slice system-driver\x2dupdates.slice.
Starting Driver Update Disk UI on tty1...
DD: starting interactive node

(Page 1 of 0) Driver disk device selection
 /DEVICE TYPE LABEL UUID
# to select, 'r'-refresh, or 'c'-continue: r

(Page 1 of 1) Driver disk device selection
 /DEVICE TYPE LABEL UUID
1) sr0 iso9660 RHEL-7.2\x20Server.x 2015-10-30-11-11-49-00
# to select, 'r'-refresh, or 'c'-continue: r

(Page 1 of 1) Driver disk device selection
 /DEVICE TYPE LABEL UUID
1) sr0 iso9660 CDROM 2016-01-19-15-52-03-00
# to select, 'r'-refresh, or 'c'-continue: 1
DD: Examining /dev/sr0
mount: /dev/sr0 is write-protected, mounting read-only

(Page 1 of 1) Select drivers to install
1) [ ] /media/DD-1/rpms/x86_64/kmod-megaraid_sas-06.810.10.00_el7.2-1.x86_64.rpm
# to toggle selection, or 'c'-continue: 1

(Page 1 of 1) Select drivers to install
1) [x] /media/DD-1/rpms/x86_64/kmod-megaraid_sas-06.810.10.00_el7.2-1.x86_64.rpm
# to toggle selection, or 'c'-continue:
```

Figure 119 KVM Console Drive Disk Selection

```

File View Macros Tools Virtual Media Help
Boot Server Shutdown Server Reset

KVM Console Server

[ 6.639033] i8042: No controller found
[ OK ] Started Show Plymouth Boot Screen.
[ OK ] Reached target Paths.
[ OK ] Reached target Basic System.
[ OK ] Created slice system-driver\x2dupdates.slice.
Starting Driver Update Disk UI on tty1...
[ OK ] Started Show Plymouth Boot Screen.
[ OK ] Reached target Paths.
[ OK ] Reached target Basic System.
[ OK ] Created slice system-driver\x2dupdates.slice.
Starting Driver Update Disk UI on tty1...
DD: starting interactive mode

(Page 1 of 0) Driver disk device selection
 /DEVICE TYPE LABEL UUID
# to select, 'r'-refresh, or 'c'-continue: r

(Page 1 of 1) Driver disk device selection
 /DEVICE TYPE LABEL UUID
1) sr0 iso9660 RHEL-7.2\x20Server.x 2015-10-30-11-11-49-00
# to select, 'r'-refresh, or 'c'-continue: r

(Page 1 of 1) Driver disk device selection
 /DEVICE TYPE LABEL UUID
1) sr0 iso9660 CDROM 2016-01-19-15-52-03-00
# to select, 'r'-refresh, or 'c'-continue: 1
DD: Examining /dev/sr0
mount: /dev/sr0 is write-protected, mounting read-only

(Page 1 of 1) Select drivers to install
1) [ ] /media/DD-1/rpms/x86_64/kmod-megaraid_sas-06.810.10.00_el7.2-1.x86_64.rpm
# to toggle selection, or 'c'-continue: 1

(Page 1 of 1) Select drivers to install
1) [x] /media/DD-1/rpms/x86_64/kmod-megaraid_sas-06.810.10.00_el7.2-1.x86_64.rpm
# to toggle selection, or 'c'-continue: c

```

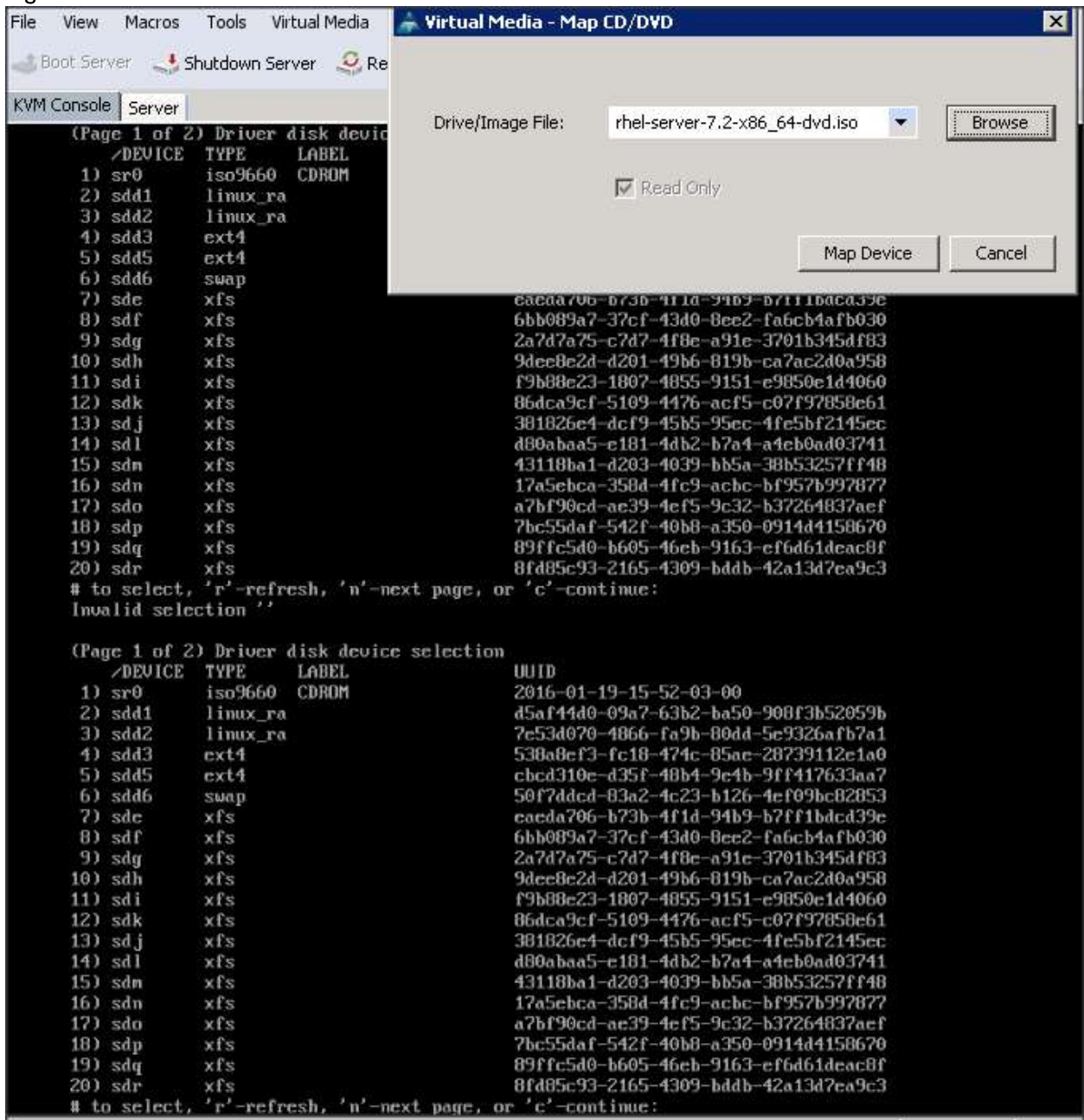
```

File  View  Macros  Tools  Virtual Media  Help
Boot Server  Shutdown Server  Reset
KVM Console  Server
(Page 1 of 0) Driver disk device selection
 /DEVICE  TYPE  LABEL  UUID
# to select, 'r'-refresh, or 'c'-continue: r
(Page 1 of 1) Driver disk device selection
 /DEVICE  TYPE  LABEL  UUID
1) sr0     iso9660  RHEL-7.2\x20Server.x 2015-10-30-11-11-49-00
# to select, 'r'-refresh, or 'c'-continue: r
(Page 1 of 1) Driver disk device selection
 /DEVICE  TYPE  LABEL  UUID
1) sr0     iso9660  CDRROM  2016-01-19-15-52-03-00
# to select, 'r'-refresh, or 'c'-continue: 1
DD: Examining /dev/sr0
mount: /dev/sr0 is write-protected, mounting read-only
(Page 1 of 1) Select drivers to install
1) [ ] /media/DD-1/rpms/x86_64/kmod-megaraid_sas-06.810.10.00_el7.2-1.x86_64.rpm
# to toggle selection, or 'c'-continue: 1
(Page 1 of 1) Select drivers to install
1) [x] /media/DD-1/rpms/x86_64/kmod-megaraid_sas-06.810.10.00_el7.2-1.x86_64.rpm
# to toggle selection, or 'c'-continue: c
DD: Extracting: kmod-megaraid_sas
(Page 1 of 2) Driver disk device selection
 /DEVICE  TYPE  LABEL  UUID
1) sr0     iso9660  CDRROM  2016-01-19-15-52-03-00
2) sdd1    linux_ra  d5af44d0-09a7-63b2-ba50-908f3b52059b
3) sdd2    linux_ra  7e53d070-4866-fa9b-80dd-5e9326afb7a1
4) sdd3    ext4      538a8ef3-fc18-474c-85ae-28739112e1a0
5) sdd5    ext4      cbcd310e-d35f-48b4-9e4b-9ff417633aa7
6) sdd6    swap     50f7ddcd-83a2-4c23-b126-4ef09bc82853
7) sde     xfs      eacda706-b73b-4f1d-94b9-b7ff1bdcd39e
8) sdf     xfs      6bb089a7-37cf-43d0-8cc2-fa6cb4afb030
9) sdg     xfs      2a7d7a75-c7d7-4f8e-a91e-3701b345df83
10) sdh    xfs      9dec8e2d-d201-49b6-819b-ca7ac2d0a958
11) sdi    xfs      f9b08e23-1807-4855-9151-e9850e1d4060
12) sdk    xfs      86dea9cf-5109-4476-acf5-c07f97858e61
13) sdj    xfs      381826e4-dcf9-45b5-95ec-4fe5bf2145ec
14) sdl    xfs      d80abaa5-e181-4db2-b7a4-a4eb0ad03741
15) sdm    xfs      43118ba1-d203-4039-bb5a-38b53257ff48
16) sdn    xfs      17a5ebca-358d-4fc9-acbc-bf957b997877
17) sdo    xfs      a7bf90cd-ae39-4ef5-9c32-b37264837aef
18) sdp    xfs      7bc55daf-542f-40b8-a350-0914d4158670
19) sdq    xfs      89ffc5d0-b605-46eb-9163-ef6d61deac8f
20) sdr    xfs      8fd85c93-2165-4309-bddb-42a13d7ea9c3
# to select, 'r'-refresh, 'n'-next page, or 'c'-continue:

```

24. After the driver extraction, unmount the megaraid driver from the virtual media and re-mount the Redhat 7.2 iso image. Figure 120

Figure 120 Remount the rhel72 iso files



25. After mounting the Redhat 7.2 iso image in the virtual media , type `r` to confirm the iso in the command shell.
26. Verify the Redhat 7.2 iso image and type `l`, type `::` to continue the installation of the Redhat 7.2. Figure 121

Figure 121 Mounted Drives

```

File  View  Macros  Tools  Virtual Media  Help
Boot Server  Shutdown Server  Reset

KVM Console  Server

(Page 1 of 2) Driver disk device selection
# /DEVICE  TYPE  LABEL  UUID
1) sr0      iso9660  RHEL-7.2\x20Server.x  2015-10-30-11-11-49-00
2) sdd1     linux_ra
3) sdd2     linux_ra
4) sdd3     ext4
5) sdd5     ext4
6) sdd6     swap
7) sde      xfs
8) sdf      xfs
9) sdg      xfs
10) sdh     xfs
11) sdi     xfs
12) sdk     xfs
13) sdj     xfs
14) sdl     xfs
15) sdm     xfs
16) sdn     xfs
17) sdo     xfs
18) sdq     xfs
19) sdr     xfs
20) sdr     xfs
# to select, 'r'-refresh, 'n'-next page, or 'c'-continue:
Invalid selection ''

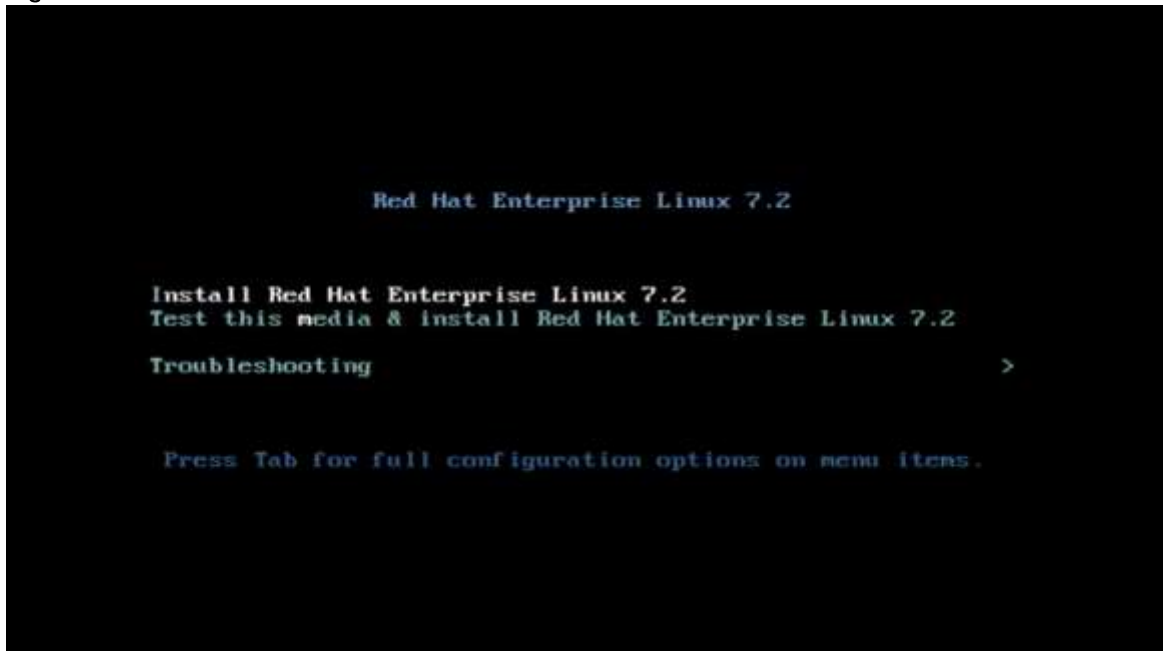
(Page 1 of 2) Driver disk device selection
# /DEVICE  TYPE  LABEL  UUID
1) sr0      iso9660  RHEL-7.2\x20Server.x  2015-10-30-11-11-49-00
2) sdd1     linux_ra
3) sdd2     linux_ra
4) sdd3     ext4
5) sdd5     ext4
6) sdd6     swap
7) sde      xfs
8) sdf      xfs
9) sdg      xfs
10) sdh     xfs
11) sdi     xfs
12) sdk     xfs
13) sdj     xfs
14) sdl     xfs
15) sdm     xfs
16) sdn     xfs
17) sdo     xfs
18) sdq     xfs
19) sdr     xfs
20) sdr     xfs
# to select, 'r'-refresh, 'n'-next page, or 'c'-continue:

```

27. Now enter :: to continue the installation process.

28. Skip the Media test and start the installation. Figure 122

Figure 122 Installation Screen



29. Select language of installation and click Continue. (Figure 123)

Figure 123 Choose Language of Installation



30. Select Date and Time, (Figure 124) which pops up another window as shown below in Figure 125

Figure 124 Date and Time

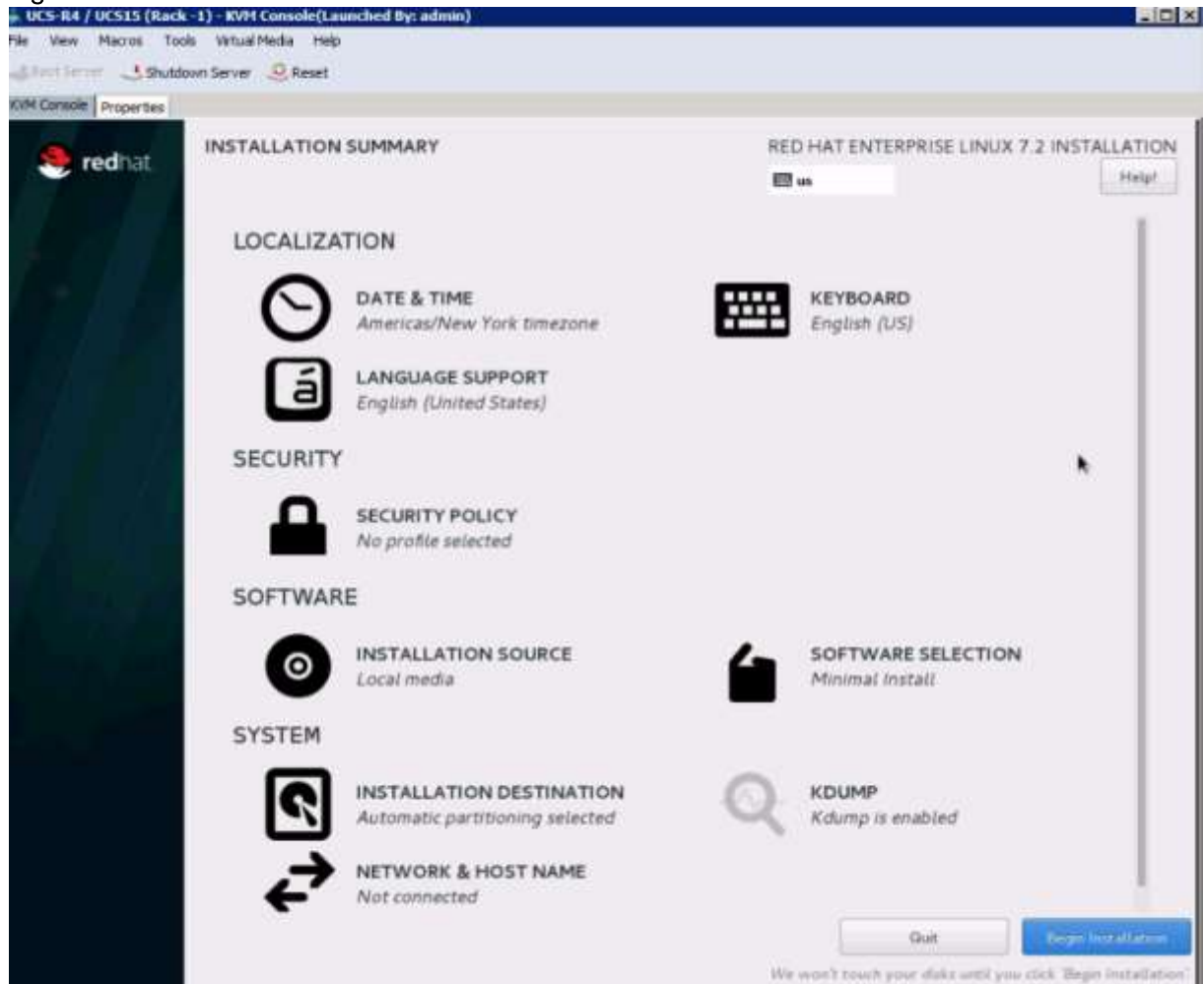
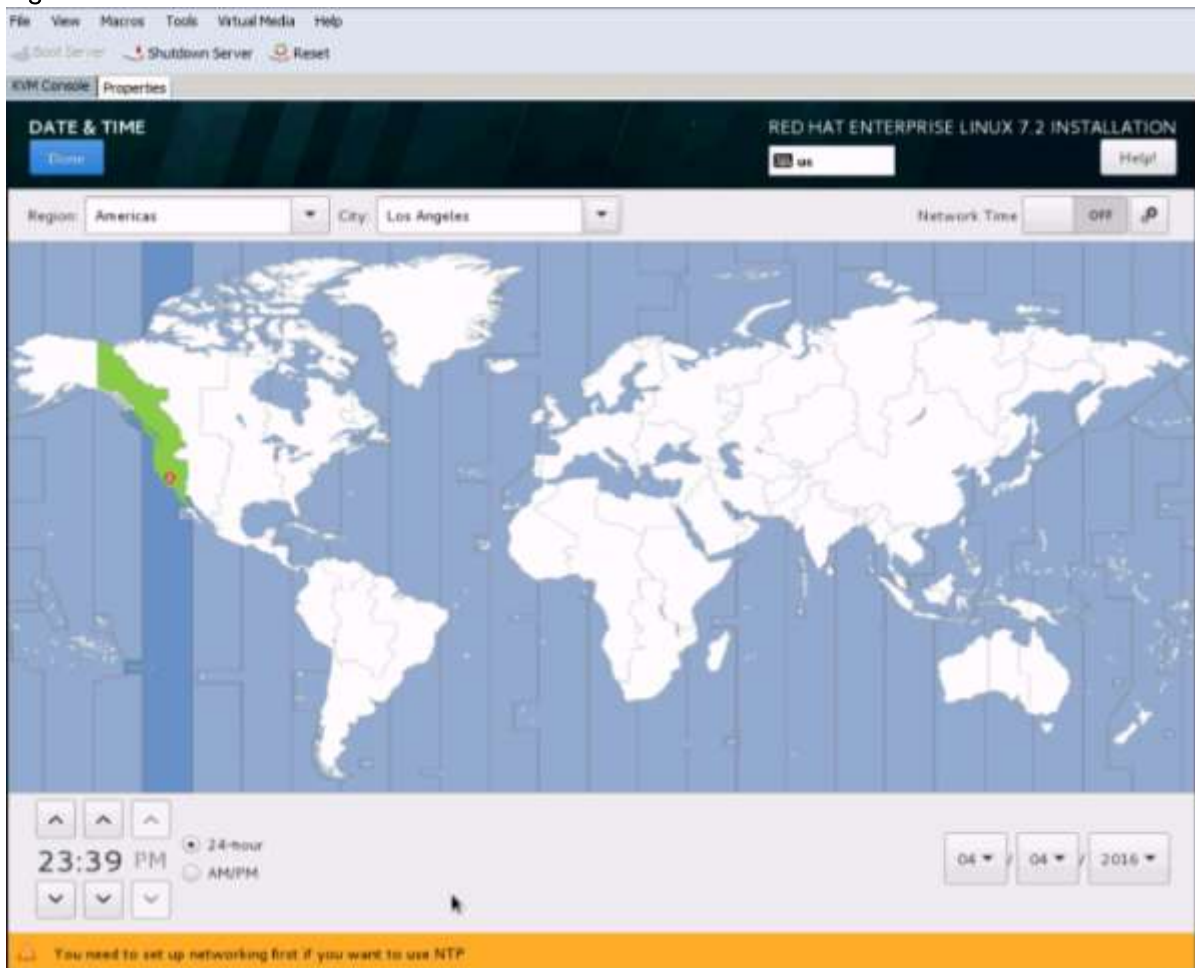
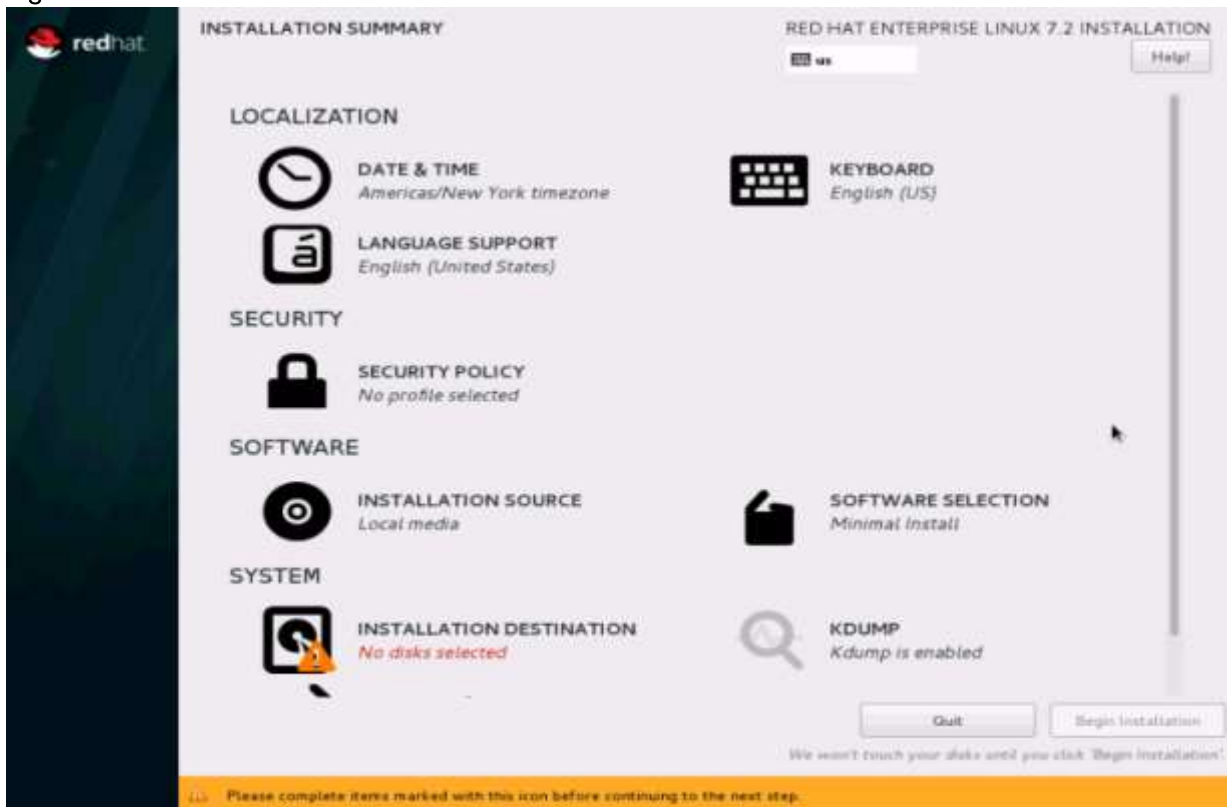


Figure 125 Choose Time Zone



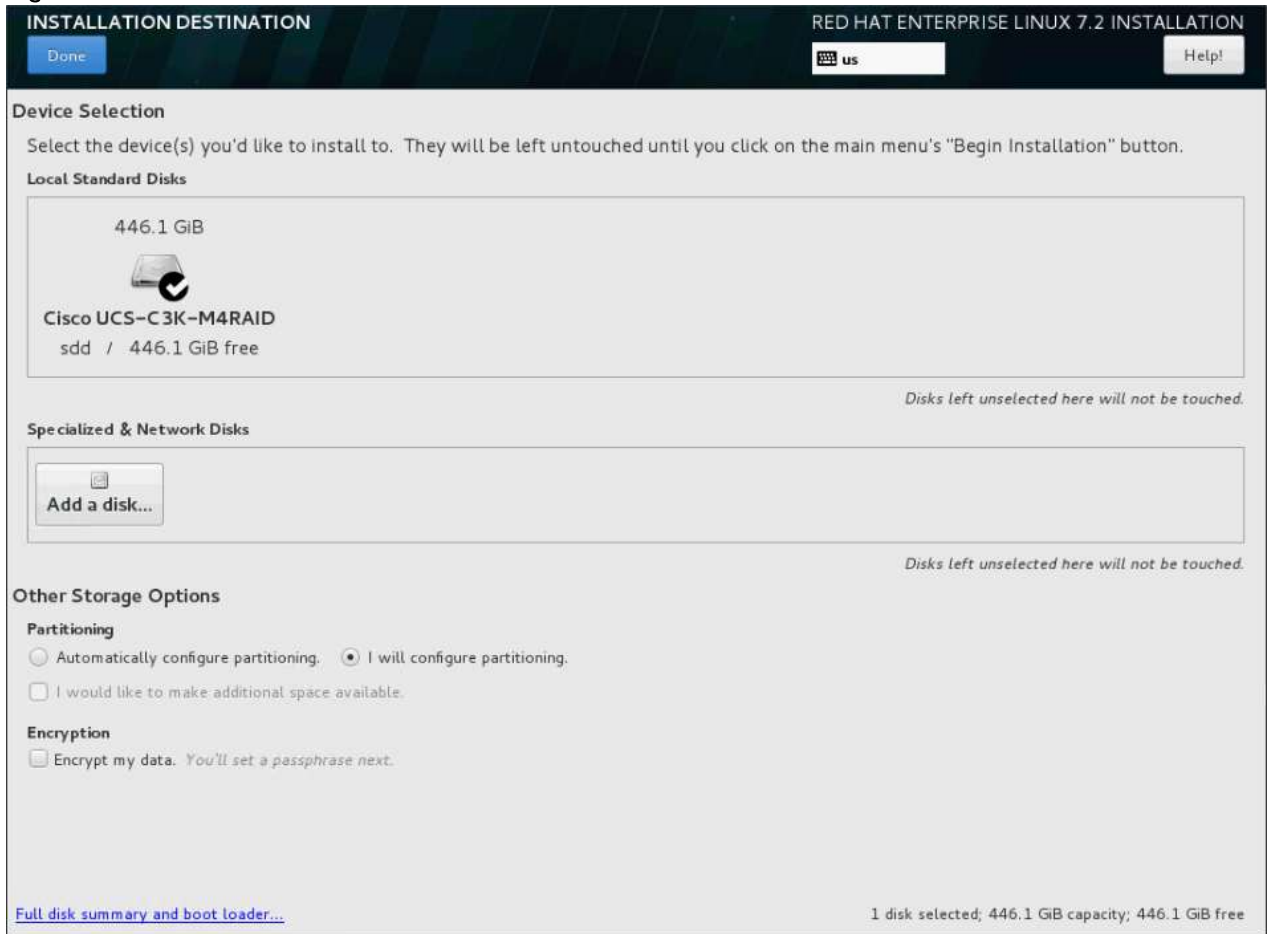
31. Select the location on the map, set the time and click Done:
32. Click on Installation Destination. (Figure 126)

Figure 126 Installation Destination



33. This opens a new window with the boot disks. Make the selection, and choose I will configure partitioning. Click Done. (Figure 127)

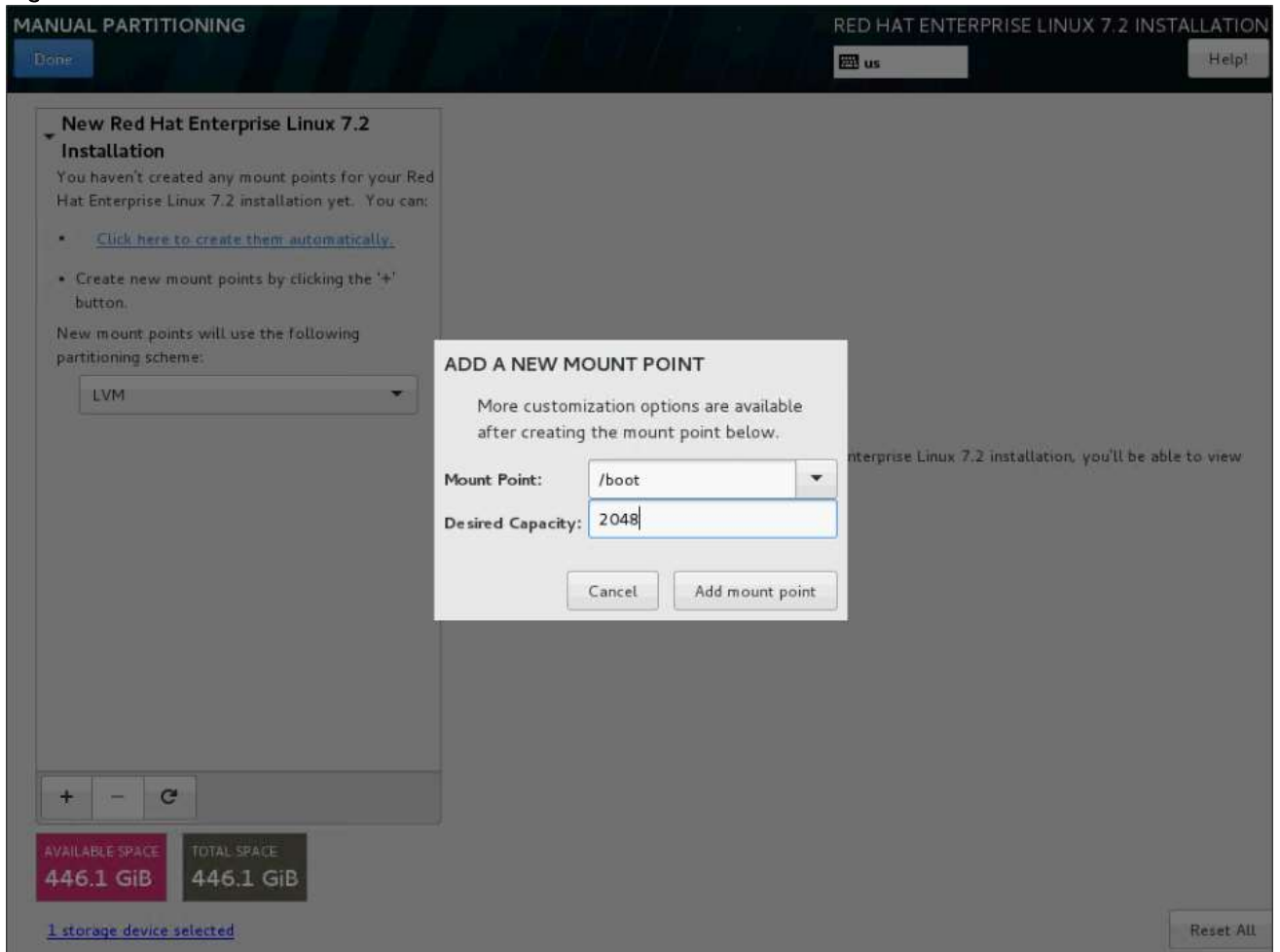
Figure 127 Installation Destination



34. This opens the new window for creating the partitions. (Figure 128) Click on the + sign to add a new partition as shown below, boot partition of size 2048 MB.

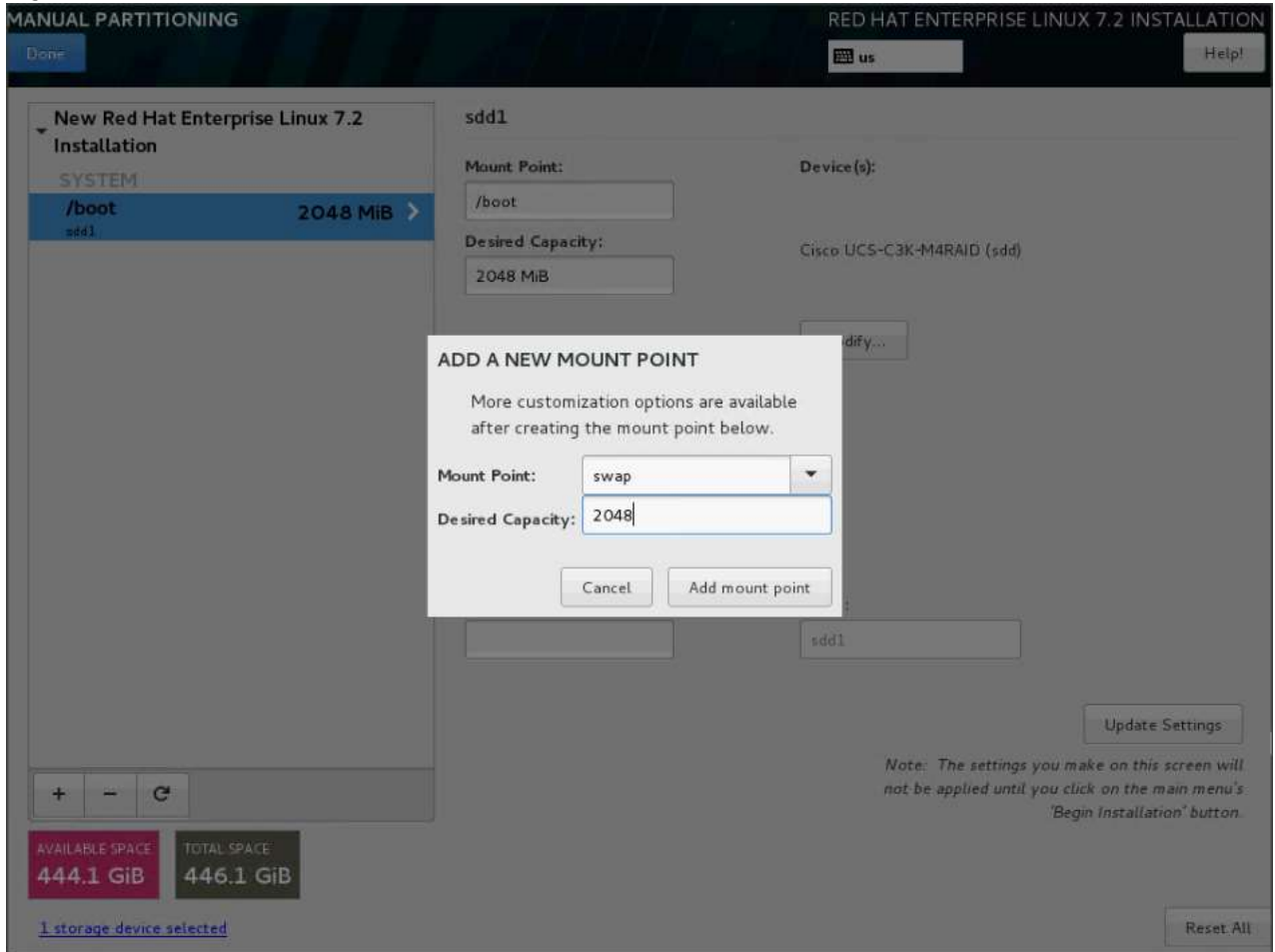
35. Click Add MountPoint to add the partition.

Figure 128 Add a New Mount Point



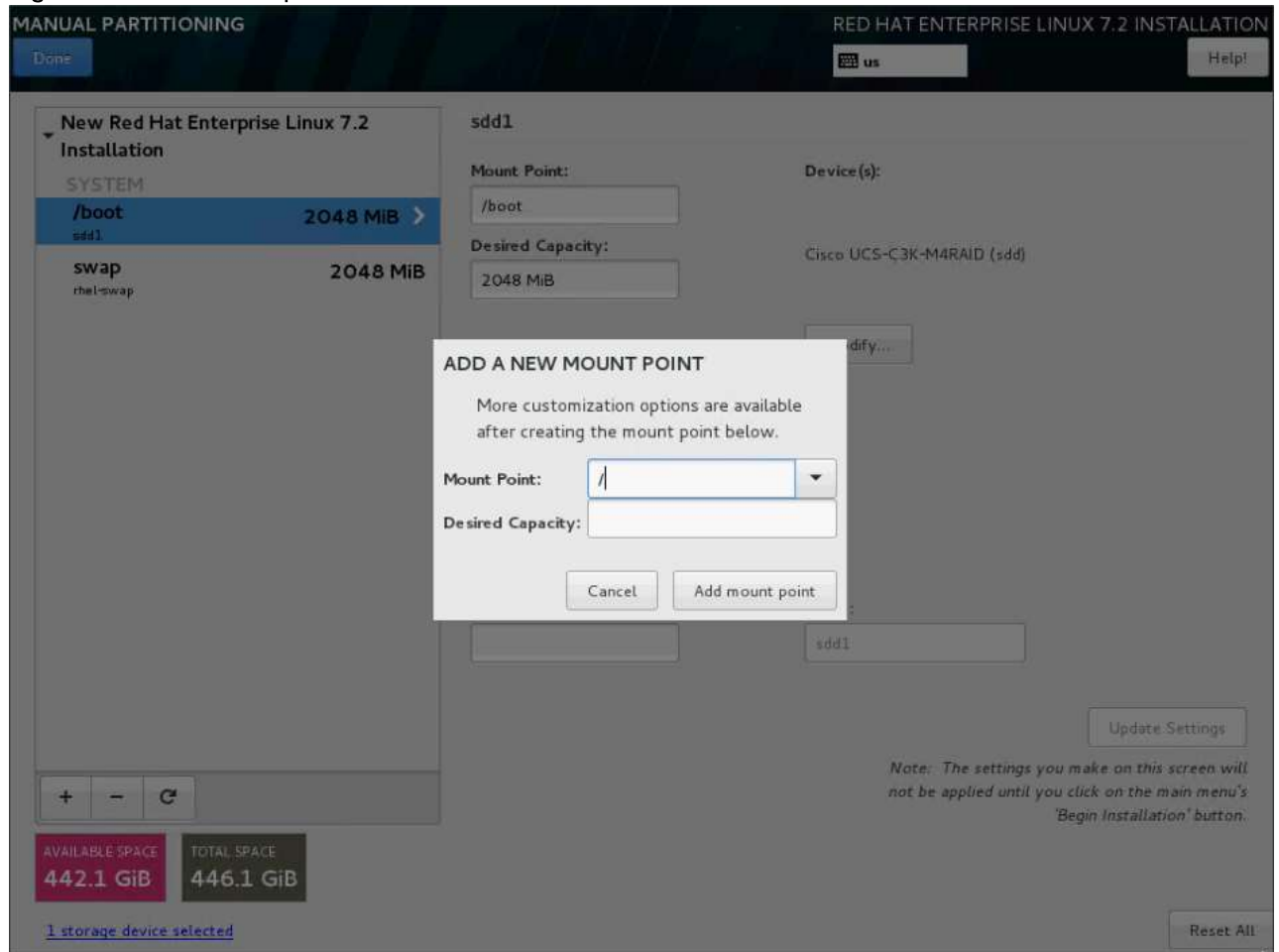
36. Click on the + sign to create the swap partition of size 2048 MB as shown below. (Figure 129)

Figure 129 Add a New Mount Point



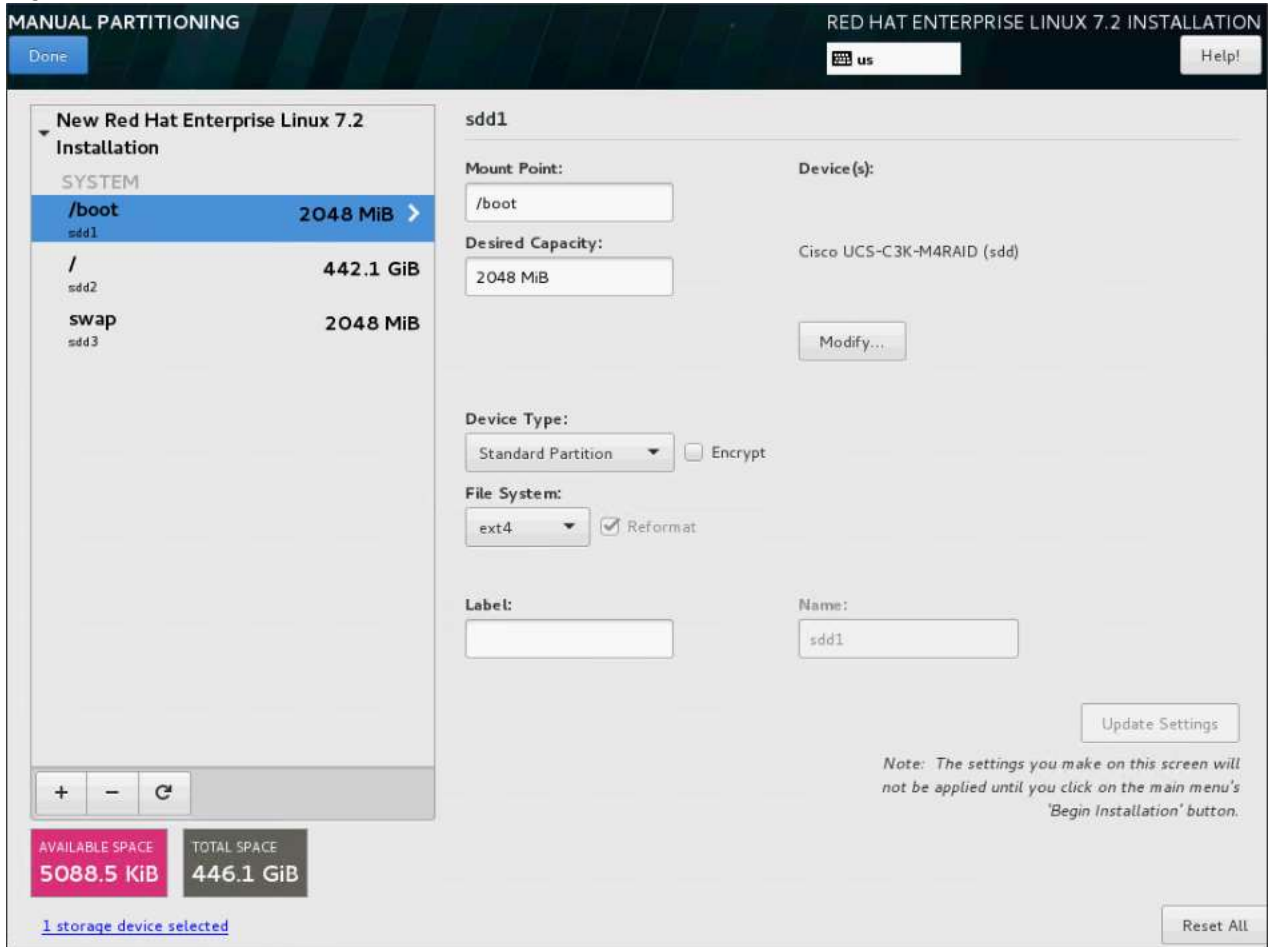
37. Click + to add the / partition. The size can be left empty so it uses the remaining capacity and click Add Mountpoint. (Figure 130)

Figure 130 Add a swap



38. Select /boot partition and change the Device Type to Standard Partition and the file system to ext4. (Figure 131)
39. Select "/" partition and change the Device Type to Standard Partition and the file system to ext4.
40. Select "swap" partition and change the Device Type to Standard Partition.

Figure 131 Standard Partition



41. Click Done to go back to the main screen and continue the Installation.

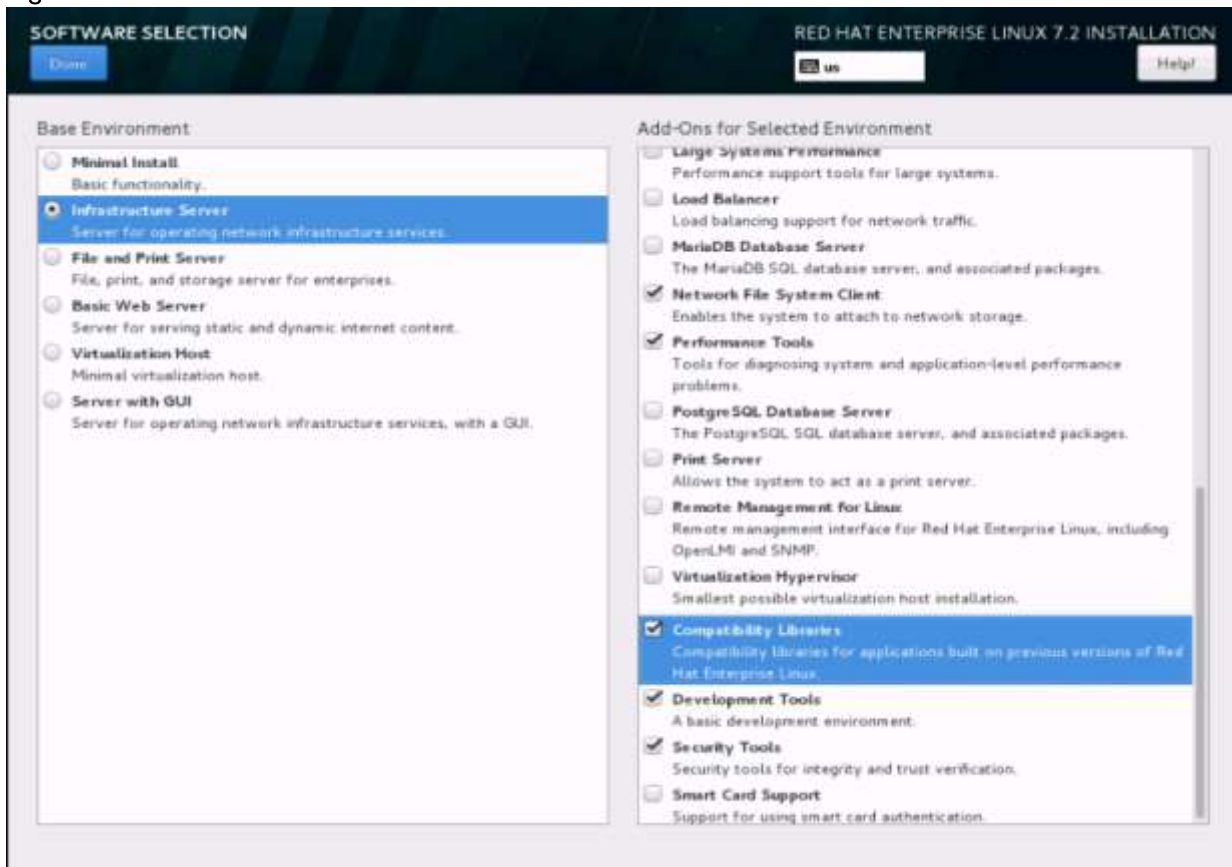
42. Click on Software Selection. (Figure 132)

Figure 132 Software Selection



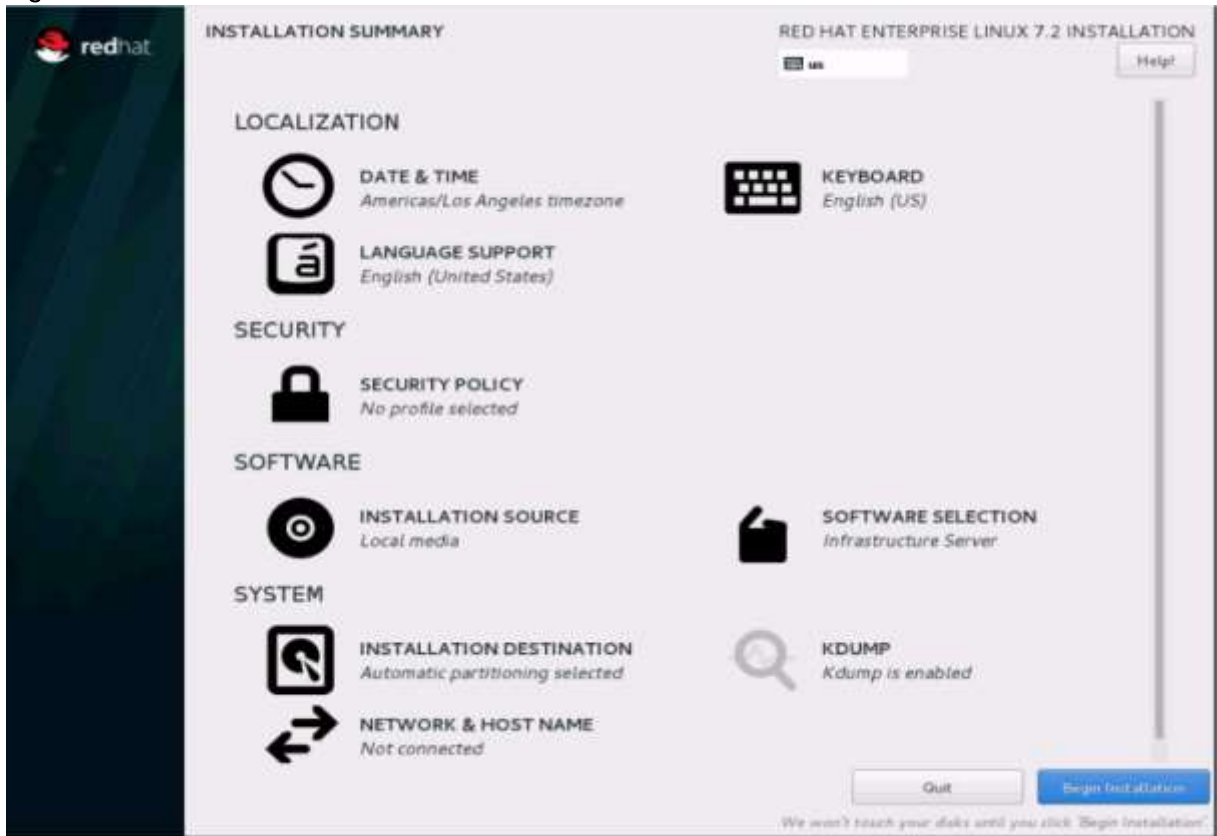
43. Select Infrastructure Server and select the Add-Ons as noted below. Click Done. (Figure 133)

Figure 133 Infrastructure Server



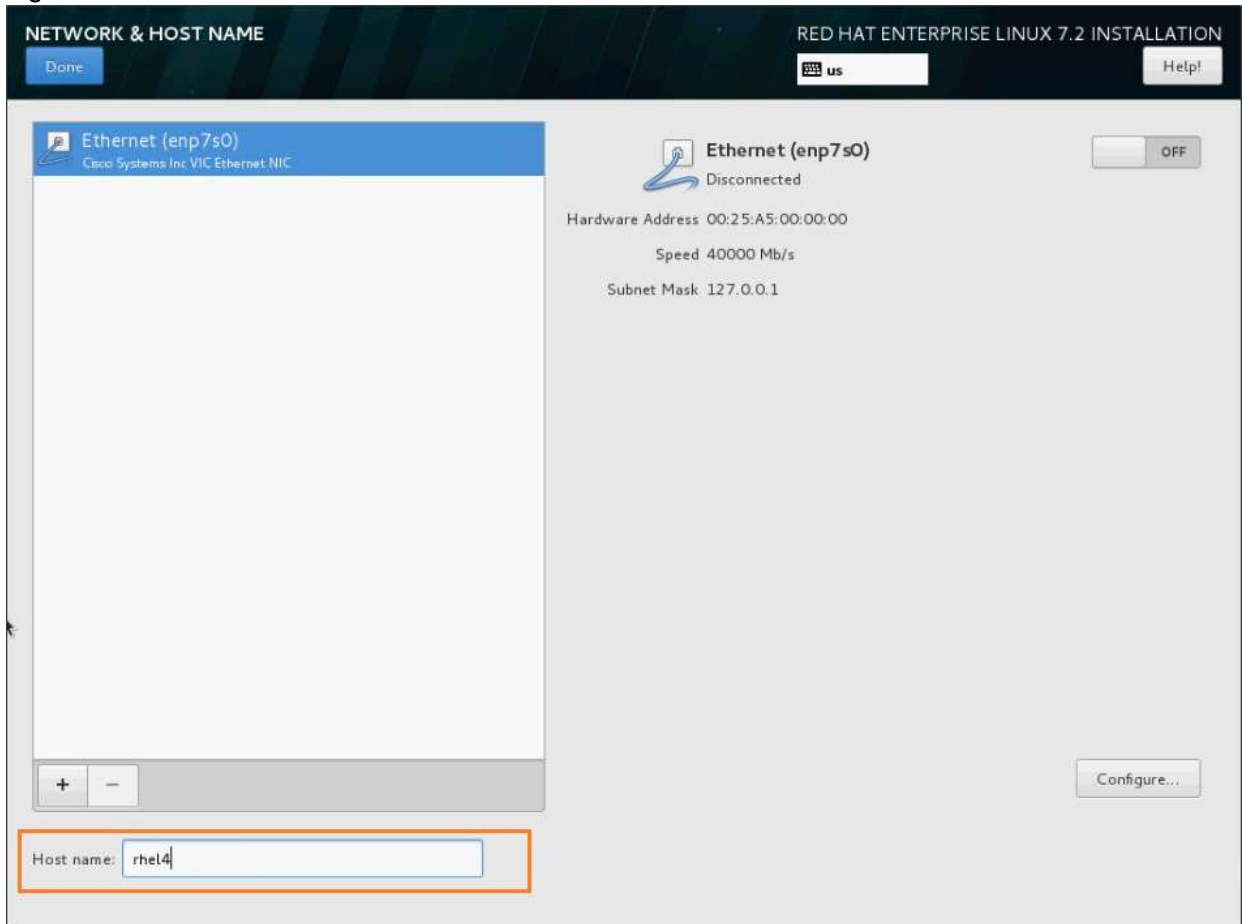
44. Click on Network and Hostname and configure Hostname and Networking for the Host.
(Figure 134)

Figure 134 Network and Hostname



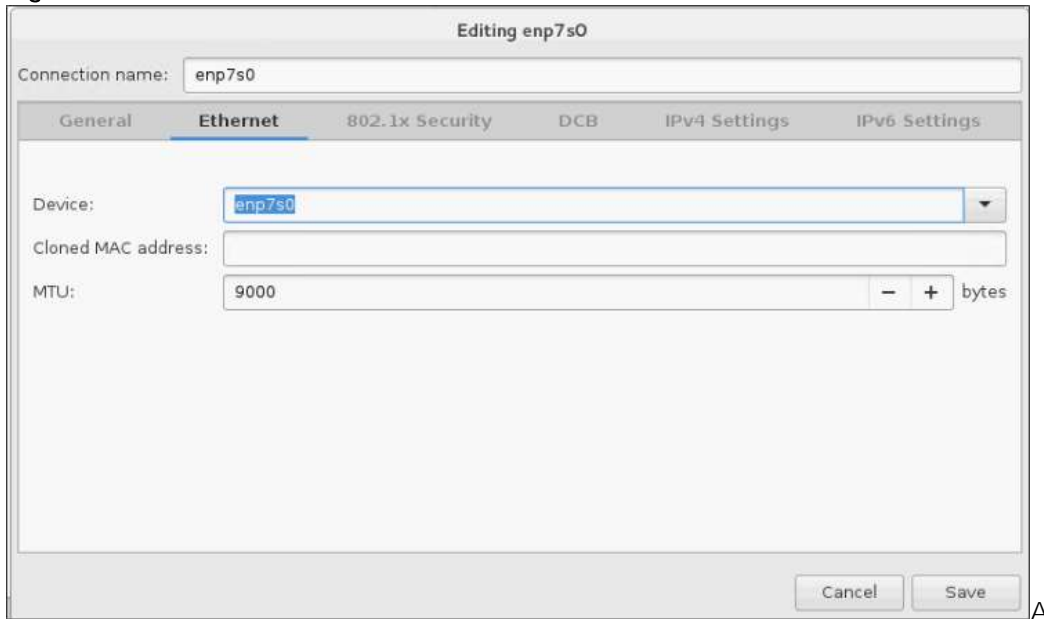
45. Type in the hostname as shown below. (Figure 135)

Figure 135 Add the Host Name



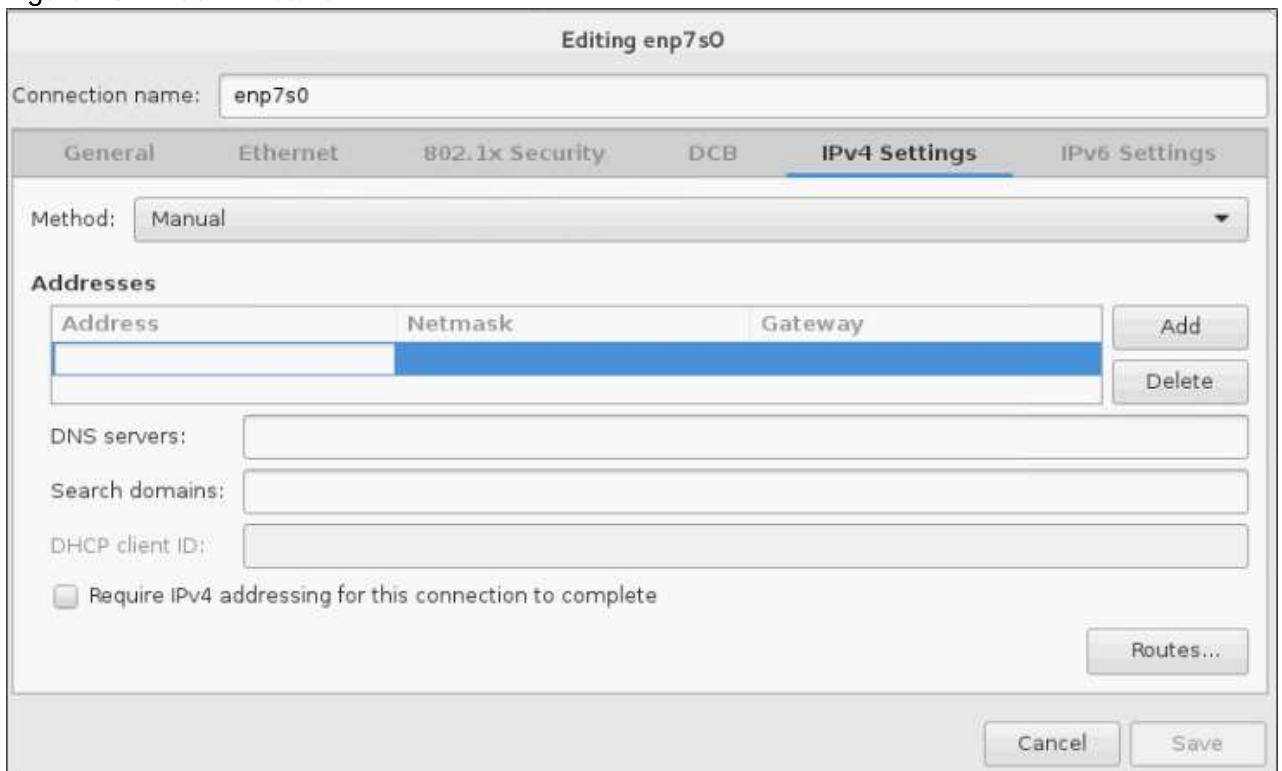
46. Click on Configure to open the Network Connectivity window. Click on Ethernet. (Figure 136)

Figure 136 Add Ethernet



47. Click on IPv4 Settings and change the Method to Manual and click Add to enter the IP Address, Netmask and Gateway details. (Figure 137)

Figure 137 Add IP Details



48. Enter the desired IP address, Netmask and Gateway and click Save. (Figure 138)

Figure 138 Manual IP Address Entry

Editing enp7s0

Connection name: enp7s0

General Ethernet 802.1x Security DCB **IPv4 Settings** IPv6 Settings

Method: Manual

Addresses

Address	Netmask	Gateway	
172.16.46.14	24	172.16.46.1	Add
			Delete

DNS servers:

Search domains:

DHCP client ID:

Require IPv4 addressing for this connection to complete

Routes...

Cancel Save

49. Click Save, update the hostname and turn Ethernet ON. Click Done to return to the main menu.

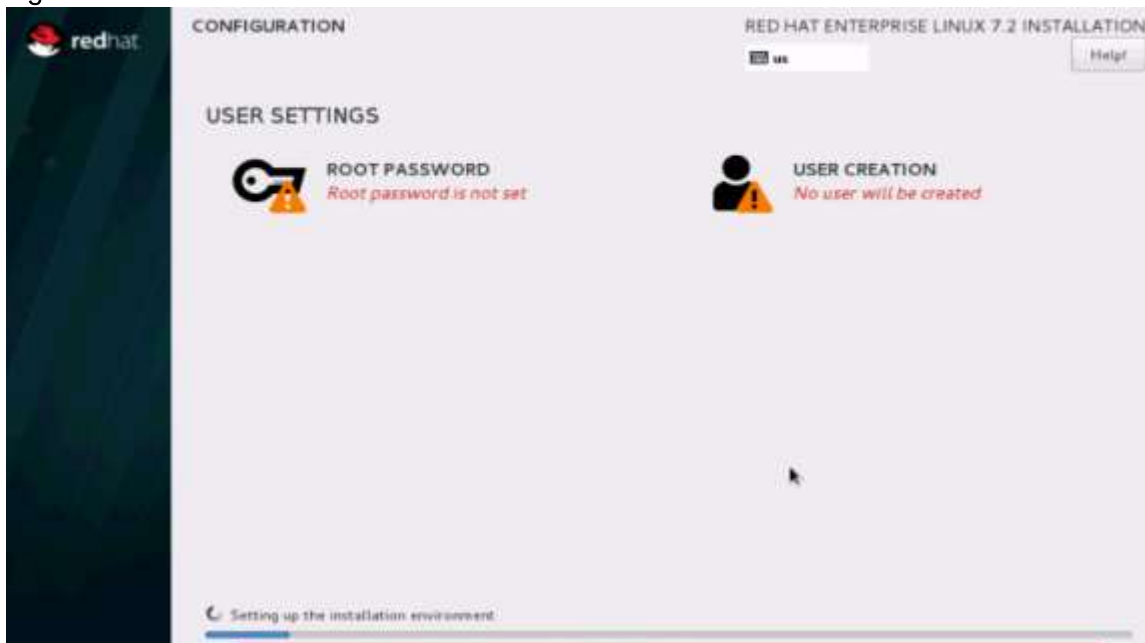
50. Click Begin Installation in the main menu. (Figure 139)

Figure 139 Begin Installation



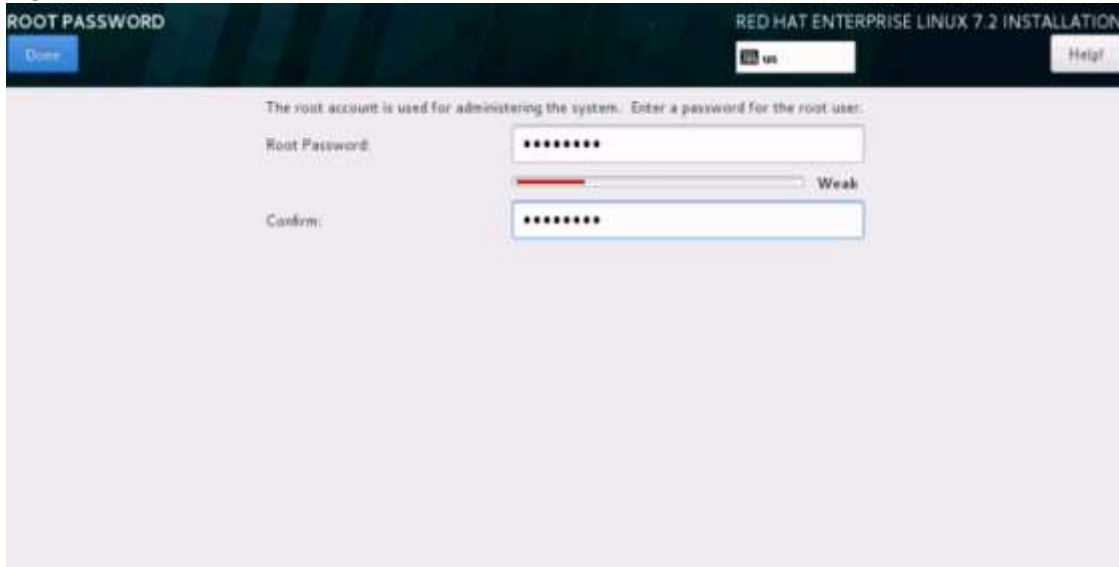
51. Select Root Password in the User Settings. (Figure 140)

Figure 140 Root Password



52. Enter the Root Password and click Done. (Figure 141)

Figure 141 Root Password



The Installation Progress window displays the process. (Figure 142)

Figure 142 Progress Screen



53. Once the installation is complete reboot the system.

54. Repeat steps 1 to 40 to install Red Hat Enterprise Linux 7.2 on rest of the Data Nodes.



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

The hostnames and their corresponding IP addresses are shown in Table 7 .

Table 7 Hostnames and IP Addresses

Hostname	eth0
rhel1	172.16.46.11
rhel2	172.16.46.12
rhel3	172.16.46.13
rhel4	172.16.46.14
rhel1	172.16.46.15
rhel6	172.16.46.16
rhel7	172.16.46.17
rhel8	172.16.46.18
rhel9	172.16.46.19
rhel10	172.16.46.20
rhel11	172.16.46.21
rhel12	172.16.46.22
rhel13	172.16.46.23
rhel14	172.16.46.24
rhel15	172.16.46.25
rhel16	172.16.46.26
rhel17	172.16.46.27
rhel18	172.16.46.28
rhel19	172.16.46.29



Note: Cloudera does not support multi-homed configurations, so please assign only one network to each node.

Post OS Install Configuration

Choose one of the nodes of the cluster or a separate node as the Admin Node for management such as CDH installation, cluster parallel shell, creating a local Red Hat repo and others. In this document, we use rhel1 for this purpose.

Setting Up Password-less Login

To manage all of the clusters nodes from the admin node, password-less login needs to be setup. It assists in automating common tasks with clustershell (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 the steps below in order to enable password-less login across all the nodes.

1. Login to the Admin Node (rhel1).

```
#ssh 172.16.46.11
```

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:
87:78:ad:cc:56:0b:52:e4:0a:86:19:23:cb:27:5e:ed root@rhel1
The key's randomart image is:
+--[ RSA 2048 ]-----+
|.  o      .
|.o =.   o
|.oooo.  o
|. +... + o
|.   E+ S +
|.      = = .
|.      = .
|.      .
+-----+

```

3. Download sshpass to the node connected to the internet and copy it to the admin node (rhel1) using the command

```
wget ftp://195.220.108.108/linux/dag/redhat/el6/en/x86_64/dag/RPMS/sshpass-1.05-1.el6.rf.x86_64.rpm
```

```
scp sshpass-1.05-1.el6.x86_64.rpm rhel1:/root/
```

4. Log in to the admin node and Install the rpm using the command

```
yum -y install sshpass-1.05-1.el6.x86_64.rpm
```

5. Create a file under `./ssh/config` and enter the following lines

```
vi ~/.ssh/config  
  
ServerAliveInterval 99  
StrictHostKeyChecking no
```

6. 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_keys`

```
#for IP in {11..29}; do echo -n "$IP -> "; sshpass -p secret123 ssh-copy-id -i ~/.ssh/id_rsa.pub 172.16.46.$IP; done
```

Configuring `/etc/hosts`

Setup `/etc/hosts` on the Admin node; this is a pre-configuration to setup DNS as shown in the next section.

To create the host file on the admin node, complete the following steps:

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 localhost localhost.localdomain localhost4 \  
localhost4.localdomain4  
  
::1 localhost localhost.localdomain localhost6 \  
localhost6.localdomain6  
  
172.16.46.11    rhel1  
172.16.46.12    rhel2  
172.16.46.13    rhel3  
172.16.46.14    rhel4  
172.16.46.15    rhel5  
172.16.46.16    rhel6  
172.16.46.17    rhel7  
172.16.46.18    rhel8  
172.16.46.19    rhel9  
172.16.46.20    rhel10  
172.16.46.21    rhel11  
172.16.46.22    rhel12  
172.16.46.23    rhel13
```

```
172.16.46.24    rhel14
172.16.46.25    rhel15
172.16.46.26    rhel16
172.16.46.27    rhel17
172.16.46.28    rhel18
172.16.46.29    rhel19
```

Creating a Red Hat Enterprise Linux (RHEL) 7.2 Local Repo

To create a repository using the 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. **Create the mount directory for redhat iso.**

```
#mkdir -p /mnt/rheliso
```

```
#mount -t iso9660 -o loop /root/rhel-server-7.2-x86_64-dvd.iso /mnt/rheliso/
```

3. **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 ~]# mount -t iso9660 -o loop /root/rhel-server-7.2-x86_64-dvd.iso /mnt/rheliso/
mount: /dev/loop0 is write-protected, mounting read-only
[root@rhel1 ~]# cp -r /mnt/rheliso/* /var/www/html/rhelrepo
```

4. **Now create a .repo file to enable the use of the yum command.**

```
#vi /var/www/html/rhelrepo/rheliso.repo
```

```
[rhel7.2]
```

```
name=Red Hat Enterprise Linux 7.2
```

```
baseurl=http://172.16.46.11/rhelrepo
```

```
gpgcheck=0
```

```
enabled=1
```

5. **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.

6. 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, create-repo, etc.)

```
#vi /etc/yum.repos.d/rheliso.repo
[rhel7.2]
name=Red Hat Enterprise Linux 7.2
baseurl=file:///var/www/html/rhelrepo
gpgcheck=0
enabled=1
```

Creating the Red Hat Repository Database

To create a Red Hat Repository Database, complete the following steps:

1. **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@rhell ~]# yum -y install createrepo
Loaded plugins: product-id, search-disabled-repos, subscription-manager
This system is not registered to Red Hat Subscription Management. You can use subscription-manager to register.
rhel7.2 | 4.1 kB | 00:00:00
(1/2): rhel7.2/group_gz | 136 kB | 00:00:00
(2/2): rhel7.2/primary_db | 3.6 MB | 00:00:00
Resolving Dependencies
--> Running transaction check
--> Package createrepo.noarch 0:0.9.9-23.el7 will be installed
--> Processing Dependency: deltarpm for package: createrepo-0.9.9-23.el7.noarch
--> Processing Dependency: python-deltarpm for package: createrepo-0.9.9-23.el7.noarch
--> Running transaction check
--> Package deltarpm.x86_64 0:3.6-3.el7 will be installed
--> Package python-deltarpm.x86_64 0:3.6-3.el7 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================
Package Arch Version Repository Size
-----
Installing:
 createrepo noarch 0.9.9-23.el7 rhel7.2 92 k
Installing for dependencies:
 deltarpm x86_64 3.6-3.el7 rhel7.2 82 k
 python-deltarpm x86_64 3.6-3.el7 rhel7.2 31 k
Transaction Summary
-----
Install 1 Package (+2 dependent packages)

Total download size: 205 k
Installed size: 553 k
Downloading packages:

Total 60 MB/s | 205 kB | 00:00:00
Running transaction check
Running transaction test
Transaction test succeeded
Running transaction
Installing : deltarpm-3.6-3.el7.x86_64 1/3
Installing : python-deltarpm-3.6-3.el7.x86_64 2/3
Installing : createrepo-0.9.9-23.el7.noarch 3/3
rhel7.2/productid | 1.6 kB | 00:00:00
Verifying : python-deltarpm-3.6-3.el7.x86_64 1/3
Verifying : deltarpm-3.6-3.el7.x86_64 2/3
Verifying : createrepo-0.9.9-23.el7.noarch 3/3

Installed:
 createrepo.noarch 0:0.9.9-23.el7

Dependency Installed:
 deltarpm.x86_64 0:3.6-3.el7 python-deltarpm.x86_64 0:3.6-3.el7

Complete!
[root@rhell ~]#

```

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

```
#cd /var/www/html/rhelrepo
```

```
#createrepo .
```

```

[root@rhell 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

```

Setting up ClusterShell

ClusterShell (or clush) is the cluster-wide shell that runs commands on several hosts in parallel. To set up ClusterShell, complete the following steps:

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

```
# wget
```

```
ftp://ftp.pbone.net/mirror/ftp.sourceforge.net/pub/sourceforge/c/cl/clustershell/clustershell/1.7/clustershell-1.7-1.el7.noarch.rpm
```

```
[root@Rack10-JB tmp]# wget ftp://ftp.pbone.net/mirror/ftp.sourceforge.net/pub/sourceforge/c/cl/clustershell/clustershell/1.7/clustershell-1.7-1.el7.noarch.rpm
--2016-07-20 09:19:11-- ftp://ftp.pbone.net/mirror/ftp.sourceforge.net/pub/sourceforge/c/cl/clustershell/clustershell/1.7/clustershell-1.7-1.el7.noarch.rpm
=> "clustershell-1.7-1.el7.noarch.rpm.1"
Resolving ftp.pbone.net... 85.14.85.4
Connecting to ftp.pbone.net|85.14.85.4|:21... connected.
Logging in as anonymous ... Logged in!
==> SYST ... done.      ==> PWD ... done.
==> TYPE I ... done.    ==> CWD (1) /mirror/ftp.sourceforge.net/pub/sourceforge/c/cl/clustershell/clustershell/1.7 ... done.
==> SIZE clustershell-1.7-1.el7.noarch.rpm ... 371336
==> PASV ... done.      ==> RETR clustershell-1.7-1.el7.noarch.rpm ... done.
Length: 371336 (363K) (unauthoritative)

100%[=====>] 371,336      348K/s   in 1.0s
2016-07-20 09:19:15 (348 KB/s) - "clustershell-1.7-1.el7.noarch.rpm.1" saved [371336]
```

```
#scp clustershell-1.7-1.el7.noarch.rpm rhel1:/root/
```

2. Login to rhel1 and install cluster shell.

```
#yum -y install clustershell-1.71.el7.noarch.rpm
```

```

[root@rhel1 ~]# yum -y install clustershell-1.7-1.el7.noarch.rpm
Loaded plugins: product-id, search-disabled-repos, subscription-manager
This system is not registered to Red Hat Subscription Management. You can use subscription-manager to register.
Examining clustershell-1.7-1.el7.noarch.rpm: clustershell-1.7-1.el7.noarch
Marking clustershell-1.7-1.el7.noarch.rpm to be installed
Resolving Dependencies
--> Running transaction check
--> Package clustershell.noarch 0:1.7-1.el7 will be installed
--> Processing Dependency: PyYAML for package: clustershell-1.7-1.el7.noarch
--> Running transaction check
--> Package PyYAML.x86_64 0:3.10-11.el7 will be installed
--> Processing Dependency: libyaml-0.so.2()(64bit) for package: PyYAML-3.10-11.el7.x86_64
--> Running transaction check
--> Package libyaml.x86_64 0:0.1.4-11.el7_0 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

=====
Package Arch Version Repository Size
=====
Installing:
clustershell noarch 1.7-1.el7 /clustershell-1.7-1.el7.noarch 1.8 M
Installing for dependencies:
PyYAML x86_64 3.10-11.el7 rhel7.2 153 k
libyaml x86_64 0.1.4-11.el7_0 rhel7.2 55 k
=====
Transaction Summary
-----
Install 1 Package (+2 Dependent packages)

Total size: 2.0 M
Total download size: 208 k
Installed size: 2.5 M
Downloading packages:
-----
Total 98 MB/s | 208 kB 00:00:00
Running transaction check
Running transaction test
Transaction test succeeded
Running transaction
Installing : libyaml-0.1.4-11.el7_0.x86_64 1/3
Installing : PyYAML-3.10-11.el7.x86_64 2/3
Installing : clustershell-1.7-1.el7.noarch 3/3
Verifying : libyaml-0.1.4-11.el7_0.x86_64 1/3
Verifying : clustershell-1.7-1.el7.noarch 2/3
Verifying : PyYAML-3.10-11.el7.x86_64 3/3

Installed:
clustershell.noarch 0:1.7-1.el7

Dependency Installed:
PyYAML.x86_64 0:3.10-11.el7 libyaml.x86_64 0:0.1.4-11.el7_0

Complete!
[root@rhel1 ~]#

```

3. Edit `/etc/clustershell/groups.d/local.cfg` file to include hostnames for all the nodes of the cluster. This set of hosts is taken when running `clush` with the `'-a'` option.
4. For a 19 node cluster as in our CVD, set groups file as follows:

```
#vi /etc/clustershell/groups.d/local.cfg
```

```

Complete!
[root@rhel1 ~]# vi /etc/clustershell/groups.d/local.cfg
[root@rhel1 ~]#

# ClusterShell groups config local.cfg
#
# Replace /etc/clustershell/groups
#
# Note: file auto-loaded unless /etc/clustershell/groups is present
#
# See also groups.d/cluster.yaml.example for an example of multiple
# sources single flat file setup using YAML syntax.
#
# Feel free to edit to fit your needs.

all: rhel[1-19]

```

```
all: rhel[1-19]
```



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

Installing httpd

Setting up RHEL repo on the admin node requires httpd. To set up RHEL repository on the admin node, complete the following steps:

5. 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
```

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

```
#vi /etc/httpd/conf/httpd.conf
```

```
ServerName 172.16.46.11:80
```

7. Start httpd:

```
#service httpd start
```

```
#chkconfig httpd on
```

```
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 is no need for that additional firewall.

```
#clush -a -b "systemctl stop firewalld"
```

```
#clush -a -b "systemctl disable firewalld"
```

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.

1. To disable SELinux, edit /etc/selinux/config and change the SELINUX line to:

```
SELINUX=disabled.
```

2. To disable SELINUX on all nodes, use the following command:

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

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

```
#clush -a -b "setenforce 0"
```



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

3. Reboot the machine to disable SELinux, if does not take effect. Check it using:


```
#clush -a -b sestatus
```

Set Up all Nodes to Use the RHEL Repository



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

1. Copy the rheliso.repo to all the nodes of the cluster.

```
#clush -w rhel[2-19] -c /var/www/html/rhelrepo/rheliso.repo --  
dest=/etc/yum.repos.d/
```

```
[root@rhel1 ~]# clush -w rhel[2-19] -c /var/www/html/rhelrepo/rheliso.repo --dest=/etc/yum.repos.d/
```

2. Copy the /etc/hosts file to all nodes.

```
#clush -w rhel[2-19] -c /etc/hosts --dest=/etc/hosts
```

3. Purge the yum caches.

```
#clush -a -B yum clean all
```

```
#clush -a -B yum repolist
```



Note: While the suggested configuration is to disable SELinux, if for any reason SELinux needs to be enabled on the cluster, run the following to make sure that httpd is able to read the Yum repofiles.

```
#chcon -R -t httpd_sys_content_t /var/www/html/
```

Configuring DNS

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

To create the host file across all the nodes in the cluster, complete the following steps:

4. Disable Network manager on all nodes.

```
#clush -a -b service NetworkManager stop
```

```
#clush -a -b chkconfig NetworkManager off
```

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

```
#vi /etc/resolv.conf
```

```
nameserver 172.16.46.11
```



Note: This step is needed to set up dnsmasq on the Admin node. Otherwise this file should be updated with the correct nameserver.



Note: Alternatively, `#systemctl start NetworkManager.service` can be used to start the service. `#systemctl stop NetworkManager.service` can be used to stop the service. Use `#systemctl disable NetworkManager.service` to stop a service from being automatically started at boot time.

6. Install and Start dnsmasq on Admin node.

```
#service dnsmasq start
```

```
#chkconfig dnsmasq on
```

7. 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.

8. Ensure DNS is working fine by running the following command on Admin node and any data-node

```
[root@rhel2 ~]# nslookup rhel1
```

```
Server:      172.16.46.11
```

```
Address:    172.16.46.11#53
```

```
Name: rhel1
```

```
Address: 172.16.46.11 ←
```



Note: `yum install -y bind-utils` will need to be run for nslookup utility to run.

Upgrading the Cisco Network Driver for VIC1387

The latest Cisco Network driver is required for performance and updates. To download the latest drivers, go to the link below:

[https://software.cisco.com/download/release.html?mdfid=283862063&release=2.0\(13\)&reind=AVAILABLE&flowid=25886&softwareid=283853158&rellifecycle=&reltype=latest](https://software.cisco.com/download/release.html?mdfid=283862063&release=2.0(13)&reind=AVAILABLE&flowid=25886&softwareid=283853158&rellifecycle=&reltype=latest)



Note that the C-Series and S-Series servers use the same drivers.

1. In the ISO image, the required driver `kmod-enic-2.3.0.30-rhel7u2.el7.x86_64.rpm` can be located at `\Network\Cisco\VIC\RHEL\RHEL7.2`.

2. From a node connected to the Internet, download, extract and transfer `kmod-enic-2.3.0.30-rhel7u2.el7.x86_64.rpm` to `rhel1` (admin node).
3. 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-2.3.0.30-  
rhel7u2.el7.x86_64.rpm
```

```
[root@rhel1 ~]# clush -a -b "rpm -ivh kmod-enic-2.3.0.30-  
rhel7u2.el7.x86_64.rpm"
```

4. 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"
```

```
[root@rhel1 ~]# modinfo enic  
filename:      /lib/modules/2.6.32-573.el6.x86_64/extra/enic/enic.ko  
version:      2.3.0.30
```

Also it is recommended to download the `kmod-megaraid` driver for higher performance , the RPM can be found in the same package at
`\Storage\LSI\Cisco_Storage_12G_SAS_RAID_controller\RHEL\RHEL7.2`

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
```

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.

```
#clush -a -b "yum -y install ntp"
```



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

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


```
#clush -a -b "service ntpd stop"
#clush -a -b "ntpdate rhel1"
#clush -a -b "service ntpd start"
```

5. Ensure restart of NTP daemon across reboots

```
#clush -a -b "systemctl enable ntpd"
```

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.

To confirm that the service is properly configured, use one of the following commands:

```
#clush -B -a rsyslogd -v
#clush -B -a service rsyslog status
```

```
[root@rhel1 ~]# clush -B -a rsyslogd -v
-----
rhel[1-19] (19)
-----
rsyslogd 7.4.7, compiled with:
    FEATURE_REGEX:                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
    uuid support:                 Yes

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

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. Set the value to 64000 on every node.

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

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

```
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
```

2. 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/
```

3. Check that the `/etc/pam.d/su` file contains the following settings:

```
##PAM-1.0

auth            sufficient      pam_rootOK.so

# Uncomment the following line to implicitly trust users in the "wheel"
group.

#auth          sufficient      pam_wheel.so trust use_uid

# Uncomment the following line to require a user to be in the "wheel"
group.

#auth          required        pam_wheel.so use_uid

auth            include          system-auth

account         sufficient      pam_succeed_if.so uid = 0 use_uid quiet

account         include          system-auth

password        include          system-auth

session         include          system-auth

session         optional        pam_xauth.so
```



Note: The 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.

Set TCP Retries

Adjust the `tcp_retries` parameter for the system network to enable 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, setting 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 add the following lines:

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

2. 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/
```

3. Load the settings from default sysctl file `/etc/sysctl.conf` by running.

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

```
[root@rhel1 ~]# clush -B -a sysctl -p
-----
rhel[1-16] (16)
-----
net.ipv4.tcp_retries2 = 5
```

Disable Swapping

1. To reduce Swapping, run the following on all nodes. The variable `vm.swappiness` defines how often swap should be used, 60 is the default.

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

2. 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.

1. To run the following commands for every reboot, copy these commands to `/etc/rc.local` so they are executed automatically for every reboot.

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

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

2. On the Admin node, run the following commands:

```
#rm -f /root/thp_disable
```

```
#echo "echo never > /sys/kernel/mm/transparent_hugepage/enabled" >>
/root/thp_disable
```

```
#echo "echo never > /sys/kernel/mm/transparent_hugepage/defrag " >>
/root/thp_disable
```

3. Copy the following file to each node:

```
#clush -a -b -c /root/thp_disable
```

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

```
#clush -a -b "cat /root/thp_disable >> /etc/rc.d/rc.local"
```

5. Change the permissions of the rc.local file

```
#chmod u+x /etc/rc.d/rc.local
```

6. Start the rc.local service if not started already

```
#systemctl start rc-local
```

Disable IPv6 Defaults

1. 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"
```

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

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

```
[root@rhel1 ~]# clush -a -b sysctl -p
-----
rhel[1-19] (19)
-----
net.ipv4.tcp_retries2 = 5
vm.swappiness = 1
net.ipv6.conf.all.disable_ipv6 = 1
net.ipv6.conf.default.disable_ipv6 = 1
net.ipv6.conf.lo.disable_ipv6 = 1
```

Configuring RAID1 on Hadoop Management Nodes

Configure non-OS disk drives as RAID1 using StorCli commands as described below. The first four disk drives are going to be part of a single RAID1 volume. This volume will be used for HDFS Metadata. This section describes in detail the RAID configuration of disk drives for HDFS Name Node Metadata.

3. To download storcli go to:

http://docs.avagotech.com/docs/1.19.04_StorCLI.zip

4. Extract the zip file and copy storcli-1.19.04-1.noarch.rpm from the linux directory.

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

```
#scp storcli-1.19.04-1.noarch.rpm rhel1:/root/
```


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

```
#clush -a -b -c /root/ storcli-1.19.04-1.noarch.rpm --dest=/root/
```

7. Run the following command to install storcli on all the nodes

```
#clush -a -b "rpm -ivh storcli-1.19.04-1.noarch.rpm"
```

8. 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
storcli64
```

9. Copy storcli64 to all the nodes:

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

10. Run the following script as root user on rhel1 to rhel3 to create the virtual drives for the management nodes.

```
#vi /root/raid1.sh
```

```
./storcli64 -cfgldadd r1[$1:1,$1:2,$1:3,$1:4] wb ra nocachedbadbbu
strpsz1024 -a0
```

The script above requires Enclosure ID as a parameter.

11. Run the following command to get the enclosure id.

```
#./storcli64 pdlist -a0 | grep Enc | grep -v 252 | awk '{print $4}' |
sort | uniq -c | awk '{print $2}'
```

```
#chmod 755 raid1.sh
```

12. 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

Configuring the Virtual Drive (RAID10) for DB Filesystem on Hadoop Management Node

This section describes configuring the remaining 8 disk drives as a RAID10 DB file system with read-ahead cache enabled and write cache enabled while battery is present.

1. **Create a script named `raid10.sh` on the admin node and copy it over to all Master/Management Nodes.**

```
vi /root/raid10.sh
```

2. **Paste the following contents into the file and save it.**

```
/opt/MegaRAID/storcli/storcli64 /c0 add vd type=raid10 drives=$1:5-12  
pdperarray=4 WB ra direct Strip=1024
```

3. **Please add/remove drives based on your configuration.**



Note: Do not execute this script on the Data Nodes.



Note: This script must be executed manually on each of the Management nodes. The script takes the EnclosureID as Input, which would be different on different Management servers.

4. **Change the mode to include execution privileges.**

```
chmod +x /root/raid10.sh
```

5. **Copy the script over to all the Management nodes.**
6. **The script above requires enclosure ID as a parameter. Run the following command to get EnclosureID on each Management node.**

```
/opt/MegaRAID/storcli/storcli64 pdlist -a0 | grep Enc | grep -v 252 |  
awk '{print $4}' | sort | uniq -c | awk '{print $2}'
```

7. **Run the script to create a single RAID10 volume as follows:**

```
./raid10.sh <EnclosureID>
```



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.

Cloudera recommends the following disk configuration for the master nodes.

- At least 10 physical disks in the following configuration
- 2 x RAID1 OS (Root disk)
- 4 x RAID 10 (DB filesystems)
- 2 x RAID 1 HDFS NameNode metadata
- 1 x JBOD - ZooKeeper
- 1 x JBOD - Quorum JournalNode

Configuring Data Drives on Data Nodes

Configure non-OS disk drives as individual RAID0 volumes using the StorCli command as described below. These volumes will be used for HDFS Data.

1. **To create virtual drives with individual RAID 0 configurations on all the data nodes, from the admin node, issue the following command:**

```
#clush -w rhel[4-19] -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 re-configure 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 a Namenode or a Data node. The OS boot partition is skipped. All drives are 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, delete them before running the script. This process is documented in the "Note" section at the end of the section.

```

#vi /root/driveconf.sh

#!/bin/bash

[[ "-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
list+=$(echo $X " ")
done

for X in /dev/sd??
do
list+=$(echo $X " ")
done

for X in $list
do
echo "====="
echo $X
echo "====="

if [[ -b ${X} && `lsbin/parted -s ${X} print quit|bin/grep -c boot` -
ne 0
]]
then
echo "$X bootable - skipping."
continue
else
Y=${X##*/}1
echo "Formatting and Mounting Drive => ${X}"

```

```

/sbin/mkfs.xfs -f ${X}

(( $? )) && continue

#Identify UUID
UUID=`blkid ${X} | cut -d " " -f2 | cut -d "=" -f2 | sed 's/"//g'`

/bin/mkdir -p /data/disk${count}

(( $? )) && continue

echo "UUID of ${X} = ${UUID}, mounting ${X} using UUID on
/data/disk${count}"

/bin/mount -t xfs -o inode64,noatime,nobarrier -U ${UUID}
/data/disk${count}

(( $? )) && continue

echo "UUID=${UUID} /data/disk${count} xfs inode64,noatime,nobarrier 0
0" >> /etc/fstab

((count++))

fi

done

```

2. Copy driveconf.sh to all the nodes with the following command:

```

#chmod 755 /root/driveconf.sh

#clush -a -B -c /root/driveconf.sh

```

3. From the admin node run the following script across all data nodes:

```

#clush -a -B /root/driveconf.sh

```

4. To list the partitions and mount points, run the following from the admin node

```

#clush -a -B df -h

#clush -a -B mount

#clush -a -B cat /etc/fstab

```



Note: In-case there is a need to delete any partitions, it can be done so using the following.

5. Run the mount command ('mount') to identify which drive is mounted to which device /dev/sd<?>
6. umount the drive for which the partition is to be deleted, and run fdisk to delete it as shown below.



Note: Care should be taken **not to delete the OS partition** as this will wipe out the OS.

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

Cluster Verification

This section describes the steps to create the script `cluster_verification.sh` that helps to verify the CPU, memory, NIC, and 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.

1. **Create the script `cluster_verification.sh` as shown, 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 C3260 Storage Server for Big Data and
Analytics \ 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 ${NC}"
clush -a -B "echo -n 'DIMM slots: '; dmidecode |grep -c \
'^[[:space:]]*Locator:'"
clush -a -B "echo -n 'DIMM count is: '; dmidecode | grep \Size| grep -c
'MB'"
clush -a -B " dmidecode | awk '/Memory Device$/ ,/^$/ {print}' |\grep -e
'^Mem' -e Size: -e Speed: -e Part | sort -u | grep -v -e 'NO \ DIMM' -e
'No Module Installed' -e Unknown"
echo ""
echo ""
# probe for cpu info #
echo -e "${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 "ls /sys/class/net | grep ^enp | \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 ""
clush -a -B "echo -n 'CPUspeed Service: '; cpupower frequency-info \
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 ${JAVA_HOME:-Not \
De-fined!}'
echo ""
echo ""
echo -e "${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'
exit

```

2. Change permissions to executable.

```
chmod 755 cluster_verification.sh
```

3. Run the Cluster Verification tool from the admin node. This can be run before starting Hadoop 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 Enterprise is an enterprise grade, hardened Hadoop distribution. Cloudera Enterprise offers Apache Hadoop and its ecosystem into a single tested and certified product. It offers the latest innovations from the open source community with the testing and quality expected from enterprise quality software.

Pre-Requisites for Cloudera Enterprise Installation

This section details the prerequisites for Cloudera Enterprise installation such as setting up Cloudera Enterprise Repo.

Cloudera Manager Repository

1. 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/
```

2. Download Cloudera Manager Repository.

```
#cd /tmp/clouderarepo/
```

```
#wget http://archive.cloudera.com/cm5/redhat/7/x86\_64/cm/cloudera-manager.repo
```

```
[root@Rack10-JB clouderarepo]# wget http://archive.cloudera.com/cm5/redhat/7/x86_64/cm/cloudera-manager.repo
--2016-07-21 10:05:17-- http://archive.cloudera.com/cm5/redhat/7/x86_64/cm/cloudera-manager.repo
Resolving archive.cloudera.com... 151.101.52.167
Connecting to archive.cloudera.com|151.101.52.167|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 290
Saving to: "cloudera-manager.repo.1"

100%[----->] 290      --.-K/s  in 0s
2016-07-21 10:05:17 (49.0 MB/s) - "cloudera-manager.repo.1" saved [290/290]
```

```
# reposync --config=./cloudera-manager.repo --repoid=cloudera-manager
```

```
[root@Rack10-JB clouderarepo]# reposync --config=./cloudera-manager.repo --repoid=cloudera-manager
[cloudera-manager: 1 of 7 ] Downloading RPMS/x86_64/cloudera-manager-agent-5.8.0-1.cm580.p0.42.e17.x86_64.rpm
cloudera-manager-agent-5.8.0-1.cm580.p0.42.e17.x86_64.rpm | 7.8 MB 00:00
[cloudera-manager: 2 of 7 ] Downloading RPMS/x86_64/cloudera-manager-daemons-5.8.0-1.cm580.p0.42.e17.x86_64.rpm
cloudera-manager-daemons-5.8.0-1.cm580.p0.42.e17.x86_64.rpm | 515 MB 00:15
[cloudera-manager: 3 of 7 ] Downloading RPMS/x86_64/cloudera-manager-server-5.8.0-1.cm580.p0.42.e17.x86_64.rpm
cloudera-manager-server-5.8.0-1.cm580.p0.42.e17.x86_64.rpm | 8.3 kB 00:00
[cloudera-manager: 4 of 7 ] Downloading RPMS/x86_64/cloudera-manager-server-db-2-5.8.0-1.cm580.p0.42.e17.x86_64.rpm
cloudera-manager-server-db-2-5.8.0-1.cm580.p0.42.e17.x86_64.rpm | 9.9 kB 00:00
[cloudera-manager: 5 of 7 ] Downloading RPMS/x86_64/enterprise-debuginfo-5.8.0-1.cm580.p0.42.e17.x86_64.rpm
enterprise-debuginfo-5.8.0-1.cm580.p0.42.e17.x86_64.rpm | 29 MB 00:01
[cloudera-manager: 6 of 7 ] Downloading RPMS/x86_64/jdk-6u31-linux-amd64.rpm
jdk-6u31-linux-amd64.rpm | 68 MB 00:02
[cloudera-manager: 7 of 7 ] Downloading RPMS/x86_64/oracle-j2sdk1.7-1.7.0+update67-1.x86_64.rpm
oracle-j2sdk1.7-1.7.0+update67-1.x86_64.rpm | 135 MB 00:05
```

This downloads the Cloudera Manager RPMs needed for the Cloudera repository.

3. Run the following command to move the RPMs
4. Copy the repository directory to the admin node (rhel1)

```
#scp -r /tmp/clouderarepo/ rhel1:/var/www/html/
```

5. On admin node (rhel1) run create repo command.

```
#cd /var/www/html/clouderarepo/

#createrepo --baseurl http://172.16.46.11/clouderarepo/cloudera-
manager/

/var/www/html/clouderarepo/cloudera-manager
```



```
Spawning worker 39 with 0 pkgs
Spawning worker 40 with 0 pkgs
Spawning worker 41 with 0 pkgs
Spawning worker 42 with 0 pkgs
Spawning worker 43 with 0 pkgs
Spawning worker 44 with 0 pkgs
Spawning worker 45 with 0 pkgs
Spawning worker 46 with 0 pkgs
Spawning worker 47 with 0 pkgs
Spawning worker 48 with 0 pkgs
Spawning worker 49 with 0 pkgs
Spawning worker 50 with 0 pkgs
Spawning worker 51 with 0 pkgs
Spawning worker 52 with 0 pkgs
Spawning worker 53 with 0 pkgs
Spawning worker 54 with 0 pkgs
Spawning worker 55 with 0 pkgs
Workers Finished
Saving Primary metadata
Saving file lists metadata
Saving other metadata
Generating sqlite DBs
Sqlite DBs complete
```



Note: Visit <http://172.16.46.11/clouderarepo/> to verify the files.

6. Create the Cloudera Manager repo file with following contents:

```
#vi /var/www/html/clouderarepo/cloudera-manager/cloudera-manager.repo

[cloudera-manager]

name=Cloudera Manager

baseurl=http://172.16.46.11/clouderarepo/cloudera-manager/

gpgcheck=0

enabled=1
```

7. 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/
```

8. From the admin node copy the repo files to /etc/yum.repos.d/ of all the nodes of the cluster.

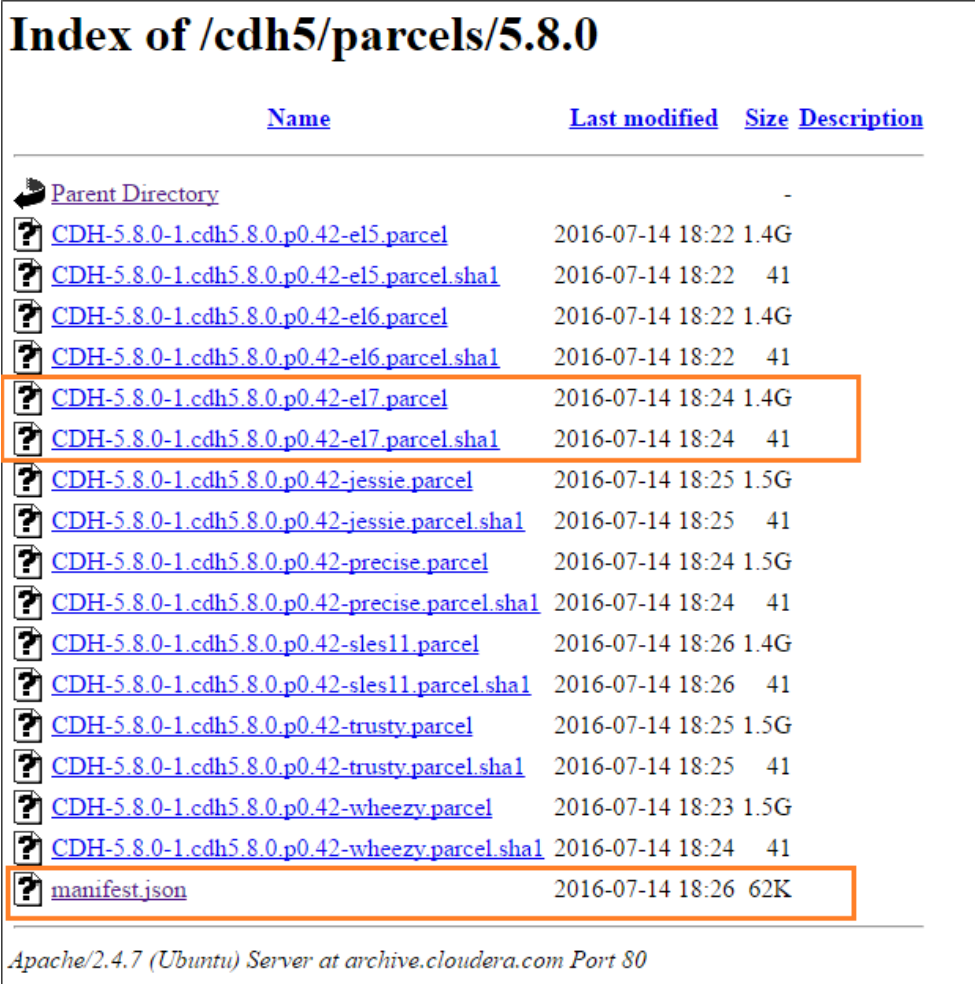
```
#clush -a -B -c /etc/yum.repos.d/cloudera-manager.repo
```

Setting up the Local Parcels for Cloudera Enterprise 5.8.0



















From a host connected the internet, download the appropriate Cloudera Enterprise 5.8.0 parcels that are meant for RHEL7.2 from the URL: <http://archive.cloudera.com/cdh5/parcels/> and place them in the directory “/var/www/html/CDH5.8.0_Parcel” of the Admin node.

The following list shows the relevant files for RHEL7.2, as shown in the figure below:

- CDH-5.8.0-1.cdh5.8.0.p0.42-el7.parcel
- CDH-5.8.0-1.cdh5.8.0.p0.42-el7.parcel.sha1 and
- manifest.json



Index of /cdh5/parcels/5.8.0

<u>Name</u>	<u>Last modified</u>	<u>Size</u>	<u>Description</u>
 Parent Directory		-	
 CDH-5.8.0-1.cdh5.8.0.p0.42-el5.parcel	2016-07-14 18:22	1.4G	
 CDH-5.8.0-1.cdh5.8.0.p0.42-el5.parcel.sha1	2016-07-14 18:22	41	
 CDH-5.8.0-1.cdh5.8.0.p0.42-el6.parcel	2016-07-14 18:22	1.4G	
 CDH-5.8.0-1.cdh5.8.0.p0.42-el6.parcel.sha1	2016-07-14 18:22	41	
 CDH-5.8.0-1.cdh5.8.0.p0.42-el7.parcel	2016-07-14 18:24	1.4G	
 CDH-5.8.0-1.cdh5.8.0.p0.42-el7.parcel.sha1	2016-07-14 18:24	41	
 CDH-5.8.0-1.cdh5.8.0.p0.42-jessie.parcel	2016-07-14 18:25	1.5G	
 CDH-5.8.0-1.cdh5.8.0.p0.42-jessie.parcel.sha1	2016-07-14 18:25	41	
 CDH-5.8.0-1.cdh5.8.0.p0.42-precise.parcel	2016-07-14 18:24	1.5G	
 CDH-5.8.0-1.cdh5.8.0.p0.42-precise.parcel.sha1	2016-07-14 18:24	41	
 CDH-5.8.0-1.cdh5.8.0.p0.42-sles11.parcel	2016-07-14 18:26	1.4G	
 CDH-5.8.0-1.cdh5.8.0.p0.42-sles11.parcel.sha1	2016-07-14 18:26	41	
 CDH-5.8.0-1.cdh5.8.0.p0.42-trusty.parcel	2016-07-14 18:25	1.5G	
 CDH-5.8.0-1.cdh5.8.0.p0.42-trusty.parcel.sha1	2016-07-14 18:25	41	
 CDH-5.8.0-1.cdh5.8.0.p0.42-wheezy.parcel	2016-07-14 18:23	1.5G	
 CDH-5.8.0-1.cdh5.8.0.p0.42-wheezy.parcel.sha1	2016-07-14 18:24	41	
 manifest.json	2016-07-14 18:26	62K	

Apache/2.4.7 (Ubuntu) Server at archive.cloudera.com Port 80

Downloading Parcels

1. From a host connected to the Internet, download the Cloudera’s parcels as shown below and transfer it to the admin node.

```
#mkdir -p /tmp/CDH5.8.0_Parcel
```

2. Download parcels:

```
#cd /tmp/CDH5.8.0_Parcels

# wget http://archive.cloudera.com/cdh5/parcels/5.8.0/CDH-5.8.0-1.cdh5.8.0.p0.42-e17.parcel

# wget http://archive.cloudera.com/cdh5/parcels/5.8.0/CDH-5.8.0-1.cdh5.8.0.p0.42-e17.parcel.sha1

# wget http://archive.cloudera.com/cdh5/parcels/5.8.0/manifest.json
```

```
[root@rack10-JB CDH5.8.0_Parcels]# wget http://archive.cloudera.com/cdh5/parcels/5.8.0/CDH-5.8.0-1.cdh5.8.0.p0.42-e17.parcel
--2016-07-20 15:12:55-- http://archive.cloudera.com/cdh5/parcels/5.8.0/CDH-5.8.0-1.cdh5.8.0.p0.42-e17.parcel
Resolving archive.cloudera.com... 151.101.52.167
Connecting to archive.cloudera.com[151.101.52.167]:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 1486884451 (1.4G)
Saving to: "CDH-5.8.0-1.cdh5.8.0.p0.42-e17.parcel"

100%[=====>] 1,486,884,451 42.5M/s in 39s

2016-07-20 15:13:34 (36.6 MB/s) - "CDH-5.8.0-1.cdh5.8.0.p0.42-e17.parcel" saved [1486884451/1486884451]

[root@rack10-JB CDH5.8.0_Parcels]# wget http://archive.cloudera.com/cdh5/parcels/5.8.0/CDH-5.8.0-1.cdh5.8.0.p0.42-e17.parcel.sha1
--2016-07-20 15:13:51-- http://archive.cloudera.com/cdh5/parcels/5.8.0/CDH-5.8.0-1.cdh5.8.0.p0.42-e17.parcel.sha1
Resolving archive.cloudera.com... 151.101.52.167
Connecting to archive.cloudera.com[151.101.52.167]:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 41 [application/x-sha1]
Saving to: "CDH-5.8.0-1.cdh5.8.0.p0.42-e17.parcel.sha1"

100%[=====>] 41 --.-K/s in 0s

2016-07-20 15:13:51 (7.80 MB/s) - "CDH-5.8.0-1.cdh5.8.0.p0.42-e17.parcel.sha1" saved [41/41]
```

```
[root@rack10-JB CDH5.8.0_Parcels]# wget http://archive.cloudera.com/cdh5/parcels/5.8.0/manifest.json
--2016-07-20 15:15:04-- http://archive.cloudera.com/cdh5/parcels/5.8.0/manifest.json
Resolving archive.cloudera.com... 151.101.52.167
Connecting to archive.cloudera.com[151.101.52.167]:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 63997 (62K) [application/json]
Saving to: "manifest.json"

100%[=====>] 63,997 --.-K/s in 0.04s

2016-07-20 15:15:04 (1.48 MB/s) - "manifest.json" saved [63997/63997]
```

3. Now edit the /tmp/clouderarepo/CDH5.8_Parcels/manifest.json file and remove the scripts that are not meant for RHEL7.2. Below is that script which can be copy and pasted.



Note: Please make sure the script starts and end with initial additional braces.

```
[root@rhel1 CDH5.8.0_Parcels]# cat manifest.json
{
  "lastUpdated": 14685205130000,
  "parcels": [
    {
      "parcelName": "CDH-5.8.0-1.cdh5.8.0.p0.42-e17.parcel",
```

```
"components": [  
  {  
    "pkg_version": "0.7.0+cdh5.8.0+0",  
    "pkg_release": "1.cdh5.8.0.p0.73",  
    "name": "bigtop-tomcat",  
    "version": "6.0.44-cdh5.8.0"  
  },  
  {  
    "pkg_version": "0.11.0+cdh5.8.0+91",  
    "pkg_release": "1.cdh5.8.0.p0.77",  
    "name": "crunch",  
    "version": "0.11.0-cdh5.8.0"  
  },  
  {  
    "pkg_version": "1.6.0+cdh5.8.0+50",  
    "pkg_release": "1.cdh5.8.0.p0.75",  
    "name": "flume-ng",  
    "version": "1.6.0-cdh5.8.0"  
  },  
  {  
    "pkg_version": "2.6.0+cdh5.8.0+1601",  
    "pkg_release": "1.cdh5.8.0.p0.93",  
    "name": "hadoop-0.20-mapreduce",  
    "version": "2.6.0-cdh5.8.0"  
  },  
  {  
    "pkg_version": "2.6.0+cdh5.8.0+1601",  
    "pkg_release": "1.cdh5.8.0.p0.93",  
    "name": "hadoop",  
    "version": "2.6.0-cdh5.8.0"  
  },  
  {
```

```

    "pkg_version": "2.6.0+cdh5.8.0+1601",
    "pkg_release": "1.cdh5.8.0.p0.93",
    "name": "hadoop-hdfs",
    "version": "2.6.0-cdh5.8.0"
  },
  {
    "pkg_version": "2.6.0+cdh5.8.0+1601",
    "pkg_release": "1.cdh5.8.0.p0.93",
    "name": "hadoop-httpfs",
    "version": "2.6.0-cdh5.8.0"
  },
  {
    "pkg_version": "2.6.0+cdh5.8.0+1601",
    "pkg_release": "1.cdh5.8.0.p0.93",
    "name": "hadoop-kms",
    "version": "2.6.0-cdh5.8.0"
  },
  {
    "pkg_version": "2.6.0+cdh5.8.0+1601",
    "pkg_release": "1.cdh5.8.0.p0.93",
    "name": "hadoop-mapreduce",
    "version": "2.6.0-cdh5.8.0"
  },
  {
    "pkg_version": "2.6.0+cdh5.8.0+1601",
    "pkg_release": "1.cdh5.8.0.p0.93",
    "name": "hadoop-yarn",
    "version": "2.6.0-cdh5.8.0"
  },
  {
    "pkg_version": "1.2.0+cdh5.8.0+160",
    "pkg_release": "1.cdh5.8.0.p0.80",

```

```

    "name": "hbase",
    "version": "1.2.0-cdh5.8.0"
  },
  {
    "pkg_version": "1.5+cdh5.8.0+64",
    "pkg_release": "1.cdh5.8.0.p0.75",
    "name": "hbase-solr",
    "version": "1.5-cdh5.8.0"
  },
  {
    "pkg_version": "1.1.0+cdh5.8.0+610",
    "pkg_release": "1.cdh5.8.0.p0.77",
    "name": "hive",
    "version": "1.1.0-cdh5.8.0"
  },
  {
    "pkg_version": "1.1.0+cdh5.8.0+610",
    "pkg_release": "1.cdh5.8.0.p0.77",
    "name": "hive-hcatalog",
    "version": "1.1.0-cdh5.8.0"
  },
  {
    "pkg_version": "3.9.0+cdh5.8.0+2512",
    "pkg_release": "1.cdh5.8.0.p0.88",
    "name": "hue",
    "version": "3.9.0-cdh5.8.0"
  },
  {
    "pkg_version": "2.6.0+cdh5.8.0+0",
    "pkg_release": "1.cdh5.8.0.p0.111",
    "name": "impala",
    "version": "2.6.0-cdh5.8.0"
  }

```



```
},
{
  "pkg_version": "1.0.0+cdh5.8.0+136",
  "pkg_release": "1.cdh5.8.0.p0.73",
  "name": "kite",
  "version": "1.0.0-cdh5.8.0"
},
{
  "pkg_version": "1.0.0+cdh5.8.0+0",
  "pkg_release": "1.cdh5.8.0.p0.73",
  "name": "llama",
  "version": "1.0.0-cdh5.8.0"
},
{
  "pkg_version": "0.9+cdh5.8.0+27",
  "pkg_release": "1.cdh5.8.0.p0.71",
  "name": "mahout",
  "version": "0.9-cdh5.8.0"
},
{
  "pkg_version": "4.1.0+cdh5.8.0+291",
  "pkg_release": "1.cdh5.8.0.p0.83",
  "name": "oozie",
  "version": "4.1.0-cdh5.8.0"
},
{
  "pkg_version": "1.5.0+cdh5.8.0+174",
  "pkg_release": "1.cdh5.8.0.p0.71",
  "name": "parquet",
  "version": "1.5.0-cdh5.8.0"
},
{
```

```

    "pkg_version": "0.12.0+cdh5.8.0+83",
    "pkg_release": "1.cdh5.8.0.p0.71",
    "name": "pig",
    "version": "0.12.0-cdh5.8.0"
  },
  {
    "pkg_version": "1.5.1+cdh5.8.0+244",
    "pkg_release": "1.cdh5.8.0.p0.83",
    "name": "sentry",
    "version": "1.5.1-cdh5.8.0"
  },
  {
    "pkg_version": "4.10.3+cdh5.8.0+423",
    "pkg_release": "1.cdh5.8.0.p0.79",
    "name": "solr",
    "version": "4.10.3-cdh5.8.0"
  },
  {
    "pkg_version": "1.6.0+cdh5.8.0+205",
    "pkg_release": "1.cdh5.8.0.p0.74",
    "name": "spark",
    "version": "1.6.0-cdh5.8.0"
  },
  {
    "pkg_version": "1.99.5+cdh5.8.0+38",
    "pkg_release": "1.cdh5.8.0.p0.72",
    "name": "sqoop2",
    "version": "1.99.5-cdh5.8.0"
  },
  {
    "pkg_version": "1.4.6+cdh5.8.0+65",
    "pkg_release": "1.cdh5.8.0.p0.69",

```

```

        "name": "sqoop",
        "version": "1.4.6-cdh5.8.0"
    },
    {
        "pkg_version": "0.9.0+cdh5.8.0+17",
        "pkg_release": "1.cdh5.8.0.p0.68",
        "name": "whirr",
        "version": "0.9.0-cdh5.8.0"
    },
    {
        "pkg_version": "3.4.5+cdh5.8.0+94",
        "pkg_release": "1.cdh5.8.0.p0.76",
        "name": "zookeeper",
        "version": "3.4.5-cdh5.8.0"
    }
],
"replaces": "IMPALA, SOLR, SPARK",
"hash": "26f281689fc24bde3ed0a34fb895417a88834fa3"
}
]
}

```

4. Copy /tmp/CDH5.8.0_Parcels to the admin node (rhel1)

```
#scp -r /tmp/CDH5.8.0_Parcels/ rhel1:/var/www/html/
```

5. Verify that these files are accessible by visiting the URL http://172.16.46.11/CDH5.8.0_Parcels/ in admin node.

Setting Up the MariaDB Database for Cloudera Manager

- Install the MariaDB Server
- Configure and Start the MariaDB Server
- Install the MariaDB/MySQL JDBC Driver

- Create Databases for Activity Monitor, Reports Manager, Hive Metastore Server, Sentry Server, Cloudera Navigator Audit Server, and Cloudera Navigator Metadata Server

Installing the MariaDB Server

To use a MariaDB database, complete the following steps:

1. In the admin node where Cloudera Manager will be installed, use the following command to install the mariadb/mysql server.

```
#yum -y install mariadb-server
```

2. To configure and start the MySQL Server, stop the MariaDB server if it is running.

```
#systemctl stop mariadb.service
```

3. Move the old InnoDB log if exists.

4. 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
```

5. Determine the location of the option file, my.cnf and edit/add following lines:

```
#vi /etc/my.cnf
```

```
[mysqld]
```

```
transaction-isolation = READ-COMMITTED
```

```
# InnoDB settings
```

```
innodb_flush_method = O_DIRECT
```

```
max_connections = 550
```

```
[root@rhell ~]# vi /etc/my.cnf
[root@rhell ~]# 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/mysql.log
pid-file=/var/run/mysqld/mysqld.pid

# InnoDB settings
innodb_flush_method = O_DIRECT

max_connections = 550
```



Note: The `max_connections` need to be increased based on number of nodes and applications. Please follow the recommendations as mentioned in the Cloudera document http://www.cloudera.com/documentation/enterprise/latest/topics/install_cm_mariadb.html - [install_cm_mariadb_config](#)

6. Ensure MySQL Server starts at boot:

```
#systemctl enable mariadb.service
```

7. Start the MySQL Server:

```
#systemctl start mariadb.service
```

8. Set the MySQL root password on admin node (rhel1)

```
#cd /usr/bin/
```

```
#mysql_secure_installation
```

```

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 MariaDB
root user without the proper authorisation.

Set root password? [Y/n] y
New password:
Re-enter new password:
Password updated successfully!
Reloading privilege tables..
... Success!

By default, a MariaDB installation has an anonymous user, allowing anyone
to log into MariaDB 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, MariaDB 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 MariaDB
installation should now be secure.

```

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.

1. From a host connected to the Internet, download the MySQL JDBC Driver and transfer it to the admin node. Download the MySQL JDBC driver from the URL <http://www.mysql.com/downloads/connector/j/5.1.html>

2. Copy `mysql-connector-java-5.1.39.tar.gz` to admin node(rhel1)

```
#scp mysql-connector-java-5.1.39.tar.gz rhel1:/root/
```

3. Log in to the admin node and extract the file:

```
#tar xzvf mysql-connector-java-5.1.39.tar.gz
```

4. Create the `/usr/share/java/` directory on the admin node (rhel1)

```
#mkdir -p /usr/share/java/
```

5. Go to the `mysql-connector-java-5.1.39` directory on the admin node (rhel1) and copy `mysql-connector-java-5.1.39-bin.jar` to `/usr/share/java/`

```
#cd mysql-connector-java-5.1.39
```

```
#cp mysql-connector-java-5.1.39-bin.jar /usr/share/java/mysql-connector-java.jar
```

Creating Databases for Servers

To create databases for Activity Monitor, Reports Manager, Hive Metastore Server, Navigator Audit Server and Navigator Metadata Server

1. In the admin node Log into MySQL as the root user:

```
#mysql -u root -p
```

2. Enter the password that was supplied in step 8 above.

Enter password:

3. Create databases for the Activity Monitor, Reports Manager and Hive Metastore Server using the command below

```
MariaDB [(none)]> create database amon DEFAULT CHARACTER SET utf8;
MariaDB [(none)]> create database hue DEFAULT CHARACTER SET utf8;
MariaDB [(none)]> create database rman DEFAULT CHARACTER SET utf8;
MariaDB [(none)]> create database metastore DEFAULT CHARACTER SET utf8;
MariaDB [(none)]> create database nav DEFAULT CHARACTER SET utf8;
MariaDB [(none)]> create database navms DEFAULT CHARACTER SET utf8;
MariaDB [(none)]> create database sentry DEFAULT CHARACTER SET utf8;
MariaDB [(none)]> create database oozie DEFAULT CHARACTER SET utf8;
```

```
MariaDB [(none)]> grant all on rman.*TO 'root'@'%' IDENTIFIED BY 'password';

MariaDB [(none)]> grant all on hue.*TO 'root'@'%' IDENTIFIED BY 'password';

MariaDB [(none)]> grant all on metastore.*TO 'root'@'%' IDENTIFIED BY 'password';

MariaDB [(none)]> grant all on amon.*TO 'root'@'%' IDENTIFIED BY 'password';

MariaDB [(none)]> grant all on nav.*TO 'root'@'%' IDENTIFIED BY 'password';

MariaDB [(none)]> grant all on navms.*TO 'root'@'%' IDENTIFIED BY 'password';

MariaDB [(none)]> grant all on sentry.*TO 'root'@'%' IDENTIFIED BY 'password';

MariaDB [(none)]> grant all privileges on oozie.* to root@'%' IDENTIFIED BY 'password';

MariaDB [(none)]> grant all on rman.*TO 'rman'@'%' IDENTIFIED BY 'password';

MariaDB [(none)]> grant all on hue.*TO 'hue'@'%' IDENTIFIED BY 'password';

MariaDB [(none)]> grant all on metastore.*TO 'hive'@'%' IDENTIFIED BY 'password';

MariaDB [(none)]> grant all on amon.*TO 'amon'@'%' IDENTIFIED BY 'password';

MariaDB [(none)]> grant all on nav.*TO 'nav'@'%' IDENTIFIED BY 'password';

MariaDB [(none)]> grant all on navms.*TO 'navms'@'%' IDENTIFIED BY 'password';

MariaDB [(none)]> grant all on sentry.*TO 'root'@'%' IDENTIFIED BY 'password';

MariaDB [(none)]> grant all privileges on oozie.* to oozie@'%' IDENTIFIED BY 'password';
```



```
[root@rhel1 mysql-connector-java-5.1.37]# mysql -u root -p
Enter password:
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 9
Server version: 5.5.41-MariaDB MariaDB Server

Copyright (c) 2000, 2014, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> create database amon DEFAULT CHARACTER SET utf8;
Query OK, 1 row affected (0.00 sec)

MariaDB [(none)]> create database rman DEFAULT CHARACTER SET utf8;
Query OK, 1 row affected (0.00 sec)

MariaDB [(none)]> create database metastore DEFAULT CHARACTER SET utf8;
Query OK, 1 row affected (0.00 sec)

MariaDB [(none)]> create database nav DEFAULT CHARACTER SET utf8;
Query OK, 1 row affected (0.00 sec)

MariaDB [(none)]> create database navms DEFAULT CHARACTER SET utf8;
Query OK, 1 row affected (0.00 sec)

MariaDB [(none)]> grant all on rman.*TO 'root'@'%' IDENTIFIED BY 'password';
Query OK, 0 rows affected (0.00 sec)

MariaDB [(none)]> grant all on metastore.*TO 'root'@'%' IDENTIFIED BY 'password';
Query OK, 0 rows affected (0.00 sec)

MariaDB [(none)]> grant all on amon.*TO 'root'@'%' IDENTIFIED BY 'password';
Query OK, 0 rows affected (0.01 sec)

MariaDB [(none)]> grant all on amon.*TO 'root'@'%' IDENTIFIED BY 'password';
Query OK, 0 rows affected (0.00 sec)

MariaDB [(none)]> grant all on nav.*TO 'root'@'%' IDENTIFIED BY 'password';
Query OK, 0 rows affected (0.00 sec)

MariaDB [(none)]> grant all on navms.*TO 'root'@'%' IDENTIFIED BY 'password';
Query OK, 0 rows affected (0.00 sec)

MariaDB [(none)]> quit
Bye
```

Installing Cloudera Manager

The following section describes installation of Cloudera Manager first and then using Cloudera Manager to install Cloudera Enterprise 5.8.

Setting Up the Cloudera Manager Server Database

The Cloudera Manager Server Database stores information about service and host configurations.

Installing Cloudera Manager

Cloudera Manager, an end to end management application, is used to install and configure Cloudera Enterprise. During Cloudera Enterprise 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.

To install Cloudera Manager, complete the following steps:

1. 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/
```

2. Install the Oracle Java Development Kit on all the host. (download the JDK1.8)

```
#clush -a -b rpm -ivh jdk-8u101-linux-x64.rpm
```

```
[root@rhel1 ~]# clush -a -b rpm -ivh jdk-8u101-linux-x64.rpm
-----
rhel[1-19] (19)
-----
Preparing...                               #####
Updating / installing...                   #####
jdk1.8.0_101-2000:1.8.0_101-fcs           #####
Unpacking JAR files...
  tools.jar...
  plugin.jar...
  javaws.jar...
  deploy.jar...
  rt.jar...
  jsse.jar...
  charsets.jar...
  localedata.jar...
```

3. Install the Cloudera Manager Server packages either on the host where the database is installed, or on a host that has access to the database.

```
#yum install cloudera-manager-daemons cloudera-manager-server
```

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 (rhel1) admin node.

```
cd /usr/share/cmfd/schema
./scm_prepare_database.sh mysql amon root <password>
./scm_prepare_database.sh mysql hue root <password>
./scm_prepare_database.sh mysql rman root <password>
./scm_prepare_database.sh mysql metastore root <password>
./scm_prepare_database.sh mysql nav root <password>
./scm_prepare_database.sh mysql navms root <password>
./scm_prepare_database.sh mysql sentry root <password>
./scm_prepare_database.sh mysql oozie root <password>
```

2. Verify the database connectivity using the following command.

```
[root@rhell ~]# mysql -u root -p
mysql> connect amon
mysql> connect rman
mysql> connect metastore
mysql> connect nav
mysql> connect navms
mysql> connect sentry
mysql> connect oozie
```

```
[root@rhell1 ~]# mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 14
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: 15
Current database: amon

mysql> connect rman
Connection id: 16
Current database: rman

mysql> connect metastore
Connection id: 17
Current database: metastore
```

The MySQL External database setup is complete.

Starting the Cloudera Manager Server

1. **Start the Cloudera Manager Server**

```
#service cloudera-scm-server start
```

2. **Access the Cloudera Manager using the URL, <http://172.16.46.11:7180> to verify that the server is up.**
3. **Once the installation of Cloudera Manager is complete, install Cloudera Enterprise 5 using the Cloudera Manager Web interface.**

Installing Cloudera Enterprise

To install the Cloudera Enterprise Data Hub, complete the following steps:

1. **Login to the Cloudera Manager. Enter "admin" for both the Username and Password fields.**

admin

.....

Log In

Remember me

2. If you do not have a Cloudera license, select Cloudera Enterprise Data Hub Trial Edition. If you do have a Cloudera license, Click "Upload License" and select your license.
3. Based on requirement, choose appropriate Cloudera Editions for the Installation. (Figure 143)

Figure 143 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 Upload License Select License File <input type="button" value="Upload"/>
Node Limit	Unlimited	Unlimited	Unlimited
CDH	✓	✓	✓
Core Cloudera Manager Features	✓	✓	✓
Advanced Cloudera Manager Features		✓	✓
Cloudera Navigator		✓	✓
Cloudera Navigator Key Trustee			✓
Cloudera Support			✓

Cloudera Enterprise is available in three editions:

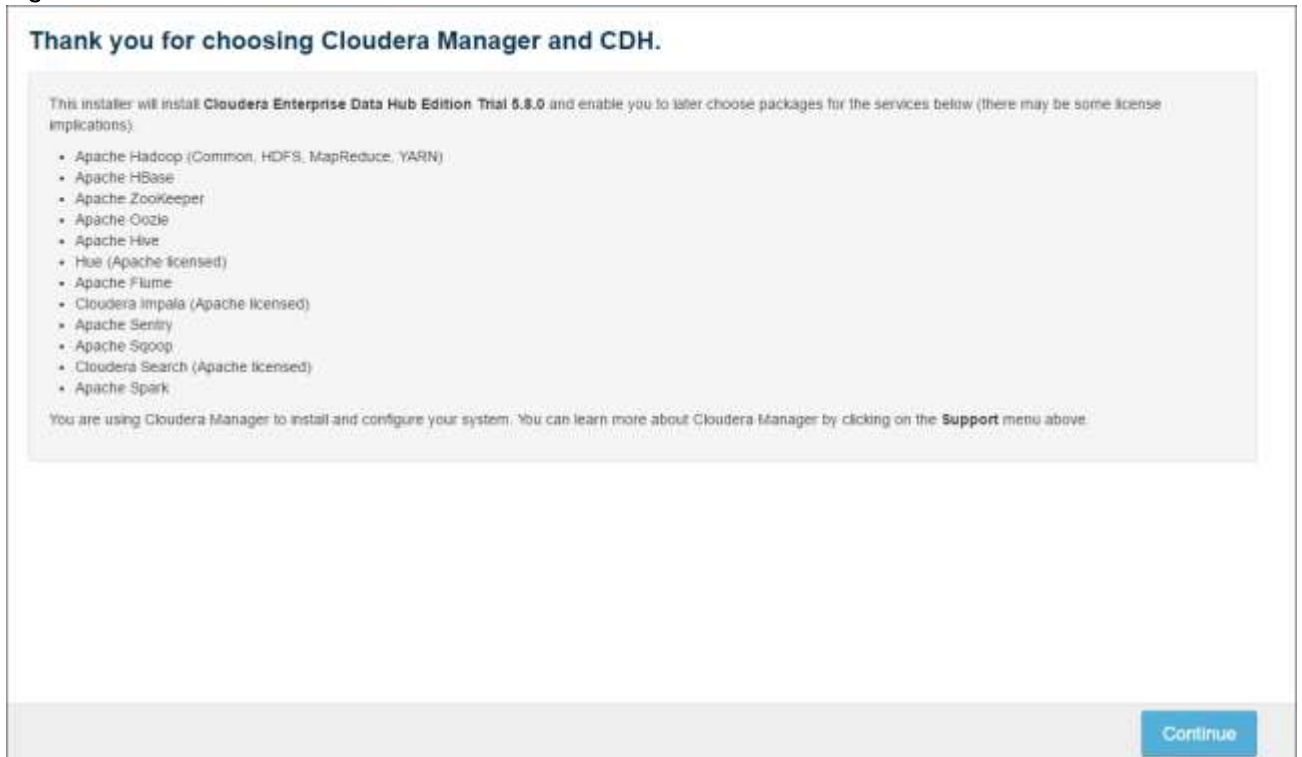
- Basic Edition
- Flex Edition
- Data Hub Edition

See [full list of features available](#) in Cloudera Express and Cloudera Enterprise.

Back

4. Click Continue on the confirmation page. (Figure 144)

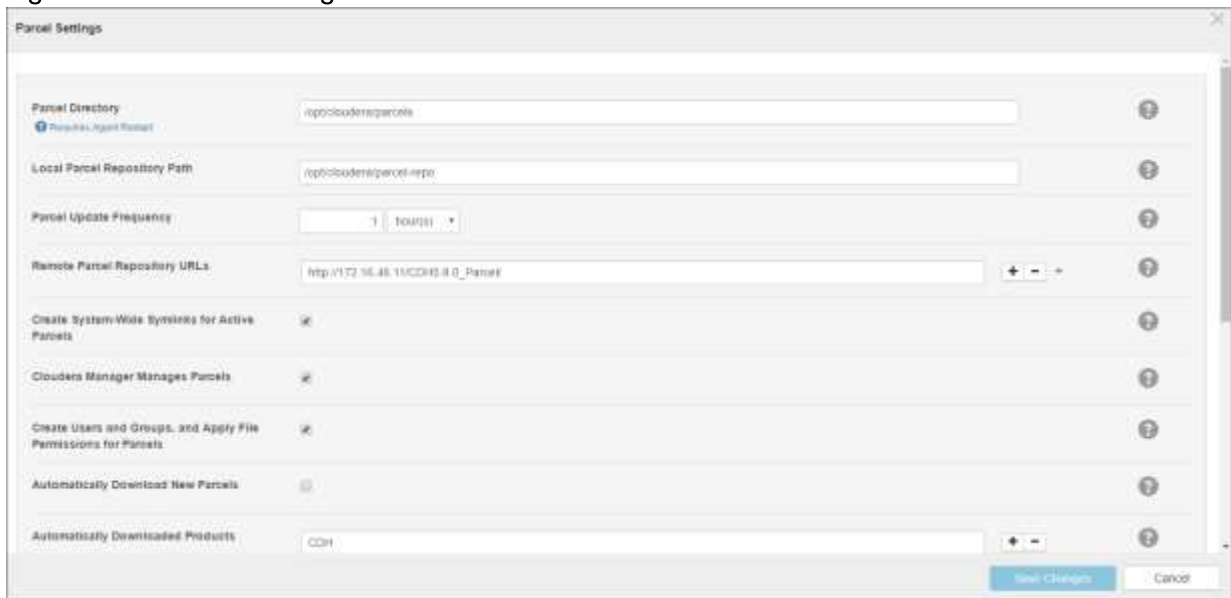
Figure 144 Cloudera Installer



Edit the Cloudera Enterprise Parcel Settings to Use the CDH 5.8.0 Parcels

5. Open another tab in the same browser window and visit the URL:
<http://172.16.46.11:7180/cm/parcel/status> to modify the parcel settings.
6. Click Configuration on this page.
7. Click to remove the entire remote repository URLs, and add the URL to the location where we kept the CDH 5.8.0 parcels i.e. http://172.16.46.11/CDH5.8.0_Parcels/ (Figure 145)

Figure 145 Parcel Settings



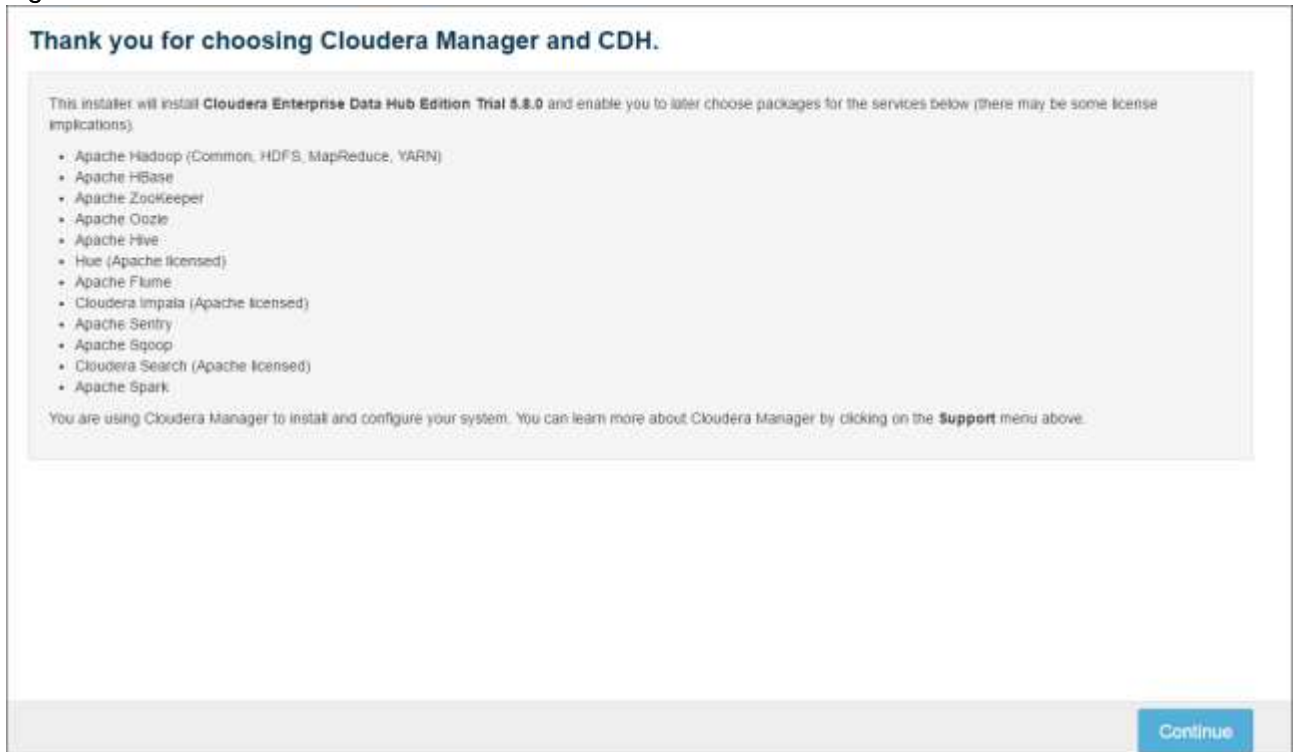
The image shows a 'Parcel Settings' dialog box with the following fields and options:

- Parcel Directory:** /opt/cloudera/parcels
- Local Parcel Repository Path:** /opt/cloudera/parcel-repo
- Parcel Update Frequency:** 1 hours
- Remote Parcel Repository URLs:** http://172.16.46.11:CDH5.8.0_Parcels
- Create System-Wide Systems for Active Parcels:**
- Cloudera Manager Manages Parcels:**
- Create Users and Groups, and Apply File Permissions for Parcels:**
- Automatically Download New Parcels:**
- Automatically Downloaded Products:** CDH

Buttons at the bottom right: Save Changes, Cancel.

8. Click Save Changes to finish the configuration.
9. Navigate back to the Cloudera installation home page i.e. <http://172.16.46.11:7180>
10. Click Continue on the confirmation page. (Figure 146)

Figure 146 Cloudera Installer



Thank you for choosing Cloudera Manager and CDH.

This installer will install **Cloudera Enterprise Data Hub Edition Trial 5.8.0** 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.

Continue

11. 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 the IP addresses range.

172.16.46.[11-19] or rhel[1-19]

12. After the IP addresses or hostnames are entered, click Search. (Figure 147)

Figure 147 Searching for Cluster Nodes

Specify hosts for your CDH cluster installation.

Hint: Search for hostnames and/or IP addresses using [patterns](#) #

rhel[1-19]

SSH Port:

13. Cloudera Manager will "discover" the nodes in the cluster. Verify that all desired nodes have been found and selected for installation. (Figure 148)

Figure 148 Specify Hosts for the Cluster

Specify hosts for your CDH cluster installation.

Hosts should be specified using the same hostname (FQDN) that they will identify themselves with.
Cloudera recommends including Cloudera Manager Server's host. This also enables health monitoring for that host.

Hint: Search for hostnames and/or IP addresses using [patterns](#) #

19 hosts scanned, 19 returning SSH.

<input checked="" type="checkbox"/>	Expanded Query	Hostname (FQDN)	IP Address	Currently Managed	Result
<input checked="" type="checkbox"/>	rhel1	rhel1	172.16.46.11	No	✓ Host ready: 1 ms response time.
<input checked="" type="checkbox"/>	rhel10	rhel10	172.16.46.20	No	✓ Host ready: 0 ms response time.
<input checked="" type="checkbox"/>	rhel11	rhel11	172.16.46.21	No	✓ Host ready: 1 ms response time.
<input checked="" type="checkbox"/>	rhel12	rhel12	172.16.46.22	No	✓ Host ready: 1 ms response time.
<input checked="" type="checkbox"/>	rhel13	rhel13	172.16.46.23	No	✓ Host ready: 0 ms response time.
<input checked="" type="checkbox"/>	rhel14	rhel14	172.16.46.24	No	✓ Host ready: 1 ms response time.
<input checked="" type="checkbox"/>	rhel15	rhel15	172.16.46.25	No	✓ Host ready: 1 ms response time.
<input checked="" type="checkbox"/>	rhel16	rhel16	172.16.46.26	No	✓ Host ready: 1 ms response time.
<input checked="" type="checkbox"/>	rhel17	rhel17	172.16.46.27	No	✓ Host ready: 1 ms response time.
<input checked="" type="checkbox"/>	rhel18	rhel18	172.16.46.28	No	✓ Host ready: 0 ms response time.

14. Click Continue.

15. For the method of installation, select the Use Parcels (Recommended) radio button. (Figure 149)

16. For the CDH version, select the CDH5.8.0-1.cd5.8.0.p0.42 radio button.

17. For the specific release of Cloudera Manager, select the Custom Repository radio button.
18. Enter the URL for the repository within the admin node.
<http://172.16.46.11/clouderarepo/cloudera-manager> as in Figure 149, and click Continue as in Figure 150

Figure 149 Cluster Installation

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, automating the 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 updates are 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-5.8.0-1.cdh5.8.0.p0.42
Versions of CDH that are too new for this version of Cloudera Manager (5.8.0) will not be shown.

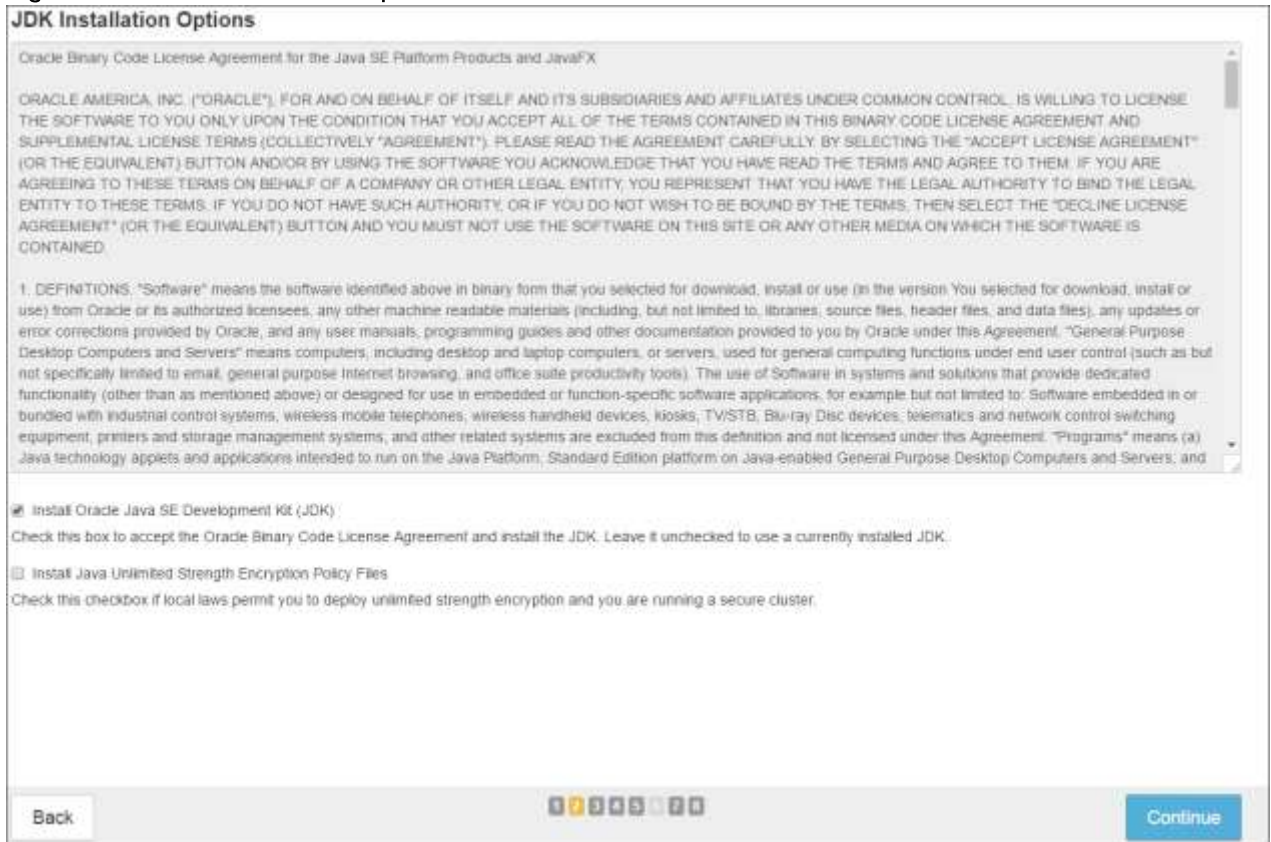
Select the specific release of the Cloudera Manager Agent you want to install on your hosts.

Matched release for this Cloudera Manager Server
 Custom Repository

Example for SLES, Redhat or other RPM based distributions:
`https://archive.cloudera.com/cm5/redhat/6/x86_64/cm5/`

Example for Ubuntu or other Debian based distributions:
`deb https://archive.cloudera.com/cm5/ubuntu/lucid/amd64/cm5 lucid-cm5 contrib`

Figure 150 JDK Installation Options



19. Click Continue as in Figure 151

Figure 151 Single User Mode

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 "hdh" 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

Back Continue

20. Provide SSH login credentials for the cluster and click Continue. (Figure 152)

Figure 152 Login Credentials to Start Cloudera Enterprise 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:

Number of Simultaneous Installations: (Running a large number of installations at once can consume large amounts of network bandwidth and other system resources)

Back Continue

21. Installation using parcels begins. (Figure 153)

Figure 153 Cluster Installation Confirmation

Cluster Installation

Installation completed successfully.

19 of 19 host(s) completed successfully.

Hostname	IP Address	Progress	Status	
rhel1	172.16.46.11	<div style="width: 100%; height: 10px; background-color: green;"></div>	Installation completed successfully	Details
rhel10	172.16.46.20	<div style="width: 100%; height: 10px; background-color: green;"></div>	Installation completed successfully	Details
rhel11	172.16.46.21	<div style="width: 100%; height: 10px; background-color: green;"></div>	Installation completed successfully	Details
rhel12	172.16.46.22	<div style="width: 100%; height: 10px; background-color: green;"></div>	Installation completed successfully	Details
rhel13	172.16.46.23	<div style="width: 100%; height: 10px; background-color: green;"></div>	Installation completed successfully	Details
rhel14	172.16.46.24	<div style="width: 100%; height: 10px; background-color: green;"></div>	Installation completed successfully	Details
rhel15	172.16.46.25	<div style="width: 100%; height: 10px; background-color: green;"></div>	Installation completed successfully	Details
rhel16	172.16.46.26	<div style="width: 100%; height: 10px; background-color: green;"></div>	Installation completed successfully	Details

Figure 154 Installing Selected Parcels

Cluster Installation

Installing Selected Parcels

The selected parcels are being downloaded and installed on all the hosts in the cluster.

CDH 5.8.0-1.cdh5.8.0.p0.42

Downloaded: 100% Distributed: 19/19 (7.1 MB/s) Unpacked: 19/19 Activated: 19/19

Progress bars for each step are shown as solid green lines, indicating 100% completion for all steps.

22. Once the installation is completed successfully, click Continue to select the required services.
23. Wait for Cloudera Manager to inspect the hosts on which it has just performed the installation.
24. Review and verify the summary. Click Continue. (Figure 155)

Figure 155 Inspecting Hosts for Correctness

Cluster Installation

Inspect hosts for correctness

Validations

- ✓ Inspector ran on all 16 hosts.
- ✓ Individual hosts resolved their own hostnames correctly.
- ✓ 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 problems were found with /proc/sys/vm/swappiness on any of the hosts.
- ✓ No performance concerns with Transparent Huge Pages settings.
- ✓ CDH 5 Hue Python version dependency is satisfied.
- ✓ 0 hosts are running CDH 4 and 16 hosts are running CDH 5.
- ✓ 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.
- ✓ All checked Cloudera Management Agents versions are consistent with the server.

Version Summary

25. Select services that need to be started on the cluster.

Figure 156 Selecting CDH Version and Services

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, and Hue
- Core with HBase**
HDFS, YARN (MapReduce 2 included), ZooKeeper, Oozie, Hive, Hue, and HBase
- Core with Impala**
HDFS, YARN (MapReduce 2 included), ZooKeeper, Oozie, Hive, Hue, and Impala
- Core with Search**
HDFS, YARN (MapReduce 2 included), ZooKeeper, Oozie, Hive, Hue, and Solr
- Core with Spark**
HDFS, YARN (MapReduce 2 included), ZooKeeper, Oozie, Hive, Hue, and Spark
- All Services**
HDFS, YARN (MapReduce 2 included), ZooKeeper, Oozie, Hive, Hue, 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

Back



Continue

26. 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. (Figure 157)

27. Reconfigure the service assignment to match Table 8 below.

Table 8 Service Assignments

Service Name	Host
NameNode	rhel1, rhel2 (HA)
HistoryServer	rhel1
JournalNodes	rhel1,rhel2,rhel3
ResouceManager	rhel2, rhel3(HA)
Hue Server	rhel2
HiveMetastore Server	rhel1
HiveServer2	rhel2
HBase Master	rhel2
Oozie Server	rhel1
ZooKeeper	rhel1, rhel2, rhel3

Service Name	Host
DataNode	rhel4 to rhel19
NodeManager	rhel4 to rhel19
RegionServer	rhel4 to rhel19
Sqoop Server	rhel1
Impala Catalog Server Daemon	rhel1
Impala State Store	rhel2
Impala Daemon	rhel4 to rhel19
Spark History Server	rhel1
Spark Executors	rhel4 to rhel19

Figure 157 Cluster Setup/Role Assignments

cloudera MANAGER
Support • admin •

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
- HBase REST Server
- HBase Thrift Server
- RegionServer • 13 New

HDFS

- NamesNode • 1 New
- SecondaryNamesNode • 1 New
- Balancer • 1 New
- HDFS
- NFS Gateway
- DataNode • 13 New

Hive

- Gateway • 15 New
- Hive Metastore Server • 1 New
- WebHCat Server • 1 New
- HiveServer2 • 1 New

Hue

- Hue Server • 1 New

Impala

- Impala Catalog Server • 1 New
- Impala StateStore • 1 New
- Impala Daemon • 13 New

Key-Value Store Indexer

- Livy HBase Indexer • 1 New

Cloudera Management Service

- Service Statist • 1 New
- Activity Monitor • 1 New
- Host Monitor • 1 New
- Report Manager • 1 New
- Event Server • 1 New
- Alert Publisher • 1 New

Oozie

- Oozie Server • 1 New

Solr

- Solr Server • 1 New

Spark

- History Server • 1 New
- Gateway • 15 New

YARN (MR2 Included)

- Resource Manager • 1 New
- JobHistory Server • 1 New
- NodeManager • 13 New

ZooKeeper

- Server • 3 New

Back
◻◻◻◻◻◻
Continue

Setting Up the Database

The role assignment recommendation above is for clusters of up to 64 servers. For clusters larger than 64 nodes, use the HA recommendation defined in Table 8 above.

1. In the Database Host Name sections use port 3306 for TCP/IP because connection to the remote server always uses TCP/IP. (Figure 158)
2. Enter the Database Name, username and password that were used during the database creation stage earlier in this document.
3. Click Test Connection to verify the connection and click Continue.

Figure 158 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](#).

Hive	Successful				
Database Host Name: *	Database Type:	Database Name: *	Username: *	Password:	
thrift	MySQL	hive	root	secret123	
Hue	Successful				
Database Host Name: *	Database Type:	Database Name: *	Username: *	Password:	
thrift	MySQL	hue	root	secret123	
Activity Monitor	Successful				
Currently assigned to run on thrift.	Database Host Name: *	Database Type:	Database Name: *	Username: *	Password:
	thrift	MySQL	amon	root	secret123
Reports Manager	Successful				
Currently assigned to run on thrift.	Database Host Name: *	Database Type:	Database Name: *	Username: *	Password:
	thrift	MySQL	rman	root	secret123
Oozie Server	Successful				
Currently assigned to run on thrift.	Database Host Name: *	Database Type:	Database Name: *	Username: *	Password:
	thrift	MySQL	oozie	root	secret123

Show Password

Notes:

- The value in the **Database Host Name** field must match the value you used for the host name when creating the database. [Learn more](#)
- If the database is not running on its default port, specify the port number using **thrift:port** in the **Database Host Name** field.
- It is highly recommended that each database is on the same host as the corresponding role instance.

4. Review and customize the configuration changes based on your requirements. (Figure 159)

Figure 159 Review the Configuration Changes Part1

DataNode Failed Volumes Tolerated <small>dfs.datanode.failed.volumes.tolerated</small>	DataNode Default Group 14	?
Reserved Space for Non DFS Use <small>dfs.datanode.nonreserved</small>	DataNode Default Group 10 GB	?
DataNode Data Directory <small>dfs.data.dir dfs.datanode.data.dir</small>	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 /data/disk18/dfs/dn /data/disk19/dfs/dn /data/disk2/dfs/dn /data/disk20/dfs/dn /data/disk21/dfs/dn /data/disk22/dfs/dn /data/disk23/dfs/dn /data/disk24/dfs/dn	?
Use Trash	Gateway Default Group <input checked="" type="checkbox"/>	?
Alternatives Priority	Gateway Default Group 90	?
HttpFS Load Balancer	HttpFS Default Group	?
JournalNode Edits Directory <small>dfs.journalnode.edits.dir</small>	JournalNode Default Group	?
Temporary Dump Directory <small>dfs.nfs.dump.dir</small>	NFS Gateway Default Group /tmp/hdfs-nfs	?
Allowed Hosts and Privileges <small>dfs.nfs.export.allowed.hosts</small>	NFS Gateway Default Group */*	?

5. Click Continue to start running the cluster services. (Figure 160)

Figure 160 Cloudera Manager Cluster Setup

The screenshot shows the Cloudera Manager interface for a cluster setup. At the top, it says "Cluster Setup" and "First Run Command". The status is "Finished" with a start time of "Jul 20, 10:37:06 PM" and a duration of "9:59m". Below this, it lists the services that were successfully installed: Impeller, HDFS, HBase, Solr, YARN (HUI Included), Key-Value Store, Tez, Spark, Hive, Impala, Oozie, Hue, and Cloudera Management Service.

The "Details" section shows a table of 10 steps, all of which are completed. The table has columns for Step, Context, Start Time, Duration, and Actions. The steps are:

Step	Context	Start Time	Duration	Actions
Run 1 steps in parallel Successfully completed 1 steps.		Jul 20, 10:37:06 PM	259ms	
Deploy Client Configuration Successfully deployed All client configurations.	Cluster:1	Jul 20, 10:37:07 PM	23.34s	
Start Cloudera Management Service, Zookeeper Successfully completed 1 steps.		Jul 20, 10:37:30 PM	02:12s	
Start HDFS Successfully completed 1 steps.		Jul 20, 10:38:22 PM	75.44s	
Start HBase, Solr Successfully completed 1 steps.		Jul 20, 10:39:39 PM	71.30s	
Start YARN (HUI Included), Key-Value Store, Tez Successfully completed 1 steps.		Jul 20, 10:40:50 PM	48:42s	
Start Spark Successfully completed 1 steps.		Jul 20, 10:41:38 PM	70.3s	
Start Hive Successfully completed 1 steps.		Jul 20, 10:42:49 PM	74.16s	
Start Oozie, Impala Successfully completed 1 steps.		Jul 20, 10:44:03 PM	05.4s	
Start Hue Successfully completed 1 steps.		Jul 20, 10:45:31 PM	31.72s	

At the bottom of the page, there is a "Back" button, a progress bar showing 100% completion, and a "Continue" button.

Starting the Cluster Services

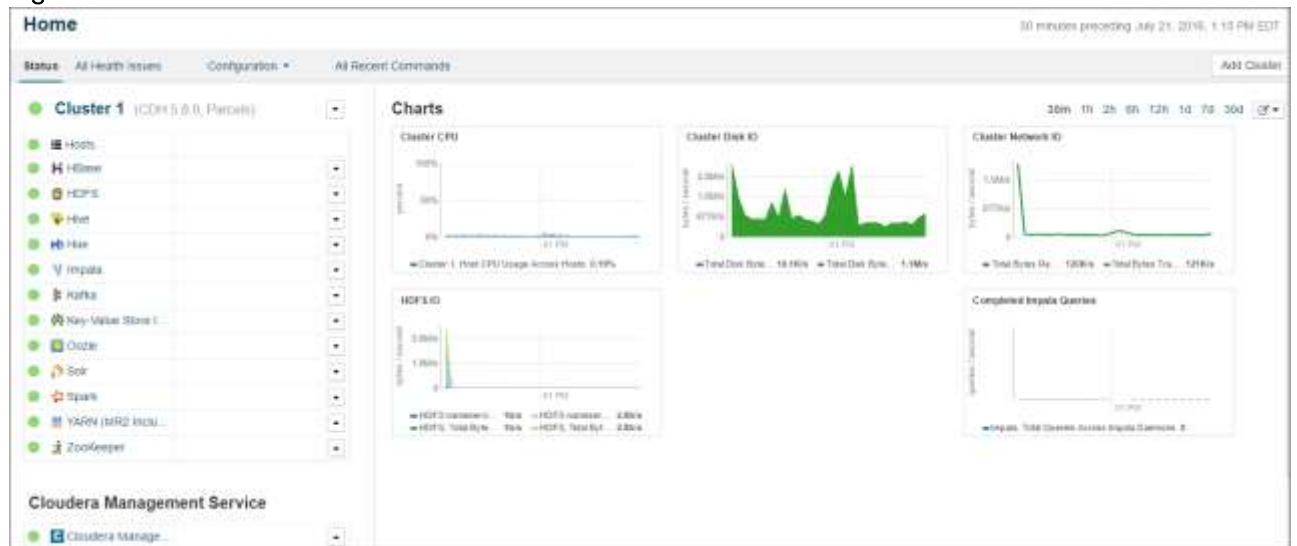
1. Hadoop services are installed, configured and now running on all the nodes of the cluster. Click Finish to complete the installation. (Figure 161)

Figure 161 Installation Complete

The screenshot shows the Cloudera Manager interface for a cluster setup. At the top, it says "Cluster Setup" and "Congratulations!". Below this, it says "The services are installed, configured, and running on your cluster." At the bottom, there is a "Back" button, a progress bar showing 100% completion, and a "Continue" button.

Cloudera Manager now displays the status of all Hadoop services running on the cluster. (Figure 162)

Figure 162 Service Status of the Cluster



Scaling the Cluster

The role assignment recommendation above is for a cluster with at least 16 servers and in High Availability (HA). For smaller clusters running without HA, the recommendation is to dedicate one server for the NameNode and a second server for a secondary name node and YARN Resource Manager. For clusters larger than 64 nodes, the recommendation is to dedicate one server each for NameNode, YARN Resource Manager and one more for running both NameNode (HA) and Resource Manager (HA) as in the table (no Secondary NameNode when in HA).

For production clusters it is recommended to set up NameNode and Resource Manager in HA mode. This implies that there will be at least 3 master nodes, running the NameNode, YARN Resource Manager, the fail-over counter-part being designated to run on another node and a third node that would have similar capacity as the other two nodes.

All three nodes will also need to run ZooKeeper and Quorum journal node services. It is also recommended to have a minimum of 5 Data Nodes in a cluster. Please refer to the next section for details on how to enable HA.

Rack-Aware Replica Placement using Hadoop Virtualization Extensions

Using rack-aware replica placement extends the Hadoop topology awareness mechanism and refines the data-locality related policies to further improve data reliability, availability and network utilization. HVE (Hadoop Virtualization Extensions) allow Hadoop clusters full awareness of the topology they are running. It is recommended to enable this specifically as there two nodes that share a single chassis in this configuration and it can cause failure or affect data locality group between hosts in this non-virtualized environment.



This needs to be done before data is loaded into HDFS, if not pre-existing HDFS will have to be copied back in for HVE to apply to them.

Customers can avoid complete data loss of data, when a worker node goes down. No duplicated replicas are on the same node or nodes under the same rack. First replica is on the local rack or on nodes under the same rack.

To configure rack awareness on a Hadoop cluster, complete the following steps:

2. Using Cloudera Manager, configure the following in safety valves:

In HDFS - Cluster-wide Advanced Configuration Snippet (Safety Valve) for core-site.xml:

```
<property>
<name>net.topology.impl</name>
<value> org.apache.hadoop.net.NetworkTopologyWithNodeGroup</value>
</property>
<property>
<name>net.topology.nodegroup.aware</name>
<value> true</value>
</property>
<property>
<name> dfs.block.replicator.classname</name>
<value>org.apache.hadoop.hdfs.server.blockmanagement.BlockPlacementPolicyWithNodeGroup</value>
</property>
```

3. In YARN Service MapReduce Advanced Configuration Snippet (Safety Valve) mapred.xml, add the following properties and values

```
<property>
<name>mapred.jobtracker.nodegroup.aware</name>
<value>true</value>
</property>
<property>
<name>mapred.task.cache.levels</name>
<value>3</value>
</property>
```

To set rack location of hosts [Setting Racks for Hosts](#):

4. Select each node from the Hosts page and then assign a rack, following the format of /rack\$ID/chassis\$ID (shown below)

Actions for Selected (1) ▾	
Assign Rack	
Delete	
Remove From Cluster	16.36.11
Regenerate Keytab	16.36.20
Hosts Decommission	16.36.21
Hosts Decommission	

Assign Rack ▲

Host	Current Rack
rhel1	/default

Enter new rack name:

rack1/chassis1

Rack names are slash-separated identifiers, like Unix paths. For example, "rack1" and "/cabinet3/rack4" are both valid.

Confirm

Cancel



Note: Follow the rack name format for each worker node in the Hadoop cluster.

Hadoop uses the rack information to place replica blocks on redundant racks. After adding the safety valves and the rack names for each server, follow these steps.

- Stop the cluster
- Deploy client config
- Start ZooKeeper
- Start HDFS
- Start all the other services.

Enabling High Availability



Note: Setting up HA is done after the Cloudera Installation is completed.

HDFS High Availability

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 a 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, go to:

http://www.cloudera.com/documentation/enterprise/latest/topics/cdh_hag_hdfs_ha_intro.html#topic_2_1

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**

```
#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 77 /data/disk1/namenode-edits
```

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. (Figure 163)

Figure 163 Enable High Availability for HDFS

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

Enabling High Availability creates a new nameservice. Accept the default name **nameservice1** or provide another name in **Nameservice Name**.

1 2 3 4 5

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.
6. Check the checkbox next to the hosts (rhel2) where the standby NameNode is 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.

Figure 164 Assign Roles

Enable High Availability for HDFS

Assign Roles

NameNode Hosts	<input type="text" value="rhe1 (Current)"/> <input type="text" value="rhe2"/>
JournalNode Hosts	<input type="text" value="rhe[1-3]"/> <small>We recommend that JournalNodes be hosted on machines of similar hardware specifications as the NameNodes. The hosts of NameNodes and the ResourceManager are generally good options. You must have a minimum of three and an odd number of JournalNodes.</small>

1 2 3 4 5



Note: JournalNodes should be hosted on hosts with similar hardware specification as the NameNodes. It is recommended that each JournalNode is put 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. (Figure 165)

Figure 165 Roles

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 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 Inherited from: NameNode Default Group	
JournalNode Edits Directory* dfs.journalnode.edits.dir	rhel1	<input type="text" value="/data/disk1/namenode-edits"/> Reset to empty default value ↶	Directory on the local file system where NameNode edits are written.
	rhel2	<input type="text" value="/data/disk1/namenode-edits"/> Reset to empty default value ↶	
	rhel3	<input type="text" value="/data/disk1/namenode-edits"/> Reset to empty default value ↶	

Back 1 2 3 4 5 Continue



Note: The directories specified should be empty, and must have the appropriate permissions.

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 chosen 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.

11. 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. (Figure 166)

Figure 166 Complete Setup of HA for HDFS

Enable High Availability for HDFS

✔ **Enable High Availability Command**

Status: **Finished** Context: [HDFS](#) Start Time: Jul 21, 11:13:07 AM Duration: 6.1m

Successfully enabled High Availability and Automatic Failover

Details Completed 20 of 20 steps All Failed Only Running Only

Step	Context	Start Time	Duration	Actions
✔ Check that name directories for the new Standby NameNode either do not exist or are writable and empty. Can optionally clear directories. <small>Process host-validate-writable-empty-dirs (id=243) on host rhel2 (id=12) exited with 0 and expected 0</small>	rhel2	Jul 21, 11:13:07 AM	429ms	
✔ Check that edit directories for the nameservice either do not exist or are writable and empty. Can optionally clear directories. <small>Successfully completed 3 steps.</small>		Jul 21, 11:13:07 AM	366ms	
✔ Stop <small>All services successfully stopped.</small>	Cluster_1	Jul 21, 11:13:08 AM	41.13s	

Back

1
2
3
4
5

Continue



Note: Formatting of the name directory is expected to fail, if the directories are not empty.

Figure 167 HA for HDFS Enabled



12. In the next screen additional steps are suggested by the Cloudera Manager to update the Hue and Hive Metastore. Click finish for Figure 167 shown above.



Note: The following subsections cover configuring Hue and Hive for HA as needed.



Federation and HA

Federation and High Availability

Add Nameservice

Name	Highly Available	Automatic Failover	NameNode	SecondaryNameNode	Actions
nameservice1	Yes	Yes	NameNode_rhel1 (Active) NameNode_rhel2 (Standby)		Actions ▾

13. In the Cloudera Manager, click on Home> HDFS> Instances to see NameNodes in High Availability. ()

Configuring Hive Metastore to Use HDFS HA

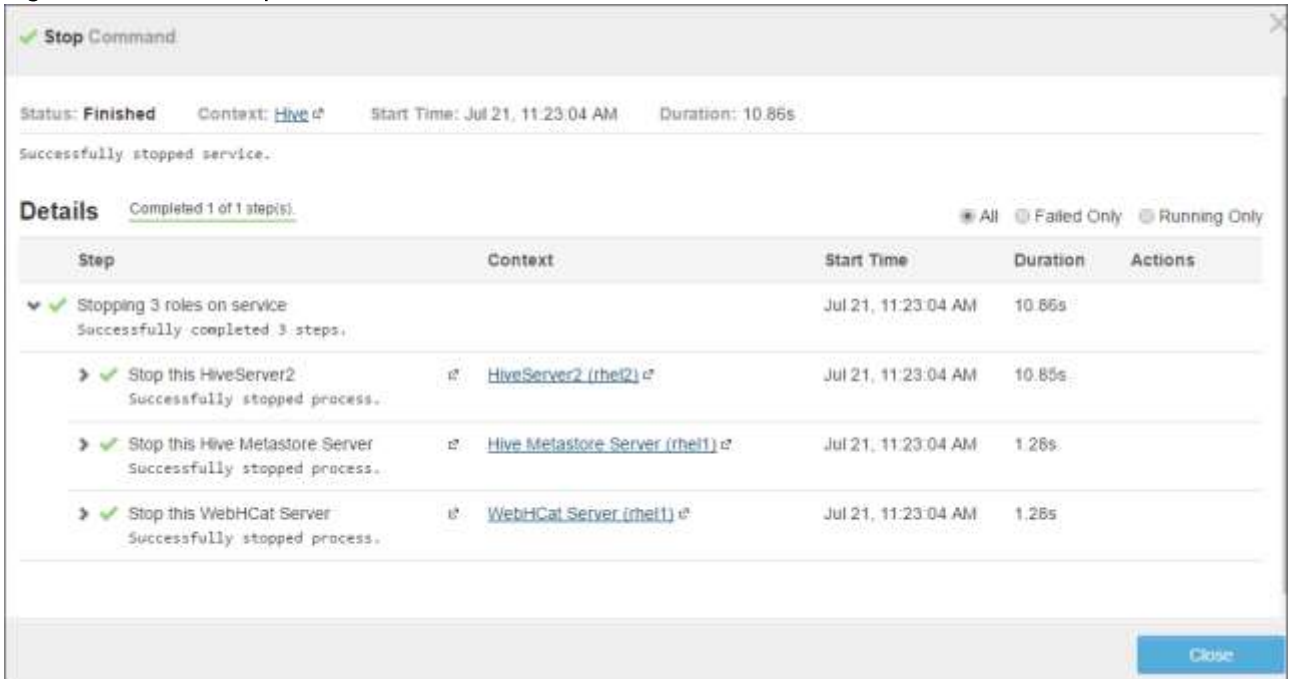
The Hive Metastore can be configured to use HDFS high availability.

14. Restart the Hue and Impala services if stopped prior to updating the Metastore.

- Go the Hive service.

- Select Actions> Stop. (Figure 168)
- Click Stop to confirm the command.

Figure 168 Hive Stop Command



15. Back up the Hive Metastore database (if any existing data is present)
16. Select Actions> Update Hive Metastore NameNodes and confirm the command.
17. Select Actions> Start.

Configuring Hue to Work with HDFS HA

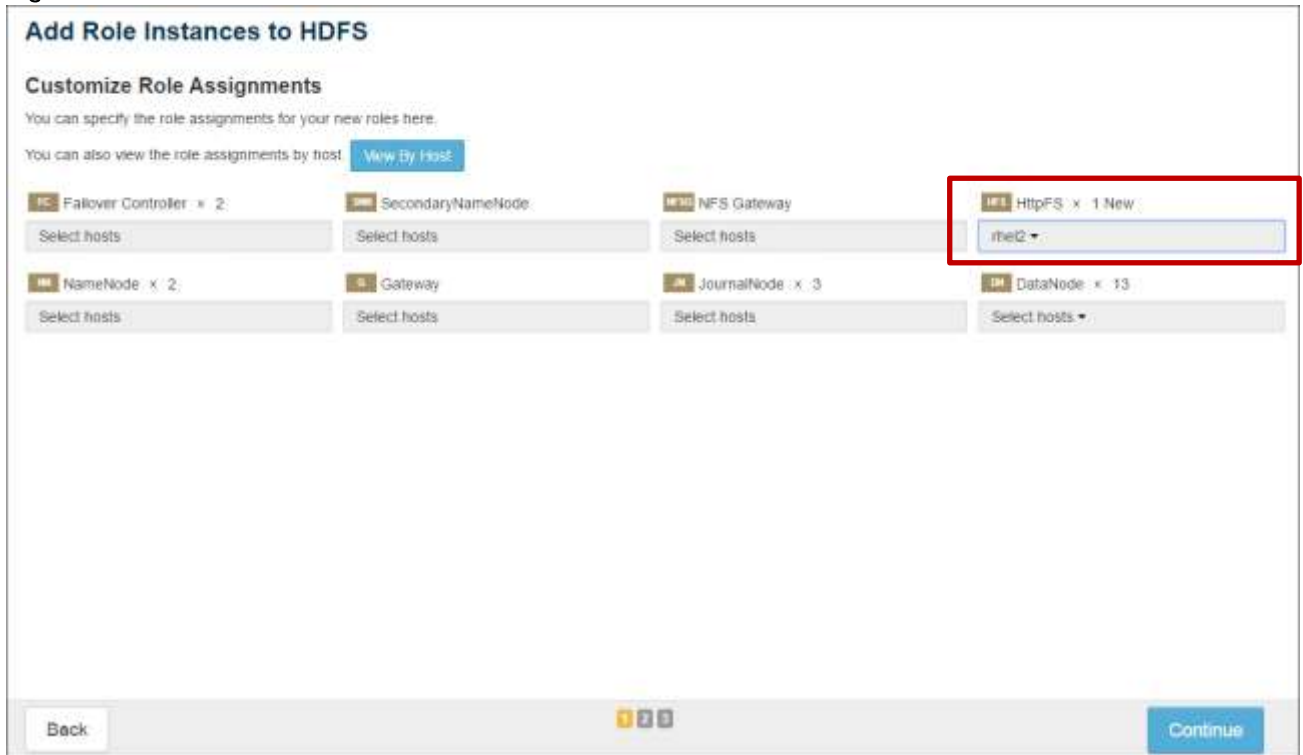
1. Go to the HDFS service.
2. Click the Instances tab.
3. Click Add Role Instances. (Figure 169)

Figure 169 Role Instances



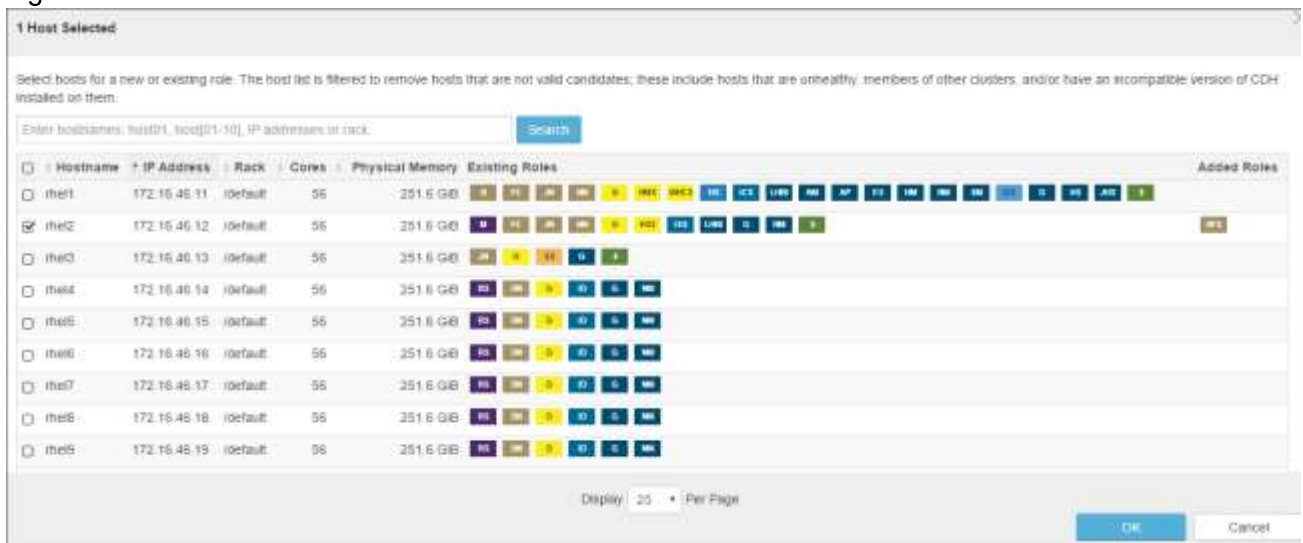
4. Select the text box below the HttpFS field. (Figure 170) The Select Hosts dialog displays.

Figure 170 Add Role Instances to HDFS



5. Select the host on which to run the role and click OK. (Figure 171)

Figure 171 Select the Host to Run the Role



6. Click Continue.
7. Check the checkbox next to the HttpFS role and select Actions for Selected> Start. (Figure 172)

Figure 172 Check HttpFS

Service	Status	Host	Commissioned	Default Group
DataNode	Started	rhel11	Commissioned	DataNode Default Group
DataNode	Started	rhel13	Commissioned	DataNode Default Group
DataNode	Started	rhel9	Commissioned	DataNode Default Group
DataNode	Started	rhel5	Commissioned	DataNode Default Group
Fallover Controller	Started	rhel2	Commissioned	Fallover Controller Default Group
Fallover Controller	Started	rhel1	Commissioned	Fallover Controller Default Group
HttpFS	Stopped	rhel2	Commissioned	HttpFS Default Group
JournalNode	Started	rhel9	Commissioned	JournalNode Default Group
JournalNode	Started	rhel2	Commissioned	JournalNode Default Group
JournalNode	Started	rhel1	Commissioned	JournalNode Default Group
NameNode (Standby)	Started	rhel2	Commissioned	NameNode Default Group
NameNode (Active)	Started	rhel1	Commissioned	NameNode Default Group

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 that was just created instead of the NameNode role, and save your changes. (Figure 173)

Figure 173 Hue Service

General Warning(s) Thrift Server role must be configured in HBase service to use the Hue HBase Browser application. [Suppress...](#)

HDFS Web Interface Role Hue (Service-Wide) [C](#)

webhdfs_url

HttpFS (rhel2)
 NameNode (rhel1)
 NameNode (rhel2)

HTTPFS role is recommended for Web interface if HDFS is HA or federated. [Suppress...](#)

Oozie Service Hue (Service-Wide) [←](#)

Oozie

HBase Service Hue (Service-Wide) [←](#)

HBase

12. Restart the Hue service.



Note: Refer to the Cloudera website: http://www.cloudera.com/documentation/enterprise/5-3-x/topics/cdh_hag_hdfs_ha_cdh_components_config.html - [concept_rj1_hsq_bp](#) for further details on setting up HA for other components like Impala, Oozie etc.

YARN High Availability

The YARN Resource Manager (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 checkpointed 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 please go to:

http://www.cloudera.com/documentation/enterprise/latest/topics/cdh_hag_rm_ha_config.html - [xd_583c10bfdbd326ba--43d5fd93-1410993f8c2--7f77](#)

Setting up 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. (Figure 174)

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.**

Figure 174 Resource Manager

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

Back 1 2 3 Continue

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. (Figure 175)

Figure 175 Enable High Availability for HA

Enable High Availability for YARN (MR2 Included)

✓ Enable ResourceManager HA Command

Status: **Finished** Context: [YARN \(MR2 Included\)](#) Start Time: Jul 21, 12:02:11 PM Duration: 2.6m

Successfully enabled ResourceManager HA.

Details Completed 4 of 4 step(s).
 All
 Failed Only
 Running Only

Step	Context
> ✓ Stop All services successfully stopped.	Cluster 1
> ✓ Add Standby ResourceManager Successfully added new ResourceManager to YARN (MR2 Included) on rhel3.	ResourceManager (rhel3)
> ✓ Start All services successfully started.	Cluster 1
> ✓ Deploy Client Configuration Successfully deployed all client configurations.	Cluster 1

Back 1 2 3 Finish

4. Click **Finish** once the installation is completed successfully.

Configuring Yarn (MR2 Included) and HDFS Services

The parameters in Table 9 are used for Cisco UCS S3260 Storage Server for Big Data and Analytics 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 9 YARN

Service	Value
mapreduce.map.memory.mb	3GiB
mapreduce.reduce.memory.mb	3GiB
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
yarn.scheduler.maximum-allocation-vcores	48
mapreduce.task.io.sort.mb	256 MiB

Table 10 HDFS

dfs.datanode.failed.volumes.tolerated	6
dfs.datanode.du.reserved	50 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

Configuring Spark

The two main resources that Spark (and YARN) are dependent on are *CPU* and *memory*. Disk and network I/O, of course, play a part in Spark performance as well, but neither Spark nor YARN currently can actively manage them. Every Spark executor in any application has the same fixed number of cores and same fixed heap size. The number of cores can be specified with the

executor-cores flag when invoking spark-submit, spark-shell, and pyspark from the command line, or by setting the spark.executor.cores property in the spark-defaults.conf file or in the SparkConf object.

And the heap size can be controlled with the executor-memory flag or the spark.executor.memory property. The cores property controls the number of concurrent tasks an executor can run, executor-cores = 5 mean that each executor can run a maximum of five tasks at the same time. The memory property impacts the amount of data Spark can cache, as well as the maximum sizes of the shuffle data structures used for grouping, aggregations, and joins.

The num-executors command-line flag or spark.executor.instances configuration property control the number of executors requested. Dynamic Allocation can be enabled from CDH5.4 instead setting the spark.dynamicAllocation.enabled to true. Dynamic allocation enables a Spark application to request executors when there is a backlog of pending tasks and free up executors when idle.

Asking for five executor cores will result in a request to YARN for five virtual cores. The memory requested from YARN is a little more complex for a couple reasons:

- executor-memory/spark.executor.memory controls the executor heap size, but JVMs can also use some memory off heap, for example for VM overhead, interned Strings and direct byte buffers. The value of the spark.yarn.executor.memoryOverhead property is added to the executor memory to determine the full memory request to YARN for each executor. It defaults to $\max(384, 0.10 * \text{spark.executor.memory})$.
- **YARN may round the requested memory up a little.** YARN's yarn.scheduler.minimum-allocation-mb and yarn.scheduler.increment-allocation-mb properties control the minimum and increment request values respectively.
- The application master is a non-executor container with the special capability of requesting containers from YARN, takes up resources of its own that must be budgeted in. In *yarn-client* mode, it defaults to a 1024MB and one vcore. In *yarn-cluster* mode, the application **master runs the driver, so it's often useful to add its resources with the -driver-memory and -driver-cores** properties.
- Running executors with too much memory often results in excessive garbage collection delays. 64GB is a rough guess at a good upper limit for a single executor.
- A good estimate is that at most five tasks per executor can achieve full write throughput, so **it's good to keep the number of cores per executor around that number.**
- Running tiny executors (with a single core and just enough memory needed to run a single task, for example) throws away the benefits that come from running multiple tasks in a single JVM. For example, broadcast variables need to be replicated once on each executor, so many small executors will result in many more copies of the data.

Tuning Resource Allocations for Spark

An example of configuring a Spark application to use as much of the cluster as possible is shown below. We are using an example cluster with 16 nodes running NodeManagers, each equipped with 56 cores and 256 GB of memory.

`yarn.nodemanager.resource.memory-mb` and `yarn.nodemanager.resource.cpu-vcores` should be set to $180 * 1024 = 184320$ (megabytes) and 48 respectively. And use the following when submitting a spark job.

- `spark.executor.instances/num-executors = 63`
- `spark.executor.cores/--executor-cores = 5`
- `spark.executor.memory/--executor-memory = 41G`

This configuration results in four executors on all nodes except for the one with the AM, which will have three executors.

- `executor-memory` is derived as $(180/4 \text{ executors per node}) = 45$; $45 * 0.10 = 4.5$ $45 - 4.5 = 40$.

For taking care of long running processes use 2G for the spark driver:

- `spark.driver.memory = 2G`

For Submitting a Job

Use the following command for submitting and running a Spark job.

```
--driver-memory 2G --executor-memory 40G --num-executors 63 --executor-cores 5 --  
properties-file /opt/cloudera/parcels/CDH/etc/spark/conf.dist/spark-defaults.conf
```

In `yarn-cluster` mode, the local directories used by the Spark executors and the Spark driver will be the local directories configured for YARN (Hadoop YARN config `yarn.nodemanager.local-dirs`). If the user specifies `spark.local.dir`, it will be ignored.

In `yarn-client` mode, the Spark executors will use the local directories configured for YARN while the Spark driver will use those defined in `spark.local.dir`. The Spark driver does not run on the YARN cluster in `yarn-client` mode, only the Spark executors do.

`spark.local.dir /tmp` (Directory to use for "scratch" space in Spark, including map output files and RDDs that get stored on disk. This should be on a fast, local disk in your system).

Every Spark stage has a number of tasks, each of which processes data sequentially. In tuning Spark jobs, this parallelism number is the most important parameter in determining performance. The number of tasks in a stage is the same as the number of partitions in the last RDD in the stage. The number of partitions in an RDD is the same as the number of partitions in the RDD on which it depends, with a couple exceptions: the `coalesce` transformation allows creating an RDD with fewer partitions than its parent RDD, the `union` transformation creates an RDD with the sum of its parents' number of partitions, and `Cartesian` creates an RDD with their product.

RDDs produced by a file have their partitions determined by the underlying MapReduce **InputFormat that's used. Typically there will be a partition for each HDFS block being read.** Partitions for RDDs produced by parallelize come from the parameter given by the user, or `spark.default.parallelism` if none is given.

The primary concern is that the number of tasks will be too small. If there are fewer tasks than **slots available to run them in, the stage won't be taking advantage of all the CPU available.**

If the stage in question is reading from Hadoop, your options are:

- Use the repartition transformation, which will trigger a shuffle.
- Configure your InputFormat to create more splits.
- Write the input data out to HDFS with a smaller block size.

If the stage is getting its input from another stage, the transformation that triggered the stage boundary will accept a `numPartitions` argument.

The most straightforward way to tune the number of partitions is experimentation: Look at the number of partitions in the parent RDD and then keep multiplying that by 1.5 until performance stops improving.

In contrast with MapReduce for Spark when in doubt, it's almost always better to be on the side of a larger number of tasks (and thus partitions).

Shuffle Performance Improvement

`spark.shuffle.compress true` (compress map output files)

`spark.broadcast.compress true`(compress broadcast variables before sending them)

`spark.io.compression.codec org.apache.spark.io.SnappyCompressionCodec` (codec used to compress internal data such as RDD partitions, broadcast variables and shuffle outputs)

`spark.shuffle.spill.compress true` (Whether to compress data spilled during shuffles.)

`spark.shuffle.io.numConnectionsPerPeer 4` (Connections between hosts are reused in order to reduce connection buildup for large clusters. For clusters with many hard disks and few hosts, this may result in insufficient concurrency to saturate all disks, and so users may consider increasing this value.)

`spark.shuffle.file.buffer 64K` (Size of the in-memory buffer for each shuffle file output stream. These buffers reduce the number of disk seeks and system calls made in creating intermediate shuffle file).

Improving Serialization Performance

Serialization plays an important role in the performance of any distributed application. Often, this will be the first thing that should be tuned to optimize a Spark application.

`spark.serializer org.apache.spark.serializer.KryoSerializer` (when speed is necessary)

spark.kryo.referenceTracking false

spark.kryoserializer.buffer 2000 (If the objects are large, may need to increase the size further to fit the size of the object being deserialized).

SparkSQL is ideally suited for mixed procedure jobs where SQL code is combined with Scala, Java, or Python programs. In general the SparkSQL command line interface is used for single user operations and ad hoc queries.

For multi-user SparkSQL environments, it is recommended to use a Thrift server connected via JDBC.

Changing the Log Directory for All Applications

To change the default log from the /var prefix to /data/disk1, complete the following steps:

1. **Log into the Cloudera home page and click My Clusters.**
2. **From the configuration drop down menu select "All Log Directories"**

Figure 176 Changes

The screenshot shows a configuration page with a header bar containing a search field, a "Save Changes" button, and a notification "27 Edited Values". Below the header, there is a list of configuration items, each with a title, a description, a default group, and a text input field. The items are:

Component	Default Group	Log Directory
DataNode Log Directory	DataNode Default Group	/data/disk1/log/hadoop-hdfs
Fallover Controller Log Directory	Fallover Controller Default Group	/data/disk1/hadoop-hdfs
HttpFS Log Directory	HttpFS Default Group	/data/disk1/hadoop-httpfs
JournalNode Log Directory	JournalNode Default Group	/data/disk1/hadoop-hdfs
NFS Gateway Log Directory	NFS Gateway Default Group	/data/disk1/hadoop-hdfs
NameNode Log Directory	NameNode Default Group	/data/disk1/hadoop-hdfs
SecondaryNameNode Log Directory	SecondaryNameNode Default Group	/data/disk1/hadoop-hdfs
Hive Metastore Server Log Directory	Hive Metastore Server Default Group	/data/disk1/log/hive
HiveServer2 Log Directory	HiveServer2 Default Group	/data/disk1/log/hive

WebHCat Server Log Directory	WebHCat Server Default Group: <input type="text" value="rdata@hadoop-hdfs@hadoop-staging"/>	Directory where WebHCat Server will place its log files.
Hue Server Log Directory	Hue Server Default Group: <input type="text" value="rdata@hadoop-hdfs@hue"/>	Directory where Hue Server will place its log files.
Kerberos Ticket Renewer Log Directory	Kerberos Ticket Renewer Default Group: <input type="text" value="rdata@hadoop-hdfs@hue"/>	Directory where Kerberos Ticket Renewer will place its log files.
Catlog Server Log Directory log_dir	Impala Catalog Server Default Group: <input type="text" value="rdata@hadoop-hdfs@catalog"/>	Directory where Catalog Server will place its log files.
Impala Daemon Log Directory log_dir	Impala Daemon Default Group: <input type="text" value="rdata@hadoop-hdfs@impalad"/> Impala Daemon Group 1: <input type="text" value="rdata@hadoop-hdfs@impalad"/>	Directory where Impala Daemon will place its log files.
Llama Log Directory name_log_dir	Impala Llama Application Mediator Default Group: <input type="text" value="rdata@hadoop-hdfs@impala-llama"/>	Directory where Llama will place its log files.
StateStore Log Directory log_dir	Impala StateStore Default Group: <input type="text" value="rdata@hadoop-hdfs@statestore"/>	Directory where StateStore will place its log files.
JobTracker Log Directory name_log_dir	JobTracker Default Group: <input type="text" value="rdata@hadoop-hadoop@hadoop-0-20-mapreduce"/>	Directory where JobTracker will place its log files.
TaskTracker Log Directory name_log_dir	TaskTracker Default Group: <input type="text" value="rdata@hadoop-hadoop@hadoop-0-20-mapreduce"/> TaskTracker Group 1: <input type="text" value="rdata@hadoop-hadoop@hadoop-0-20-mapreduce"/>	Directory where TaskTracker will place its log files.
Code Server Log Directory	Code Server Default Group: <input type="text" value="rdata@hadoop-hdfs@code"/>	Directory where Code Server will place its log files.
Sort Server Log Directory	Sort Server Default Group: <input type="text" value="rdata@hadoop-hdfs@sort"/>	Directory where Sort Server will place its log files.
History Server Log Directory log_dir	History Server Default Group: <input type="text" value="rdata@hadoop-hdfs@history"/>	The log directory for log files of the role History Server.
Sqoop 2 Server Log Directory	Sqoop 2 Server Default Group: <input type="text" value="rdata@hadoop-hdfs@sqoop2"/>	Directory where Sqoop 2 Server will place its log files.
JobHistory Server Log Directory name_log_dir	JobHistory Server Default Group: <input type="text" value="rdata@hadoop-hadoop@mapreduce"/>	Directory where JobHistory Server will place its log files.
Nodemanager Log Directory name_log_dir	Nodemanager Default Group: <input type="text" value="rdata@hadoop-hadoop@yarn"/>	Directory where Nodemanager will place its log files.
ResourceManager Log Directory name_log_dir	ResourceManager Default Group: <input type="text" value="rdata@hadoop-hadoop@yarn"/>	Directory where ResourceManager will place its log files.
ZooKeeper Log Directory	Server Default Group: <input type="text" value="rdata@hadoop-hdfs@zookeeper"/>	Directory where ZooKeeper will place its log files.

Display 25 entries

First Previous 1 2 Next Last

3. Click Save Changes.

Bill of Materials

This section provides the BOM for the 16 nodes. See Table 11 Bill of Materials for the Cisco UCS Fabric Interconnect 6332, Table 12 Bill of Materials for the Cisco UCS C240M4 Rack Server, Table 13 for the Cisco UCS S3260 Storage Server Base Rack, Table 14 Bill of Materials for Cisco UCS S3260 Storage Server Capacity Rack, and Table 15 and Table 16 for software components. Table 17 lists Cloudera SKUs available from Cisco.

Table 11 Bill of Materials for Cisco UCS Fabric Interconnect 6332

Part Number	Description	Quantity
UCS-FI-6332UP-UPG	UCS 6332UP 2RU Fabric Int/No PSU/48 UP/ 18p LIC	2
CON-SNT-FI6332UP	SMARTNET 8X5XNBD UCS 6332UP 2RU Fabric Int/2 PSU/4 Fans	2
SFP-H40GB-CU3M	40GBASE-CU SFP+ Cable 3 Meter	8
UCS-ACC-6296UP	UCS 6296UP Chassis Accessory Kit	2
UCS-PSU-6296UP-AC	UCS 6296UP Power Supply/100-240VAC	4
N10-MGT014	UCS Manager v3.1	2
UCS-L-6200-10G-C	2rd Gen FI License to connect C-direct only	62
UCS-BLKE-6200	UCS 6200 Series Expansion Module Blank	6
UCS-FAN-6296UP	UCS 6296UP Fan Module	8
CAB-N5K6A-NA	Power Cord 200/240V 6A North America	4
UCS-FI-E16UP	UCS 6200 16-port Expansion module/16 UP/ 8p LIC	4
RACK-UCS2	Cisco R42610 standard rack w/side panels	1
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 12 Bill of Materials for Cisco UCS C240M4 Rack Server

Part Number	Description	Quantity
-------------	-------------	----------

UCS-SL-CPA4-P2	Performance Optimized Option 2 Cluster	1
UCSC-C240-M4SX	UCS C240 M4 SFF 24 HD w/o CPU, memory, HD, PCIe, PS, rail kit w/expander	3
UCSC-MRAID12G	Cisco 12G SAS Modular Raid Controller	3
UCSC-MRAID12G-2GB	Cisco 12Gbps SAS 2GB FBWC Cache module (Raid 0/1/5/6)	3
UCSC-MLOM-CSC-02	Cisco UCS VIC1387 VIC MLOM - Dual Port 40Gb Ethernet QSFP ports	3
CAB-9K12A-NA	Power Cord 125VAC 13A NEMA 5-15 Plug North America	6
UCSC-PSU2V2-1200W	1200W/800W V2 AC Power Supply for 2U C-Series Servers	6
UCSC-RAILB-M4	Ball Bearing Rail Kit for C240 M4 rack servers	3
UCSC-HS-C240M4	Heat Sink for UCS C240 M4 Rack Server	6
UCSC-SCCBL240	Supercap cable 250mm	3
UCS-CPU-E52680E	2.40 GHz E5-2680 v4/120W 14C/35MB Cache/DDR4 2400MHz	6
UCS-MR-1X161RV-A	16GB DDR4-2400-MHz RDIMM/PC4-19200/single rank/x4/1.2v	48
UCS-HD18TB10KS4K	1.2 TB 12G SAS 10K rpm SFF HDD (4K)	36
UCS-SD240GBKS4-EB	240 GB 2.5 inch Enterprise Value 6G SATA SSD (BOOT)	6
UCSC-PCI-1C-240M4	Right PCI Riser Bd (Riser 1) 2onbd SATA bootdrvs+ 2PCI slts	3

Table 13 Bill of Materials for Cisco UCS S3260 Storage Server Base Rack

Part Number	Description	Quantity
UCSC-C3260	Cisco UCS C3260 Base Chassis w/4x PSU, SSD, Railkit	8
CAB-C13-C14-2M	Power Cord Jumper, C13-C14 Connectors, 2 Meter Length	32
UCS-C3K-HD4TB	UCS C3000 4TB NL-SAS 7200 RPM 12Gb HDD w Carrier- Top Load	48

UCSC-C3160-BEZEL	Cisco UCS C3160 System Bezel	8
UCSC-C3X60-RAIL	UCS C3X60 Rack Rails Kit	8
UCSC-PSU1-1050W	UCS C3X60 1050W Power Supply Unit	32
UCSC-C3K-M4SRB	UCS C3000 M4 Server Node for Intel E5-2600 v4	8
UCS-CPU-E52680E	2.40 GHz E5-2680 v4/120W 14C/35MB Cache/DDR4 2400MHz	16
UCS-MR-1X322RV-A	32GB DDR4-2400-MHz RDIMM/PC4-19200/dual rank/x4/1.2v	64
UCS-C3K-M4RAID	Cisco UCS C3000 RAID Controller M4 Server w 4G RAID Cache	8
UCSC-HS-C3X60	Cisco UCS C3X60 Server Node CPU Heatsink	16
UCSC-C3K-M4SRB	UCS C3000 M4 Server Node for Intel E5-2600 v4	8
UCS-CPU-E52680E	2.40 GHz E5-2680 v4/120W 14C/35MB Cache/DDR4 2400MHz	16
UCS-MR-1X322RV-A	32GB DDR4-2400-MHz RDIMM/PC4-19200/dual rank/x4/1.2v	64
UCS-C3K-M4RAID	Cisco UCS C3000 RAID Controller M4 Server w 4G RAID Cache	8
UCSC-HS-C3X60	Cisco UCS C3X60 Server Node CPU Heatsink	16
UCS-S3260-42HD4	Cisco UCS C3X60 Three row of drives containing 42 x 4TB (Tot	8
UCS-C3K-HD4TB	UCS C3000 4TB NL-SAS 7200 RPM 12Gb HDD w Carrier- Top Load	336
UCSC-C3260-SIOC	Cisco UCS C3260 System IO Controller with VIC 1300 incl.	8
UCSC-C3260-SIOC	Cisco UCS C3260 System IO Controller with VIC 1300 incl.	8
UCS-C3X60-G2SD48	UCSC C3X60 480GB Boot SSD (Gen 2)	32

Table 14 Bill of Materials for Cisco UCS S3260 Storage Server Capacity Rack

Part Number	Description	Quantity
UCSC-C3260	Cisco UCS C3260 Base Chassis w/4x PSU, SSD, Railkit	8

Part Number	Description	Quantity
CAB-C13-C14-2M	Power Cord Jumper, C13-C14 Connectors, 2 Meter Length	32
UCSC-C3X60-HD8TB	UCSC 3X60 8TB NL-SAS 7.2K Helium HDD with HDD Carrier	48
UCSC-C3160-BEZEL	Cisco UCS C3160 System Bezel	8
UCSC-C3X60-RAIL	UCS C3X60 Rack Rails Kit	8
UCSC-PSU1-1050W	UCS C3X60 1050W Power Supply Unit	32
UCSC-C3K-M4SRB	UCS C3000 M4 Server Node for Intel E5-2600 v4	8
UCS-CPU-E52680E	2.40 GHz E5-2680 v4/120W 14C/35MB Cache/DDR4 2400MHz	16
UCS-MR-1X322RV-A	32GB DDR4-2400-MHz RDIMM/PC4-19200/dual rank/x4/1.2v	64
UCS-C3K-M4RAID	Cisco UCS C3000 RAID Controller M4 Server w 4G RAID Cache	8
UCSC-HS-C3X60	Cisco UCS C3X60 Server Node CPU Heatsink	16
UCSC-C3K-M4SRB	UCS C3000 M4 Server Node for Intel E5-2600 v4	8
UCS-CPU-E52680E	2.40 GHz E5-2680 v4/120W 14C/35MB Cache/DDR4 2400MHz	16
UCS-MR-1X322RV-A	32GB DDR4-2400-MHz RDIMM/PC4-19200/dual rank/x4/1.2v	64
UCS-C3K-M4RAID	Cisco UCS C3000 RAID Controller M4 Server w 4G RAID Cache	8
UCSC-HS-C3X60	Cisco UCS C3X60 Server Node CPU Heatsink	16
UCSC-C3X60-42HD8	UCS C3X60 3 rows of 8TB NL-SAS7200 RPM SAS-3 (42Total) 336TB	8
UCSC-C3X60-HD8TB	UCSC 3X60 8TB NL-SAS 7.2K Helium HDD with HDD Carrier	336
UCSC-C3260-SIOC	Cisco UCS C3260 System IO Controller with VIC 1300 incl.	8
UCSC-C3260-SIOC	Cisco UCS C3260 System IO Controller with VIC 1300 incl.	8
UCS-C3X60-G2SD48	UCSC C3X60 480GB Boot SSD (Gen 2)	32



Note: Both Cisco UCS S3260 Storage Server Basic Rack and Cisco UCS S3260 Storage Server Capacity Rack Bundle comes with 24 x 4TB Disk Drives, supports up to 28 x 4 TB.

Table 15 Red Hat Enterprise Linux License

Red Hat Enterprise Linux		
RHEL-2S2V-3A	Red Hat Enterprise Linux	19
CON-ISV1-EL2S2V3A	3 year Support for Red Hat Enterprise Linux	19

Table 16 Cloudera Software

Cloudera Software edition needed for this CVD		
Cloudera Enterprise Flex Edition	UCS-BD-CEDHC-BZ=	19
Cloudera Enterprise Data Hub Edition	UCS-BD-CEDHC-GD=	19

Table 17 Cloudera SKU's Available at Cisco

Cisco TOP SKU	Cisco PID with Duration	Product Name
UCS-BD-CEBN-BZ=	UCS-BD-CEBN-BZ-3Y	Cloudera Enterprise Basic Edition, Node License, Bronze Support - 3 Year
UCS-BD-CEBN-BZI=	UCS-BD-CEBN-BZI-3Y	Cloudera Enterprise Basic Edition + Indemnification, Node License, Bronze Support - 3 Year
UCS-BD-CEBN-GD=	UCS-BD-CEBN-GD-3Y	Cloudera Enterprise Basic Edition, Node License, Gold Support - 3 Year
UCS-BD-CEBN-GDI=	UCS-BD-CEBN-GDI-3Y	Cloudera Enterprise Basic Edition + Indemnification, Node License, Gold Support - 3 Year
UCS-BD-CEDEN-BZ=	UCS-BD-CEDEN-BZ-3Y	Cloudera Enterprise Data Engineering Edition, Node License, Bronze Support - 3 Year
UCS-BD-CEDEN-GD=	UCS-BD-CEDEN-GD-3Y	Cloudera Enterprise Data Engineering Edition, Node License, Gold Support - 3 Year
UCS-BD-CEODN-BZ=	UCS-BD-CEODN-BZ-3Y	Cloudera Enterprise Operational Database Edition, Node License, Bronze Support - 3 Year
UCS-BD-CEODN-GD=	UCS-BD-CEODN-GD-2Y	Cloudera Enterprise Operational Database Edition, Node License, Gold Support - 2 Year
UCS-BD-CEODN-GD=	UCS-BD-CEODN-GD-3Y	Cloudera Enterprise Operational Database Edition, Node License, Gold Support - 3 Year
UCS-BD-CEADN-BZ=	UCS-BD-CEADN-BZ-3Y	Cloudera Enterprise Analytical Database Edition, Node License, Bronze Support - 3 Year

Cisco TOP SKU	Cisco PID with Duration	Product Name
UCS-BD-CEADN-GD=	UCS-BD-CEADN-GD-3Y	Cloudera Enterprise Analytical Database Edition, Node License, Gold Support - 3 Year
UCS-BD-CEDHN-BZ=	UCS-BD-CEDHN-BZ-3Y	Cloudera Enterprise Data Hub Edition, Node License, Bronze Support - 3 Year
UCS-BD-CEDHN-GD=	UCS-BD-CEDHN-GD-3Y	Cloudera Enterprise Data Hub Edition, Node License, Gold Support - 3 Year
UCS-BD-CEBC-BZ=	UCS-BD-CEBC-BZ-3Y	Cloudera Enterprise Basic Edition, Capacity License, Bronze Support - 3 Year
UCS-BD-CEBC-BZI=	UCS-BD-CEBC-BZI-3Y	Cloudera Enterprise Basic Edition + Indemnification, Capacity License, Bronze Support - 3 Year
UCS-BD-CEBC-GD=	UCS-BD-CEBC-GD-3Y	Cloudera Enterprise Basic Edition, Capacity License, Gold Support - 3 Year
UCS-BD-CEBC-GDI=	UCS-BD-CEBC-GDI-3Y	Cloudera Enterprise Basic Edition + Indemnification, Capacity License, Gold Support - 3 Year
UCS-BD-CEDEC-BZ=	UCS-BD-CEDEC-BZ-3Y	Cloudera Enterprise Data Engineering Edition, Capacity License, Bronze Support - 3 Year
UCS-BD-CEDEC-GD=	UCS-BD-CEDEC-GD-3Y	Cloudera Enterprise Data Engineering Edition, Capacity License, Gold Support - 3 Year
UCS-BD-CEODC-BZ=	UCS-BD-CEODC-BZ-3Y	Cloudera Enterprise Operational Database Edition, Capacity License, Bronze Support - 3 Year
UCS-BD-CEODC-GD=	UCS-BD-CEODC-GD-3Y	Cloudera Enterprise Operational Database Edition, Capacity License, Gold Support - 3 Year
UCS-BD-CEADC-BZ=	UCS-BD-CEADC-BZ-3Y	Cloudera Enterprise Analytical Database Edition, Capacity License, Bronze Support - 3 Year
UCS-BD-CEADC-GD=	UCS-BD-CEADC-GD-3Y	Cloudera Enterprise Analytical Database Edition, Capacity License, Gold Support - 3 Year
UCS-BD-CEDHC-BZ=	UCS-BD-CEDHC-BZ-3Y	Cloudera Enterprise Data Hub Edition, Capacity License, Bronze Support - 3 Year
UCS-BD-CEDHC-GD=	UCS-BD-CEDHC-GD-3Y	Cloudera Enterprise Data Hub Edition, Capacity License, Gold Support - 3 Year

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