Bright Cluster Manager 7.0

Cisco UCS® Deployment Manual

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Preface

Welcome to the UCS Deployment Manual for Bright Cluster Manager 7.0.

0.1 About This Manual

This manual is aimed at helping cluster administrators understand and manage Cisco UCS server capabilities that are integrated into Bright Cluster Manager. The administrator is expected to be reasonably familiar with the Bright Cluster Manager *Administrator Manual*.

0.2 About The Manuals In General

Regularly updated versions of the Bright Cluster Manager 7.0 manuals are available on updated clusters by default at /cm/shared/docs/cm. The latest updates are always online at http://support.brightcomputing.com/manuals.

- The *Installation Manual* describes installation procedures for a basic cluster.
- The *Administrator Manual* describes the general management of the cluster.
- The *User Manual* describes the user environment and how to submit jobs for the end user.
- The *Cloudbursting Manual* describes how to deploy the cloud capabilities of the cluster.
- The *Developer Manual* has useful information for developers who would like to program with Bright Cluster Manager.
- The *OpenStack Deployment Manual* describes how to deploy Open-Stack with Bright Cluster Manager.
- The *Hadoop Deployment Manual* describes how to deploy Hadoop with Bright Cluster Manager.
- The *UCS Deployment Manual* describes how to deploy the Cisco UCS server with Bright Cluster Manager.

If the manuals are downloaded and kept in one local directory, then in most pdf viewers, clicking on a cross-reference in one manual that refers to a section in another manual opens and displays that section in the second manual. Navigating back and forth between documents is usually possible with keystrokes or mouse clicks.

For example: <Alt>-<Backarrow> in Acrobat Reader, or clicking on the bottom leftmost navigation button of xpdf, both navigate back to the previous document. The manuals constantly evolve to keep up with the development of the Bright Cluster Manager environment and the addition of new hardware and/or applications. The manuals also regularly incorporate customer feedback. Administrator and user input is greatly valued at Bright Computing. So any comments, suggestions or corrections will be very gratefully accepted at manuals@brightcomputing.com.

0.3 Getting Administrator-Level Support

Unless the Bright Cluster Manager reseller offers support, support is provided by Bright Computing over e-mail via support@ brightcomputing.com. Section 10.2 of the *Administrator Manual* has more details on working with support.

1

Introduction

This chapter introduces how Cisco Unified Computing System (*Cisco UCS*) is integrated with Bright Cluster Manager. It introduces the following topics:

- Section 1.1 gives a brief overview of Cisco UCS.
- Section 1.2 discusses how servers in Cisco UCS are managed and integrated in Bright Cluster Manager.

1.1 Cisco Unified Computing System

Cisco UCS is a data center server platform that comprises compute servers, switching fabric, and management software. The physical chassis used in the platform is available in two models:

- the B-Series blade chassis with blade servers
- the C-Series rack mount servers

The hardware in both models can be managed by the UCS Manager software, which typically runs on the fabric interconnect(s). When the C-Series servers are used as part of UCS they perform the same functions as the B-Series blade servers. A cluster instance that is managed by UCS Manager is called a *Cisco UCS domain* in Cisco terminology.

The C-Series rack servers can also operate in a standalone environment. Here "standalone" means without the UCS Manager software, and typically managed by a cluster manager such a Bright Cluster Manager. In such a setup they are normally connected with a Cisco Nexus switch. The C-Series rack servers are managed and monitored through the Cisco Integrated Management Controller (CIMC). The CIMC can be accessed through a Web-based GUI, a CLI, and IPMI, like any other baseboard management controller. The CIMC also exposes an XML API, which is a programmatic interface to the CIMC, and which accepts XML documents through HTTP/HTTPS requests. The CIMC XML API implements a subset of the methods available in the Cisco UCS Manager XML API. The scope of the CIMC XML API is limited to a single C-Series server.

For extensive and detailed documentation on Cisco UCS the hardware vendor or the Cisco website should be consulted.

The next section explains how Bright Cluster Manager 7.0 integrates into the Cisco UCS domain and makes use of the CIMC XML API to configure, monitor, and manage the rack servers.

1.2 UCS Integration in Bright Cluster Manager

Bright Cluster Manager 7.0 can configure, monitor, and manage C-Series rack servers directly—that is in the standalone mode, or via UCS Manager. Deployment and management of UCS C-Series servers from Bright Cluster Manager is designed to be easy in this version. Complete support for configuring and managing B-Series blade chassis and servers are intended for future versions of Bright Cluster Manager.

Chapter 2 describes a simplified deployment of a Bright UCS cluster that should serve the most common needs.

After deployment, interaction with the rack servers is performed through the CIMC XML API. The CIMC XML API presents all information from a rack server as a hierarchical tree comprising several managed objects and classes. This information is stored as properties of a node or a category of nodes in Bright Cluster Manager. These properties can then be modified, monitored, and managed using standard Bright Cluster Manager tools such as the cluster management GUI (cmgui, section 2.4 of the *Administrator Manual*) or the cluster management shell (cmsh, section 2.5 of the *Administrator Manual*).

Bright Cluster Manager allows the administrator to:

- modify BIOS tokens and BIOS boot order
- modify Cisco VIC Adapter and interface properties
- assign and modify usNIC profiles for Cisco VIC interfaces
- modify Fibre Channel Adapter and Interface properties
- launch remote KVM console to nodes
- modify network-related settings of a CIMC, such as NTP and syslog
- monitor metrics related to power supply, fans, temperature, voltage, and storage
- automatically configure CIMC user and network

Chapter 5 explains how to accomplish the preceding tasks in detail.

1.3 Cisco usNIC

The Cisco user-space NIC (usNIC) is a vital feature that improves the performance of MPI applications running in an HPC environment. The MPI applications bypass the kernel and interact directly with the Cisco UCS VIC 1225 adapter when sending and receiving network packets. A Bright Cisco UCS cluster has all the required software pre-installed and configured for Cisco usNIC functionality to work out-of-the box. The following are installed and configured by default:

- The Linux kernel verbs driver for usNIC (kmod-usnic_verbs)
- The Linux kernel driver for enic (kmod-enic)
- The user space library libibverbs plugin for usNIC (lib_usnic_verbs)
- The latest Open MPI software that provides full support for usNIC

- The services that required are enabled to start on boot (rdma for usnic_verbs)
- The recommended BIOS and CIMC usNIC settings are preconfigured

Section 2.7 covers the following Cisco usNIC topics in more detail:

- Verifying that usNIC is working and available in user space
- Running MPI applications using usNIC

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2

UCS Cluster Deployment Procedure

This chapter describes a step-by-step procedure to deploy Bright Cluster Manager on Cisco UCS hardware. With it, an experienced cluster administrator should quickly be able to get Bright Cluster Manager running on a Cisco UCS cluster.

A Cisco UCS cluster is also called a domain in Cisco terminology, and in Bright Cluster Manager 7.0 implies a combination of Cisco UCS C-Series Rack Servers and supported fabric interconnects or fabric extenders. Full support for Cisco UCS B-Series Blade Servers is planned for later.

Following the deployment procedure does not require extensive knowledge of Bright Cluster Manager or Cisco UCS. A brief explanation of the task is given at each step, and references to other documentation are given if necessary. However, only references to the Bright Cluster Manager manuals are provided. Further Cisco UCS documentation can be obtained from Cisco or the appropriate hardware vendors.

The procedure follows.

2.1 Pre-install Checklist

Before starting deployment, the following should be checked or considered. This prevents delays or having to restart at a later stage of the deployment.

• Choosing the node booting and provisioning network: In a Cisco UCS domain, nodes can boot from the regular 1GE network interface, or from the Cisco VIC 10GE interface. On most UCS C-Series rack servers, the 1GE interface is the first device in the network boot order.

If the interface used to boot and provision compute nodes is:

- the Cisco VIC 10GE interface, then:

- * Cisco VIC ports must be cabled to the 10GE switch or fabric extender that is connected to the switch.
- * The first boot device in the network boot order must be set to the Cisco VIC that the node should boot from.

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- the 1GE interface, then:
 - * The 1GE ports must be cabled to a 1GE switch, or to the 10GE switch through a GBIC converter.
 - * The first boot device in the network boot order must be set to the 1GE interface that the node should boot from.
- Choosing the CIMC (BMC) network: It is best to connect the dedicated BMC ports to an external network which is accessible from outside the cluster. This makes reaching the remote console of the node easier if there is a communication failure between the head and compute nodes. However, the BMC network can also be configured to be internal to the cluster.
- **RAID configuration:** It is best to consult with the hardware vendor for known issues with a specific RAID configuration for the RAID controller on the servers. RAID volumes can be configured by choosing Ctrl-H (WebBios) during boot.

2.2 Switch Configuration

The servers in a Cisco UCS cluster are typically connected via a 10GE Cisco Nexus Switch running the NX-OS operating system.

The switch should be configured according to the recommended procedures for proper functioning of the cluster and for extracting maximum network performance. Chapter 3: *Nexus Switch Configuration* has details on the configuration options and recommended settings.

The switch must be configured properly before the compute nodes can be provisioned, or provisioning is likely to fail. Other issues may also occur due to bad configuration, even if provisioning is succesful.

2.3 Head Node Installation

The head node now has to have Bright Cluster Manager installed onto it. Chapter 1 of the Bright Cluster Manager *Installation Manual* has a quick start guide for this. A bare-metal installation procedure is recommended.

During installation onto Cisco UCS, the following choices must be made:

- Hardware vendor: Cisco UCS must be chosen as the hardware vendor on the node information screen, if it was not chosen during download of the Bright Cluster Manager ISO.
- UCS Profile: (figure 2.1) This profile determines the default UCS configuration that is applied for the head node and the default category of compute nodes. Appendix A has more on the default profile types.

2.3 Head Node Installation

🌼 Bright Cluster Manager Ins	staller				7.0
Nodes					English(US)
 Welcome License Kernel Modules 	The numer of nodes, node start n compute nodes, and do not incluc Please enter node information.		ame and node digi	ts are relevant only	for the
 Hardware Info Nodes 	Number of racks	1			
Network Topology Additional Networks	Number of nodes	1			
Additional Networks Networks	Node start number	1			
 Nameservers Network Interfaces 	Node base name Node digits	node			
 Subnet Managers Installation Source 	Node Hardware Manufacturer	3	•		
Workload Management	Cisco UCS Profile	hpc	•		
 OpenStack Hadoop 					
 Ceph Disk Layout 					
O Time Configuration					
 Cluster Access Authentication 					
 Console Summary 					
			<u>C</u> ancel	Go <u>B</u> ack	Co <u>n</u> tinue

Figure 2.1: Selecting The UCS Profile

- The following items:
 - a separate layer-3 network for 10 Gig-E
 - node booting

can be set in the Additional High Speed Networks section of
figure 2.2:

Auditional Network C	Configuration English(US)
Welcome	
O License	Additional High Speed Networks
O Kemel Modules	Additional high speed interconnect 10 Gig-E
Hardware Info	Create layer-3 10 Gig-E network? • Yes No
O Nodes	Allow booting over 10 Gig-E Ves No
Network Topology	
Additional Networks	Note: Creation of a separate 10GE layer-3 network is not strictly necessary if it will be used as the default management network and/or if a regular GE network is not available. The network 'internalnet' will act as
Networks	the 10GE network and only the corresponding network interfaces need to be assigned on "internalnet" on the Network Interfaces screen. However, if it is still required to define a separate 10GE network alongside
O Nameservers	the regular GE network, and if the 10GE network should be used as the default management network,
O Network Interfaces	then please remember to select the 10GE network as the Management Network in the next screen.
O Subnet Managers	BMC Network Configuration
Installation Source	
O Workload Management	Will nodes have IPMI/iLO/CIMC compatible BMCs? Yes No
O OpenStack	Please select a BMC network type CIMC *
⊖ Hadoop	Use dedicated BMC port or share BMC with first Ethernet Interface? Dedicated
O Ceph	
O Disk Layout	To which Ethernet segment are the BMCs connected? Internal Network
Time Configuration	Create new layer-3 network (i.e. IP subnet) for BMC interfaces? Ves No
Cluster Access	Use DHCP to obtain BMC IP addresses? O Yes
Authentication	Automatically configure BMC when node boots? Yes O No
Console	

Figure 2.2: Allowing Separate Layer-3 Networking And Node Booting For 10 Gig-E

• An External Network should be selected for the BMC Ethernet segment (figure 2.3):

👫 Bright Cluster Manager Ins	taller		7.0
Additional Network Co	onfiguration	English(US)	é
Welcome License	Additional High Speed Networks		
 Kernel Modules Hardware Info Nodes 	Additional high speed interconnect 10 Gig- Create layer-3 10 Gig-E network? • Yes Allow booting over 10 Gig-E • Yes	O No	
Network Topology Additional Networks Networks Nameservers	Note: Creation of a separate 10GE layer-3 network is not strictly necessary management network and/or if a regular GE network is not available. Ther the 10GE network and only the corresponding network interfaces need to the Network Interfaces screen. However, if it is still required to define a sep the regular GE network, and if the 10GE network should be used as the define	network 'internalnet' will act as be assigned on 'internalnet' on ¤arate 10GE network alongside	
Network Interfaces Subnet Managers Installation Source	then please remember to select the 10GE network as the Management Net BMC Network Configuration	work in the next screen.	
Workload Management OpenStack	Will nodes have IPMI/iLO/CIMC compatible BMCs? Please select a BMC network type	CIMC	
 Hadoop Ceph Disk Layout Time Configuration 	Use dedicated BMC port or share BMC with first Ethernet Interface? To which Ethernet segment are the BMCs connected? Use DHCP to obtain BMC IP addresses?	External Network *	
ClusterAccess Authentication Console	Automatically configure BMC when node boots?	● Yes ○ No	
O Summary	Cancel	Go <u>B</u> ack Co <u>n</u> tinu	e

Figure 2.3: Select Ethernet segment for BMC

- If the BMC is to use DHCP to obtain BMC IP addresses, it should be set to do so in the same section of figure 2.3.
- If a separate layer-3 network was chosen and is to be used for node booting, then 10genet should be selected as the management network (figure 2.4).

🍀 Bright Cluster Manager Installe		7.0
Networks	English(US)	-
License be altered. Co screen. The d	P networks have been pre-configured. Using the controls below, the network settings may figuration of IP addresses for devices on these networks will be handled in the next fault management network can be changed, by selecting one from the list below. Please etworks that are defined bootable, will be listed.	
Additional Networks internalne	externalnet 10genet	
Networks		
O Nameservers		
Network Interfaces Network par	meters (externalnet)	
Subnet Managers	ame externalnet	
Installation Source Base ad	ess DHCP	
Workload Management OpenStack	ask DHCP	
O Hadoop Domain	ame brightcomputing.com	
O Ceph Default ga	way DHCP	
O Disk Layout		
Time Configuration Network	type Ethernet	
Cluster Access		
Authentication		
O Console		
O Summary		
	<u>C</u> ancel Go <u>B</u> ack Co <u>n</u> tinue	

Figure 2.4: Select 10 Gig-E Network As Management Network

Otherwise the default (internalnet) can be used.

• In the Network Interfaces screen (figure 2.5), the correct interface that will be used for management and external networks on the head node must be chosen.

By default:

- eth0 is assigned an IP address on the internal network.
- eth1 is assigned an IP address on the external network.

If the Cisco VIC interface is to be used for management and node booting, then the network of the corresponding interface—the one identified by the enic driver—should be set to:

- 10genet if the separate 10genet was chosen
- set to internalnet otherwise.

	ıstaller				
Network Interfaces					English(US)
Welcome License Kernel Modules		etwork Interfaces			•
Kerner Modules Hardware Info	Interface	Network	s will be set u	IP Address	Ŷ
 Nodes Network Topology 	eth0[e1000]	Unassigned	*		
Additional Networks	eth1[e1000]	externalnet	•	DHCP	
Networks Nameservers	eth2[enic] eth3[enic]	Unassigned	•	10.141.255.254	_
 Network Interfaces Subnet Managers 	cimc0	externalnet	•	DHCP	
-	To adjust the orde control on the upp		ies are assig	ned to physical network po	rts, please use the
 Workload Management OpenStack 			ies are assig	ned to physical network po	rts, please use the
 Workload Management OpenStack Hadoop 		oer right corner.	ies are assig	ned to physical network po	rts, please use the
 Installation Source Workload Management OpenStack Hadoop Ceph Disk Layour 	control on the upp	er right corner. K Interfaces		ned to physical network por	
Workload Management OpenStack Hadoop Ceph Disk Layout Time Configuration	Node Network	er right corner. K Interfaces			
 Workload Management OpenStack Hadoop Ceph Disk Layour 	Node Network	er right corner. K Interfaces igned network interface:		p on the nodes. IP address	

Figure 2.5: Set network of Cisco VIC interface

2.4 Compute Nodes Provisioning

After the head node installation is done, the compute nodes must be installed. The following procedure installs the compute nodes:

- Ensuring the switch has been configured correctly (section 2.2).
- Ensuring that nodes are configured to boot from the network in their BIOS settings.
- Booting the compute nodes/servers.
- Carrying out the compute node installation. The Bright Cluster Manager quick start installation guide (section 1.3 of the *Installation Manual*) has a simplified guide of this process for the administrator.

2.5 Firmware Upgrade On Servers

If the firmware for different components in Cisco UCS servers needs to be upgraded, then Chapter 4: *UCS Firmware* has instructions on downloading and upgrading the firmware for all servers in the cluster.

2.6 Post-Installation Configuration

Bright Cluster Manager can configure and manage all important components of a Cisco UCS server from the UCS tab in cmgui or from the ucs submode in cmsh. This is discussed in the following sections:

- Chapter 5: possible configuration options for the head node and individual compute nodes are described, as well as for node categories.
- Appendix 6: an overview of all metrics that are monitored from the CIMC of a server is provided.

2.7 Using usNIC

After a Bright UCS cluster has been deployed, Cisco usNIC is configured and ready to use out of the box.

- Section 2.7.1 explains how to verify the usNIC installation.
- Section 2.7.2 describes how to verify MPI communication using the installed example programs.

2.7.1 Verifying The usNIC Installation

The following helps verify that usNIC has been installed correctly and is working.

• Listing the usnic_verbs kernel module and related dependencies

```
$ lsmod | grep usnic_verbs
usnic_verbs 78776 0
ib_core 73747 13\
ib_ipoib,rdma_ucm,ib_ucm,ib_uverbs,ib_umad,rdma_cm,\
ib_cm,iw_cm,ib_sa,ib_mad,iw_cxgb4,iw_cxgb3,\
usnic_verbs
enic 67741 1 usnic_verbs
```

The preceding output may vary depending on the other kernel modules installed.

Viewing The Configuration Of usNIC-enabled Interfaces

```
$ ibv_devinfo
hca_id: usnic_1
...
state: PORT_ACTIVE(2)
...
hcaid: usnic_0
...
```

```
...
state: PORT_ACTIVE(2)
...
```

• Verifying that rdma service is running and is using the usNIC-related modules. Bright Cluster Manager enables the service by default and is also configured to start on boot, as chkconfig output should show:

```
$ chkconfig --list rdma
rdma 0:off 1:off 2:on 3:on 4:on 5:on 6:off
$ service rdma status
Low level hardware support loaded:
    none found
Upper layer protocol modules:
    ib_ipoib
User space access modules:
    rdma_ucm ib_ucm ib_uverbs ib_umad usnic_verbs
Connection management modules:
    rdma_cm ib_cm iw_cm
```

2.7.2 Running MPI Applications

Tranmission of the usNIC network packages between the hosts can be verified by running the following program:

```
su - cmsupport
module load cluster-tools-ext
cm-ibv-pingpong-test
```

To verify correctness of MPI traffic, the cm-usnic-ring-test program can be run. The following example shows how to run it as the cmsupport user.

```
su - cmsupport
module load openmpi/gcc cluster-tools-ext
cm-usnic-ring-test
```

3

Nexus Switch Configuration

This chapter recommends configuration settings for a Cisco Nexus Switch that is part of a Cisco UCS C-Series rack mount cluster. The following instructions are based on the Cisco Nexus Operating System (NX-OS) version 6.0 running on a Cisco Nexus 3548 switch, and assume command line access to the switch.

The administrator should consult the appropriate switch and NX-OS documentation for possible changes before proceeding with the configuration.

The administrator executes the following steps:

- The switch is logged into (details on logging in are to be found in the switch documentation).
- The configuration mode is entered:

configure terminal

• The interfaces are selected, and flow control is set:

```
interface ethernet 1/1-48
flowcontrol receive on
flowcontrol send on
```

• The network-qos policies are set:

class-map type network-qos class1

policy-map type network-qos my_network_policy class type network-qos class1 pause no-drop system qos service-policy type network-qos my_network_policy policy-map type network-qos jumbo class type network-qos class-default mtu 9216 system qos service-policy type network-qos jumbo • The qos is set:

```
configure terminal
class-map type qos class1
match cos 2
policy-map type qos my_qos_policy
class type qos class1
set qos-group 1
```

• The running qos can be displayed:

show running-config ipqos

4

UCS Firmware

This chapter explains how to upgrade the CIMC and BIOS firmware of multiple C-Series servers after a Bright Cluster has been installed—that is, after the head node and compute nodes are in the status UP, and are running.

Bright Cluster Manager installed on UCS comes pre-installed with the latest Cisco UCS firmware packages that were available at the time of installation. The firmware files are placed in a shared location, accessible to all the nodes: /cm/shared/apps/hwvendor/ciscoucs.

If different firmware files are to be used, then placing them in that location is recommended.

4.1 Head Node Firmware Upgrade

The example that follows uses the head node C-Series server model C220. The variables <code>\$CIMC_FIRMWARE</code> and <code>\$BIOS_FIRMWARE</code> are set in this example to point to firmware files for Cisco UCS version 1.5.4.

The path and names of the files must be changed if the firmware files are in a different location. The examples are based on where the files are located on a default Bright Cluster Manager installation.

4.1.1 CIMC Firmware Update

The head node CIMC firmware can be upgraded as follows:

Example

```
[root@bright70 ~]# export CIMC_FIRMWARE=/cm/shared/apps/hwvendor/ciscou\
cs/current/firmware/c220//cimc/upd-pkg-c220-m3-cimc.full.1.5.4.bin
[root@bright70 ~]# service ipmi start
[root@bright70 ~]# /cm/shared/apps/hwvendor/ciscoucs/current/firmware/f\
wup cimc update $CIMC_FIRMWARE
```

The update takes several minutes. The administrator must wait for it to complete. It is completed when a message appears prompting the administrator to run CIMC firmware activation.

4.1.2 CIMC Firmware Activation

The head node CIMC firmware can be activated as follows:

Example

```
[root@bright70 ~]# /cm/shared/apps/hwvendor/ciscoucs/current/firmware/f\
wup cimc activate
```

© Bright Computing, Inc.

4.1.3 CIMC Firmware Version View

The head node CIMC firmware can be viewed as follows:

Example

```
[root@bright70 ~]# /cm/shared/apps/hwvendor/ciscoucs/current/firmware/f\
wup cimc show version
```

Firmware Update Utility v1.1 Build 9 Copyright (c) 2011 Cisco Systems Inc. All rights reserved.

```
Platform detected ..... C240M3 Series ...
```

4.1.4 BIOS Firmware Update

The head node BIOS firmware can be updated as follows:

Example

```
[root@bright70 ~]# export BIOS_FIRMWARE=/cm/shared/apps/hwvendor/ciscou\
cs/current/firmware/c220/bios/UCS/C220-BIOS-1-5-4-0.CAP
[root@bright70 ~]# /cm/shared/apps/hwvendor/ciscoucs/current/firmware/b\
iosup -n -p -u $BIOS_FIRMWARE
```

For the head node BIOS firmware update:

- The update takes several minutes. The hosts automatically reboot after 'biosup' has completed.
- In some cases the hosts do not power on automatically. The hosts must then be powered on manually, for example via cmgui.

4.1.5 BIOS Firmware Version View

The head node BIOS firmware can be viewed as follows:

Example

```
[root@bright70 ~]# /cm/shared/apps/hwvendor/ciscoucs/current/firmware/b\
iosup -i
```

```
BIOS Update Utility v2 Build 8
Copyright (c) 2013 Cisco Systems Inc.
All rights reserved.
```

```
      Vendor
      : Cisco Systems, Inc.

      Version
      : C240M3.1.5.4f.0.111320130505

      StartAddr
      : 61440 (0xf000)

      BIOSReleaseDate
      : 11/13/2013

      BIOS RomSize
      : 127 (0x7f)

      BIOS BIOSCharacteristics
      : 1066113152 (0x3f8b9880)
```

4.2 Compute Node Firmware Upgrade

The following example assumes that the compute nodes use the C-Series server model C220, and that the variables <code>\$CIMC_FIRMWARE</code> and <code>\$BIOS_FIRMWARE</code> point to the respective firmware files.

The paths and names of the files used in the example are defaults, and may need adjustment if the firmware locations are elsewhere.

4.2.1 CIMC Firmware Update

The compute node CIMC firmware can be updated as follows:

Example

```
[root@bright70 ~]# cmsh
[bright70]% device
[bright70->device]% pexec -b -n node001..node002 "export CIMC_FIRMWARE\
=/cm/shared/apps/hwvendor/ciscoucs/current/firmware/c220/cimc/upd-pkg-c\
220-m3-cimc.full.1.5.4.bin; service ipmi start; /cm/shared/apps/hwvendo\
r/ciscoucs/current/firmware/fwup cimc update $CIMC_FIRMWARE"
```

The text between the quote marks is one long line, using backslashes to indicate continuation on the printed page as is customary in the Bright Cluster Manager manuals.

The CIMC firmware update takes several minutes. The administrator must wait for it to complete. It is completed when a message appears prompting the administrator to run CIMC firmware activation.

4.2.2 CIMC Firmware Activation

The compute node CIMC firmware can be activated as follows:

Example

```
[root@bright70 ~]# cmsh
[bright70]% device
[bright70->device]% pexec -b -n node001..node004 "service ipmi start; \
/cm/shared/apps/hwvendor/ciscoucs/current/firmware/fwup cimc activate"
```

The CIMC firmware activation will take several minutes. The administrator must wait for it to complete. It is completed when the CIMC completion message is seen.

4.2.3 CIMC Firmware Version View

The compute node CIMC firmware can be viewed as follows:

Example

```
[root@bright70 ~]# cmsh
[bright70]% device
[bright70->device]% pexec -n node001..node004 "service ipmi start; /cm/\
shared/apps/hwvendor/ciscoucs/current/firmware/fwup cimc show version"
```

4.2.4 BIOS Firmware Update

The compute node BIOS firmware can be updated as follows:

Example

```
[root@bright70 ~]# cmsh
[bright70]% device
[bright70->device]% pexec -b -n node001..node004 "export BIOS_FIRMWARE=\
/cm/shared/apps/hwvendor/ciscoucs/current/firmware/c220/bios/UCS/C220-B\
IOS-1-5-4-0.CAP; /cm/shared/apps/hwvendor/ciscoucs/current/firmware/bio\
sup -n -p -u $BIOS_FIRMWARE"
```

For the compute node BIOS firmware updates:

- The BIOS firmware update takes several minutes. The hosts automatically reboot after the biosup command has completed.
- In some cases the hosts do not power on automatically. The hosts must then be powered on manually, for example via cmgui.

4.2.5 BIOS Firmware Version View

The compute node BIOS firmware can be viewed as follows:

Example

```
[root@bright70 ~]# cmsh
[bright70]% device
[bright70->device]% pexec -b -n node001..node004 "/cm/shared/apps/hwven\
dor/ciscoucs/current/firmware/biosup -i"
Nodes down: node001
[bright70->device]%
```

```
[node002] :
BIOS Update Utility v2 Build 8
Copyright (c) 2013 Cisco Systems Inc.
All rights reserved.
Vendor : Cisco Systems, Inc.
Version : C220M3.1.5.4f.0.111320130449
StartAddr : 61440 (0xf000)
BIOSReleaseDate : 11/13/2013
BIOS RomSize : 127 (0x7f)
BIOS BIOSCharacteristics : 1066113152 (0x3f8b9880)
```

5

UCS Node And Category Configuration

This chapter describes the management of UCS configuration for individual head and compute nodes using cmgui.

Section 5.1 explains the BIOS Settings tab, which allows the BIOS settings of the node to be modified directly.

Section 5.2 explains how to modify properties of VIC adapter interfaces.

Section 5.3 explains NTP-related settings that can be configured for the CIMC.

Section 5.4 describes syslog parameters and other settings that can be configured for the CIMC.

Section 5.5 describes fault logging.

Section 5.6 explains how to launch a KVM session to the node console. Section 5.7 describes how to import CIMC/UCS-related settings from an XML file into the UCS configuration settings of the node.

Section 5.9 describes how node categories are used in managing UCS configuration.

5.1 BIOS Settings

Figure 5.1 shows a view of the BIOS subtab properties that can configured.

🛋 ucs-head			
			Eright trunk Cluste
Denne (Denk) Sensity Sensity Neural Sensity (Denk) Sensity Sensity Neural Sensity (Denk) Wards Occore Synaps Neural Sensity (Denk) Sensity Neural Sensity (Denk) Wards Occore Synaps Neural Sensity (Denk) Sensity Neural Sensity (Denk) Wards Occore Synaps Neural Sensity (Denk) Sensity Neural Sensity (Denk) Wards Occore Synaps Neural Sensity (Denk) Sensity Neural Sensity (Denk) Wards Occore Synaps Neural Sensity (Denk) Sensity Neural Sensity (Denk) Memory Neural Sensity (Denk) Occore Sensity (Denk) Sensity Neural Sensity (Denk) Memory Neural Sensity (Denk) Occore Sensity (Denk) Sensity Neural Sensity (Denk) Memory Neural Sensity (Denk) Occore Sensity (Denk) Sensity Neural Sensity (Denk) Memory Neural Sensity (Denk) Occore Sensity (Denk) Sensity Neural Sensity (Denk) Memory Neural Sensity (Denk) Occore Sensity (Denk) Sensity Neural Sensity (Denk)	Image:	Strive Hanaponet IIIIS Thes: <u>Anten</u> Of Birl Watching Theory <u>Concert</u> Of Birl Watching Theory <u>Concert</u> Of Birl Watching Theory <u>Concert</u>	Locater LED: O Storage Status: O Privet Stoppiles: D Frenjevatari: O Frenjevatari: O Server Statas: O
Neemer Catignation Neemer Catign		Ul Cantiguestes Laper 100 apper Laper 100 appe	
		where is one spaces or the space spac	

Figure 5.1: Full-width View Of The BIOS Subtab In cmgui

If this manual has been printed on A4 paper, then figure 5.1 has an unreadable text size. The text in the figure can however be read with the Bright-released PDF file version of this manual, if it is on a display and if zooming in on the figure is allowed.

If running cmgui itself to display the UCS tabs screen with its subtabs, then the full-width view is quite readable on a relatively modest 21" monitor with a resolution of 1280x1024, or better.

A zoomed-in view that shows some details and is thus helpful for A4 paper readers is shown in figure 5.2.

	mation Se	ervices	Process Management	Network Setup	Static Rou	tes FS Mounts	FS Exports	Roles	GPU Settings	UCS N
	Model:	UCSC-	C240-M3S		Firmwares				Locator L	ED;
	Vendor:	Cisco	Systems Inc		CIMC:	1.5(4)			Storage S	
	Serial:	FCH16	17V0UL		BIOS:	C240M3.1.5.4f.	0 (Build Date	11/13/20	13) Power Su	pplies: 🧯
	UUID:		905-9245-40CC-878B-/	AC483AB455A4	Lom:	2.1(2.84)			Temperat	ture: 🧯
	vNICs:				Storage:	2.120.234-1471			Fans:	•
	vHBAs:	2			PCI:				Server St	atus: (
	BIOS VIC	Adapter	s NTP Settings Syst	og Settings 🛛 Fa	ult Log					
P	Console re			og Settings Fa	ult Log	LOM and PCIe S	Slots Configu	ation		
ľ		edirectio		og Settings Fa	ult Log	LOM and PCIe S		ation	•	
ľ	Console re	edirectio	n		ult Log		: Enabled	ation	•	
ľ	Console re Redirectio	edirectio	disabled		ult Log	LOM port0 state	Enabled	ation		

Figure 5.2: Smaller Window View Of The BIOS Subtab In cmgui

In the BIOS subtab, the different BIOS properties that can be configured are grouped into boxes based on their functionality. These subtabs are:

- Console redirection
- LOM and PCIe Slots Configuration (LOM Lan On Motherboard)
- Server Management

- Processor Configuration
- Memory Configuration
- USB Configuration
- Onboard Storage
- QPI Configuration (QPI Quick Path Interconnect)
- Other Settings
- PCI Configuration
- BIOS Boot Order

If a BIOS property is modified then the Save button can be clicked to update the settings via CIMC.

For example, in figure 5.3, the property Intel(R) Hyper-Threading Technology has been modified to enabled. Save has become clickable, and clicking it requests CIMC to update the property.

	12001		ion p												
	0	💼 br	ight70-	ucs									Bright	7.0 UCS	Cluster
	< 0	rmation	Service	Process Manag	ement	Network Setup	Static Rout	tes FS	6 Mounts	FS Exports	Roles	GPU S	ettings	UCS	Notes >
\$		Mode	el: UCS	C-C240-M3S			Firmwares					L	.ocator L	ED:	0
		Vend	or: Cisc	o Systems Inc			CIMC:	1.5(4)				5	Storage S	status:	•
S		Seria		1617V0UL			BIOS:	C240	//3.1.5.4f.0) (Build Date:	: 11/13/2	1 013) F	Power Su	pplies:	•
l		UUID		2905-9245-40CC	-878B-	AC483AB455A4	Lom:	2.1(2.8				٦	Temperat	ure:	•
1 1		VNIC					Storage:	2.120.	234-1471				ans:		•
)		VHBA	ls: 2				PCI:					5	Server St	atus:	•
				ers NTP Settings	0						_		_		
		BIOS	/IC Adapt	ers NTP Settings	Syst	log Settings Fa	ult Log								
		Proces	sor Conf	guration				Memor	y Configu	ration					USI
		Intel(R)	Hyper-Tł	reading Technolog	y:	enabled	<u>•)</u>	Select	memory R	AS configurat	ion: 🕅	aximum-j	performance	••)	Leç
		Number	ofEnable	d Cores:		platform-default disabled		DRAM	clock throt	ttling:	B	alanced		•	USI
les		Enhance	d Intol/P	Speedstep Techn	alogy	enabled	_	DRAM	refresh rat		(2)			5	AII
its					orogy.	<u> </u>								2	
ə	1.0	Intel(R)	Turbo Bo	ost Technology:		enabled	•)	Low Vo	Itage DDR	mode:	(pc	wer-savi	ng-mode	▼)	USI
										·					
		<u>K</u> VM	Load L	CS XML from file	Show	Live Import fro	m <u>C</u> ategory						<u>R</u> ever	t <u>S</u>	ave

Figure 5.3: Edit BIOS tokens using cmgui

5.2 VIC Adapters

The VIC Adapters subtab as seen in figure 5.4 shows the list of physical, vNIC and vHBA interfaces that have identified themselves to the system, along with a summary of their settings. Properties of a physical interface cannot be modified, but vNIC and vHBA interface properties can be modified.

< tion	Services	Process Man	agement	Network Setup	Static Rou	ites F	SMounts	FS Exports	Roles	GPU Set	inas l	JCS Note
			3									
1	Vodel: U	ICSC-C240-M3	s		Firmw	/ares					Locato	r LED:
\	/endor: C	cisco Systems	Inc		CIMC:	: 1	.5(4)				Storag	e Status:
5	Serial: F	CH1617VOUL			BIOS:	c	C240M3.1.5	5.4f.0 (Build	Date: 11	/13/2013)	Power	Supplies:
ι	JUID: 5	4F92905-924	-40CC-87	8B-AC483AB455	A4 Lom:	2	2.1(2.84)				Tempe	rature:
\ \	/NICs: 2				Stora	ge: 2	2.120.234-1	471			Fans:	
1	/HBAs: 2				PCI:						Server	Status:
	_											
BIO	S VIC Ad	apters NTP 9	ettings	Syslog Settings	Fault Log							
Physic	cal Interfac	es										
Port II	MAC Add	ress		Link State		Transp	ort		dmin Spee	d		Operating
0	BC:16:65:3	30:AF:BE		up		CE		1	0Gbps			10Gbps
1	BC:16:65:3	30:AF:BF		down		CE		1	0Gbps			
Virtual	Ethornot In	nterfaces (vNIC	c)									
Names		idre 🗸 🛛 M 🍾		V Uplink P V	C 🗸 🛛 VI	~	VLAN Mo V	iSCSI B	✓ Chan.	Det Det	Prof 🗸	Uplink Fail
eth0	MAC AC BC:16:0		0	0	0 0		O VLAN MO V	true	✓ Cnan. 0	N/A	Prot V	О
eth1	BC:16:		0	1	0 0		0	true	0	N/A		0
Curz	00.10.	1000	, v		<u> </u>		•	uuc				
Minteral	Filter Oken											
Name		nel Interfaces (~		V Uplin	nk Port	~	Boot	~	hannel	\sim	Port Prof	
fc0		C:16:65:30:	10:00:BC:1		IK POR	~	true	V (~	N/A	ne
fc1		3C:16:65:30:	10:00:BC:1				true	0			N/A N/A	
101	20.00.0	50.10.00.30	10.00.80.1	10.00.00 1			uue	0			19075	

Figure 5.4: Overview of vNICs and vHBAs in cmgui

Double-clicking on a vNIC interface row opens an edit dialog (figure 5.5). Property classes that can be modified for a vNIC interface are:

- vNIC Settings
- Receive Side Scaling
- usNIC Profile

Each of these property classes has several device properties that can be changed. The Save button of the dialog saves the changes via CIMC directly.

× Edit Virtual Ethernet Interface	000
Enable TCP TX Offload Checksum Generation: 📝	1
Enable Large Receive:	
Receive Side Scaling	
Enable TCP Receive Side Scaling:	
Enable IPv4 RSS:	
Enable TCP-IPv4 RSS:	
Enable IPv6 RSS:	
Enable TCP-IPv6 RSS:	
usNIC Profile	
usNIC Profile:	
Class Of Service:	-
<u>C</u> ancel <u>S</u> ave	<u>R</u> evert

Figure 5.5: Edit vNIC properties using cmgui

Double clicking on a vHBA interface will open an edit dialog (figure 5.6). Property classes that can be modified for a vHPB interface are:

- General Settings
- Error Recovery
- Fiber Channel Properties
- Queue Profiles
- Boot Table
- Persistent Bindings

Device properties in these classes can be changed. The Save button of the dialog saves the changes via CIMC directly.

×Edit Virtual Fiber Channe	el Interface	000
FC SAN Boot:	~	
Enable Persistent LUN Binding:		
Error Recovery		
Enable FCP Error Recovery:		
Link Down Timeout:	30000	
Port Down I/O Retries:	8	
Port Down Timeout:	10000	
Error Detect Timeout:	2000	
Resource Allocation Timeout:	10000	
Fiber Channel Properties		
Interrupt Mode:	MSIx	-
I/O Throttle Count	512	
	<u>C</u> ancel <u>S</u> ave <u>F</u>	Revert

Figure 5.6: Edit vHBA properties using cmgui

5.3 NTP Settings

Enabling and configuring the NTP clients via CIMC can be done using the NTP Settings subtab (figure 5.7).

🗙 Bright Cluster Ma	lanager C	000
<u>File Monitoring View</u>	Bookmarks Help	
RESOURCES	bright70-ucs	luster
RESOURCES ▼ My Clusters ▼ Bright 7.0 U ▼ Switches ⊗ switc ▷ Networks ▷ Power Di ▷ Node Ca ▼ Head No ● Racks ▷ Chassis ▷ Vrittual S ▼ Nodes © node ▷ Cloud N ▷ GPU Units ▷ Other De ▷ Node Gr ▷ Hadoop	Overview Tasks Settings System Information Services Process Model: UCSC-C240-M3S Firmwares Firmwares Vendor: CiMC: 1. Vendor: Cisco Systems Inc CIMC: 1. Serial: FCH1617V0UL BIOS: C UUID: 54F92905-9245-40CC-878B-AC483AB455A4 Lom: 2.	
Lusers &	KVM Load UCS XML from file Show Live Import from Category	
Ready		

Figure 5.7: Configuring NTP Settings Using cmgui

5.4 Syslog Settings

Logging controls for the CIMC are configured from the Syslog Settings subtab figure 5.8). The properties that can be configured are

- the Remote Syslog Server Primary
- the Remote Syslog Server Secondary
- the Local Logging

	Services	Process Management	Network Set	tup Static	Routes	FS Mounts	FS Exports	Roles	GPU Settings	UCS
Model: UCS	C-C240-M35	5		Firmwares					Locator	LED:
Vendor: Cisc	Vendor: Cisco Systems Inc								Storage	Status:
Serial: FCH1	Serial: FCH1617V0UL					3.1.5.4f.0 (Bi	ild Date: 11/:	13/2013)		
	2905-9245	-40CC-878B-AC483AB		Lom:	2.1(2.8				Tempera	ature:
vNICs: 2				Storage:	2.120.2	34-1471			Fans:	
vHBAs: 2		PCI:					Server S	tatus:		
BIOS VIC Adapte	ers NTP Se	ettings Syslog Settin	gs Fault Lo	g						
BIOS VIC Adapte			ngs Fault Loi Remote Sysio	-	econdary	1	Local Lo	gging		
		ary	-	-	econdary	r				
Remote Syslog S		ary	Remote Sysle	-	econdary	,	Local Lo Logging S			
Remote Syslog S Enable		ary	Remote Sysle	-	econdary	, 				

Figure 5.8: Configuring Syslog Settings Using cmgui

5.5 Fault Logs

The Fault Log subtab (figure 5.9) shows a summary of faults instances reported by the CIMC. System event logs and CIMC authentication and audit logs are not captured at the moment. The fault summary is initially empty at the start of a cmgui session. Clicking on the Refresh button retrieves and displays the list of faults. The values displayed persist in

the subtab until a click of the Refresh button retrieves the latest fault logs. The values are not refreshed automatically.

nitoring <u>V</u> iew	Bookmarks Help										
JRCES	node002								📄 Bri	ght 7.0 U	CS Cluster
Clusters 🚖	< cess Management	Network Setup	Static Routes	FS Mounts	FS Exports	Roles	Disk Setup	RAID Setup	GPU Settings	UCS	Burn N
Bright 7.0 U											
Switches	Model:	Firmwares Locator LE								r LED:	0
🐼 switc	Vendor:			CI	AC:				Storag	e Statu	s: 🔾
Networks	Serial:			BIO	DS:				Power	Supplie	s: 🔾
Power Di	UUID:			Lo	n:				Tempe	rature:	0
Software	vNICs:			Sto	orage:				Fans:		0
Node Ca	vHBAs:			PC	E				Server	Status	0
Head No											
Racks	BIOS VIC Adapt	ers NTP Setting	IS Syslog Setti	ngs Fault L	og						
Chassis	<u>Time</u>	Severity	Code	DN	P	robable c	ause	Descr	iption		
Virtual S Nodes node Cloud N	Fri Jan 24 16:26:21	warning	F0996	sys/rack board/st SLOT-ME	orage-SAS-	quipment-d	legraded		Local disk 2 is de rebuild or copybac		
MIC Nodes GPU Units Other De Node Gr	Refresh	_	_	_	_		_	*	* 1 * *	-	25 🔹

Figure 5.9: CIMC Fault Logs In cmgui

5.6 The KVM Button

The CIMC provides a KVM console. The KVM console is an interface that emulates direct keyboard, video, and mouse connections to the server. It also allows mapping physical device locations to virtual drives that are accessible during the KVM session.

A KVM console is launched within cmgui by clicking the KVM button. The button is found on the status bar of the UCS configuration settings subtabs of each node.

5.6.1 KVM Console Requirements

The following must be installed on the host that is running cmgui, in order for cmgui to launch the KVM console:

- JRE (Java Runtime Environment) version 1.5.0 or greater
- Java Web Start application (IcedTea WebStart on Linux)

The KVM button launches a request to CIMC to obtain the JNLP file containing the information to make connection to the console. If the CIMC replies with a valid JNLP file, then cmgui checks if Java Web Start (typically javaws) exists in the default path. If javaws is found, then cmgui uses a downloaded JNLP file to automatically launch the KVM console (figure 5.10).

Overview Tasks Set	tings System Inf	ormation	Services	Process Management	Network Setup	Static Routes	FS Mounts	FS Exports	Roles	Hadoop	Ceph	OpenStack	GPU Settings	UC
Model: UCSC-C24	0.035						Firmwa	ires						
Vendor: Cisco Sys	tems Inc						CIMC:	1.5(4)						
Serial: FCH1617V							BIOS:			0 (Build D	ate: 11/	13/2013)		
UUID: 54F92905- vNICs: 2	9245-40CC-878B-/	AC483AB45	5A4				Lom: Storag	2.1(2.8 e: 2.120.3						
vHBAs: 2							PCI:							
BIOS VIC Adapters I	TD Cattings Com	la a Castin an	Fred			10.2.183.18	7 – KVM Co	nsole				- x		
BIOS VIC Adapters 1	in setungs sys	aog serungs	F	le View Macros 1								_		
Console redirection				🕤 KVM 🥤 🔂 Virtual I	Чedia								Server Mana	
				ntOS release 6.										gem
Redirection:	disabled	-	Ke	rnel 2.6.32-431	.3.1.el6.x86	5_64 on an	×86_64						FRB-2 Timer:	
Baud rate:	(115200		ua	s-head login:									OS Boot Watc	
Flow control:	none												OS Boot Watc	hdog
Putty key pad:	ESCN	•											OS Boot Watch	hdog
Redirection after POST:	Always Enable	•											UCSM Boot Or	der R
Terminal type:	vt100													
			_											
Processor Configurati	on												USB Configu	
Intel(R) Hyper-Threading	Technology:	disabled	_										Legacy USB s	uppor
Number of Enabled Core	s: (al	_										USB Emul 606	0:
Enhanced Intel[R] Speed	Istep Technology; (enabled	_	•)	DRAM	refresh rate:	0	2x		•)			All usb device:	s:
Intel(R) Turbo Boost Tecl	mology:	enabled		•	Low Vo	Itage DDR mode:		power-saving-	mode	•			USB port front	
Intel(R) VT:		enabled		•	NUMA (optimized:		enabled		•			USB port inter	nal:
Intel(R) VT-d:		enabled		•	Altítudo	2		300-m		•			USB port KVM:	

Figure 5.10: KVM Console Launched From KVM Button

An error is reported by cmgui if CIMC does not provide a valid JNLP file, or if javwas is not found.

5.7 Importing UCS Settings From An XML File

Configuration and settings for different components in CIMC for a particular node can be imported from an XML file. The list of specifications in the XML file is called the *UCS profile*.

The Load UCS XML from file button launches a file browser to help import of the XML file. After import, the contents populate all the UCS subtabs. Clicking the Save button, stores the imported changes in the CMDaemon database, and CIMC is notified of the requested changes. Appendix A has the XML schema details for the UCS profile.

5.8 Applying UCS Settings Changes

UCS settings for a node can be applied while the node is up.

If a node has been provisioned at least once before, and is known to Bright Cluster Manager, then when changes are made to the UCS settings of the node or to the UCS settings of the node category, the change request is immediately sent to the CIMC of the node. This is done by CMDeamon on the head node, as already explained in the other sections of this chapter.

5.9 UCS Category Settings

In Bright Cluster Manager, defining a configuration at category level means that compute nodes in that category inherit the specified configuration.

The default category that is defined in a standard vanilla installation of Bright Cluster Manager is preconfigured with the UCS profile (section 5.7). The UCS profile can be selected during head node installation, but by default it takes the default value (Appendix A.3). In this case, all nodes by default therefore simply inherit the default UCS profile. The list of nodes to which the UCS profile is applied to is conveniently listed at the top of the UCS tab of the specific category (figure 5.11). Selecting an individual node from there with a double click then opens up the node item, and allows configuration adjustments per node, as described in the preceding sections of this chapter.

Keright Cluster Manag	ger 00
RESOURCES	default 🗎 Bright 7.0 UCS Cluster
▼ My Clusters ■ Bright 7.0 UCS CL ▼ Switches ⊗ switchol ● Networks ● Software Images ▼ Node Categories ● deauti	Cecs Disk Setup RAID Setup Static Routes FS Mounts FS Exports Roles Nodes GPU Settings UCS I Hotsman BIOS Fir. CIMC Fir. V VNCS V VHBAs V Boxt. V VIII VIII VIIII VIIIII VIIIIII
	Console redirection LOM and PCle Slots Configuration Redirection: • Baud rate: • Flow control: • Putty key pad: •
D ☐ GPU Units D ☐ Other Devices	KVM Load UCS XML from file Save
Ready	

Figure 5.11: The Category UCS Tab

While in the UCS tab of the category, subtabs allow UCS configuration, just as for individual nodes. So, BIOS settings (section 5.1), VIC adaptors (section 5.2), NTP settings (section 5.3), syslog settings (section 5.4), fault logging (section 5.5), and importing a UCS profile (section 5.7), can all be configured at the just like was done for at the node level. The difference being that the configuration profile thus created is applied at the category level, and can be overridden at node level.

Launching a KVM console (section 5.6) is not included in the preceding list of category configuration settings. This is because having the KVM button work directly at the category level to open up many consoles for all the nodes in the category is hardly likely to be useful. Instead, clicking on the button in category mode simply prompts the user to select a specific node, and launches a console for the selected node.

6

Monitoring

Metrics that can be measured and monitored through CIMC on a C-series rack server are covered in this chapter. The majority of the metrics are reported via IPMI, while some metrics are measured through the CIMC XML API. Chapter 9 of the *Administrator Manual* has more information about metric collection and metric collection scripts.

The following table shows a list of metrics that are monitored from the CIMC using the XML API.

Metric	Description
boardconsumedPower	Power consumed by board
boardinputVoltage	Input voltage across board
boardinputCurrent	Input current into board
boardfrontTemp	Front temperature of board
boardioh1Temp	Temperature of IOH1 on board
boardioh2Temp	Temperature of IOH2 on board
boardambientTemp	Ambient temperature of board
boardrearTemp	Temperature of rear of board
DIMM_A1	Temperature of DIMM A1
DIMM_B1	Temperature of DIMM B1
DIMM_C1	Temperature of DIMM C1
DIMM_D1	Temperature of DIMM D1
DIMM_E1	Temperature of DIMM E1
DIMM_F1	Temperature of DIMM F1
DIMM_G1	Temperature of DIMM G1

...continues

continued					
Metric	Description				
DIMM_H1	Temperature of DIMM H1				
P1_TEMP_SENS	Temperature of power supply 1				
P2_TEMP_SENS	Temperature of power supply 2				

CIMC XML API Metrics

The metric collection script that is used to collect the preceding metrics is located on the head node at:

/cm/local/apps/cluster-tools/ext/ucs/ucsmetrics

Plots from the data values obtained from these sensors can then be viewed in the monitoring inteface of cmgui:



Figure 6.1: Plot of CIMC metrics obtained via XML API



Figure 6.2: UCS metrics monitoring

A

UCS Profiles

In this appendix, XML schemas are listed for the following Cisco UCS profiles:

- HPC (Appendix A.1)
- Custom (Appendix A.2)
- Default (Appendix A.3)

A.1 UCS Profile: HPC

```
<UCSProfile>
 <topSystem>
   <biosUnit>
     <biosSettings>
       <!-- CPU -->
       <biosVfIntelHyperThreadingTech vpIntelHyperThreadingTech="disabled"/>
       <biosVfCoreMultiProcessing vpCoreMultiProcessing="all"/>
       <biosVfIntelVirtualizationTechnology vpIntelVirtualizationTechnology="enabled"/>
       <biosVfIntelVTForDirectedIO vpIntelVTDCoherencySupport="enabled"\</pre>
          vpIntelVTForDirectedIO="enabled" vpIntelVTDATSSupport="enabled"/>
       <biosVfCPUPerformance vpCPUPerformance="hpc"/>
       <biosVfHardwarePrefetch vpHardwarePrefetch="enabled"/>
       <biosVfAdjacentCacheLinePrefetch vpAdjacentCacheLinePrefetch="enabled"/>
       <biosVfDCUPrefetch vpStreamerPrefetch="enabled" vpIPPrefetch="enabled"/>
       <biosVfDirectCacheAccess vpDirectCacheAccess="enabled"/>
       <biosVfCPUPowerManagement vpCPUPowerManagement="energy-efficient"/>
       <biosVfEnhancedIntelSpeedStepTech vpEnhancedIntelSpeedStepTech="enabled"/>
       <biosVfIntelTurboBoostTech vpIntelTurboBoostTech="enabled"/>
       <biosVfProcessorC6Report vpProcessorC6Report="enabled"/>
       <biosVfProcessorC1E vpProcessorC1E="enabled"/>
       <biosVfPStateCoordType vpPStateCoordType="HW ALL"/>
       <biosVfCPUFrequencyFloor vpCPUFrequencyFloor="disabled"/>
       <biosVfCPUEnergyPerformance vpCPUEnergyPerformance="energy-efficient"/>
       <!-- MEMORY -->
        <biosVfSelectMemoryRASConfiguration vpSelectMemoryRASConfiguration=\
          "maximum-performance"/>
       <biosVfDRAMClockThrottling vpDRAMClockThrottling="performance"/>
       <biosVfNUMAOptimized vpNUMAOptimized="enabled"/>
       <biosVfLvDIMMSupport vpLvDDRMode="performance-mode"/>
```

```
<body>

        <biosVfDramRefreshRate vpDramRefreshRate="auto"/>

        <biosVfMemoryInterleave vpChannelInterLeave="auto" vpRankInterLeave="auto"/></to>
        <biosVfPatrolScrub vpPatrolScrub="enabled"/>

        <biosVfDemandScrub vpDemandScrub="enabled"/>
        <biosVfAltitude vpAltitude="auto"/>

        </biosSettings>
        </biosUnit>

        </to>
```

A.2 UCS Profile: Custom

```
<UCSProfile>
  <topSystem>
    <biosUnit>
      <biosSettings>
        <!-- CPU -->
        <biosVfIntelHyperThreadingTech vpIntelHyperThreadingTech="disabled"/>
        <biosVfCoreMultiProcessing vpCoreMultiProcessing="all"/>
        <biosVfIntelVirtualizationTechnology vpIntelVirtualizationTechnology=\</pre>
          "enabled"/>
        <biosVfIntelVTForDirectedIO vpIntelVTDCoherencySupport="enabled"\</pre>
          vpIntelVTForDirectedIO="enabled" vpIntelVTDATSSupport="enabled"/>
        <biosVfCPUPerformance vpCPUPerformance="hpc"/>
        <biosVfHardwarePrefetch vpHardwarePrefetch="enabled"/>
        <biosVfAdjacentCacheLinePrefetch vpAdjacentCacheLinePrefetch=\</pre>
          "enabled"/>
        <biosVfDCUPrefetch vpStreamerPrefetch="enabled" vpIPPrefetch=\</pre>
          "enabled"/>
        <biosVfDirectCacheAccess vpDirectCacheAccess="enabled"/>
        <biosVfCPUPowerManagement vpCPUPowerManagement="energy-efficient"/>
        <biosVfEnhancedIntelSpeedStepTech vpEnhancedIntelSpeedStepTech\</pre>
          ="enabled"/>
        <biosVfIntelTurboBoostTech vpIntelTurboBoostTech="enabled"/>
        <biosVfProcessorC6Report vpProcessorC6Report="enabled"/>
        <biosVfProcessorC1E vpProcessorC1E="enabled"/>
        <biosVfPStateCoordType vpPStateCoordType="HW ALL"/>
        <biosVfCPUFrequencyFloor vpCPUFrequencyFloor="disabled"/>
        <biosVfCPUEnergyPerformance vpCPUEnergyPerformance="energy\</pre>
          -efficient"/>
        <!-- MEMORY -->
        <biosVfSelectMemoryRASConfiguration vpSelectMemoryRASConfiguration=\</pre>
          "maximum-performance"/>
        <biosVfDRAMClockThrottling vpDRAMClockThrottling="performance"/>
        <biosVfNUMAOptimized vpNUMAOptimized="enabled"/>
        <biosVfLvDIMMSupport vpLvDDRMode="performance-mode"/>
        <biosVfDramRefreshRate vpDramRefreshRate="auto"/>
        <biosVfMemoryInterleave vpChannelInterLeave="auto"\</pre>
           vpRankInterLeave="auto"/>
        <biosVfPatrolScrub vpPatrolScrub="enabled"/>
        <biosVfDemandScrub vpDemandScrub="enabled"/>
        <biosVfAltitude vpAltitude="300-m"/>
      </biosSettings>
    </biosUnit>
```

</topSystem> </UCSProfile>

A.3 UCS Profile: Default

```
<UCSProfile>
  <topSystem>
   <biosUnit>
      <biosSettings>
        <!-- CPU -->
        <biosVfIntelHyperThreadingTech vpIntelHyperThreadingTech="disabled"/>
        <biosVfCoreMultiProcessing vpCoreMultiProcessing="all"/>
        <biosVfIntelVirtualizationTechnology vpIntelVirtualizationTechnology=\</pre>
          "enabled"/>
        <biosVfIntelVTForDirectedIO vpIntelVTDCoherencySupport="enabled"\</pre>
          vpIntelVTForDirectedIO="enabled" vpIntelVTDATSSupport="enabled"/>
        <biosVfCPUPerformance vpCPUPerformance="enterprise"/>
        <biosVfHardwarePrefetch vpHardwarePrefetch="enabled"/>
        <biosVfAdjacentCacheLinePrefetch vpAdjacentCacheLinePrefetch="enabled"/>
        <biosVfDCUPrefetch vpStreamerPrefetch="enabled" vpIPPrefetch="enabled"/>
        <biosVfDirectCacheAccess vpDirectCacheAccess="enabled"/>
        <biosVfCPUPowerManagement vpCPUPowerManagement="custom"/>
        <biosVfEnhancedIntelSpeedStepTech vpEnhancedIntelSpeedStepTech="enabled"/>
        <biosVfIntelTurboBoostTech vpIntelTurboBoostTech="enabled"/>
        <biosVfProcessorC6Report vpProcessorC6Report="disabled"/>
        <biosVfProcessorC1E vpProcessorC1E="disabled"/>
        <biosVfPStateCoordType vpPStateCoordType="HW ALL"/>
        <biosVfCPUFrequencyFloor vpCPUFrequencyFloor="enabled"/>
        <biosVfCPUEnergyPerformance vpCPUEnergyPerformance="custom"/>
        <!-- MEMORY -->
        <biosVfSelectMemoryRASConfiguration vpSelectMemoryRASConfiguration=\
          "maximum-performance"/>
        <biosVfDRAMClockThrottling vpDRAMClockThrottling="performance"/>
        <biosVfNUMAOptimized vpNUMAOptimized="enabled"/>
        <biosVfLvDIMMSupport vpLvDDRMode="performance-mode"/>
        <biosVfDramRefreshRate vpDramRefreshRate="auto"/>
        <biosVfMemoryInterleave vpChannelInterLeave="auto" vpRankInterLeave="auto"/>
        <biosVfPatrolScrub vpPatrolScrub="disabled"/>
        <biosVfDemandScrub vpDemandScrub="enabled"/>
        <biosVfAltitude vpAltitude="300-m"/>
      </biosSettings>
   </biosUnit>
  </topSystem>
</UCSProfile>
```

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