Managing Cisco UCS C-Series Rack Servers

What You Will Learn

Effective system management in the data center and across distributed locations requires support for a wide range of environments and functionality. This document provides an overview of the two options customers have for managing Cisco UCS® C-Series Rack Servers. The first option is to use Cisco UCS Manager. The second option is to use the Cisco® Integrated Management Controller (IMC) in standalone mode.

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

- Cisco Integrated Management Controller (IMC) is a baseboard management controller (BMC) in the C-Series servers that provides embedded server management in the data center and across distributed branch-office locations. It supports multiple management interfaces, including a web user interface (UI), a command-line interface (CLI), and a unified API that is consistent with the one used by Cisco UCS Manager. IMC also supports industry-standard management protocols, including Simple Network Management Protocol (SNMP) v3 and Intelligent Platform Management Interface (IPMI) v2.0.

This paper also includes a section describing how IMC Supervisor enables centralized management for standalone Cisco UCS C-Series Rack Servers as well as Cisco UCS S-Series Storage Servers and Cisco UCS E-Series Servers located across one or more sites.

Some Background on Server Management

Most x86-architecture servers today include a management function commonly known as a baseboard management controller (BMC). The BMC is usually embedded on the motherboard or main circuit board of the server and includes a specialized service processor and firmware to monitor and manage the physical state of the server hardware. BMC functions and standards are defined in the IPMI specifications, originally developed jointly by Intel, Hewlett-Packard Enterprise, Dell, and NEC. The specification is maintained and published at Intel's corporate website, helping ensure that BMC functions are consistently implemented on all x86 managed server platforms.

Intel includes BMCs on its customer reference board (CRB) designs, which are given to original equipment manufacturers (OEMs) and original design manufacturers (ODMs) to accelerate time to market and help ensure compliance with industry standards such as IPMI. Cisco has added value to the basic BMC functions by reengineering the BMC to make it an important part of the Cisco UCS architecture. This integration helps enable powerful, industry-leading unified computing features and the use of service profiles for server provisioning and change management.

## Cisco UCS Manager and Cisco UCS C-Series

Cisco UCS Manager runs in the [Cisco UCS 6100, 6200, and 6300 Series Fabric Interconnects](#). It provides a wide range of powerful features for the integrated and unified computing, networking, and storage environment of Cisco UCS. The features include the rapid provisioning of infrastructure from shared pools of computing, networking, and storage resources and the rapid scaling and provisioning of IT infrastructure through the model-based management approach of Cisco service profiles.

Service profiles are used to provision and manage Cisco UCS C-Series Rack Servers and their I/O properties within a single management domain. They are created by server, network, and storage administrators and are stored in the fabric interconnects. Infrastructure policies needed to deploy applications are encapsulated in the service profile. The policies coordinate and automate element management at every layer of the hardware stack, including RAID levels, BIOS settings, firmware revisions and settings, server identities, adapter settings, VLAN and VSAN network settings, network quality of service (QoS), and data center connectivity.

Service profile templates are used to simplify the creation of new service profiles, helping ensure consistent policies within the system for a given service or application. Whereas a service profile is a description of a logical server and there is a one-to-one relationship between the profile and the physical server, a service profile template can be used to define multiple servers. The template approach makes it just as easy to configure one server as it is to configure hundreds of servers with perhaps thousands of virtual machines. This automation reduces the number of manual steps needed, helping reduce the opportunities for human error, improving consistency, and further reducing server and network deployment times.

Cisco IMC communicates vital information about each individual server to Cisco UCS Manager (Figure 1). Cisco IMC provides many diagnostic and health monitoring services that contribute to the holistic management environment enabled by Cisco UCS.

Figure 1.   Monitoring Hard Disk Drive (HDD) Health in a Cisco UCS C-Series Rack Server
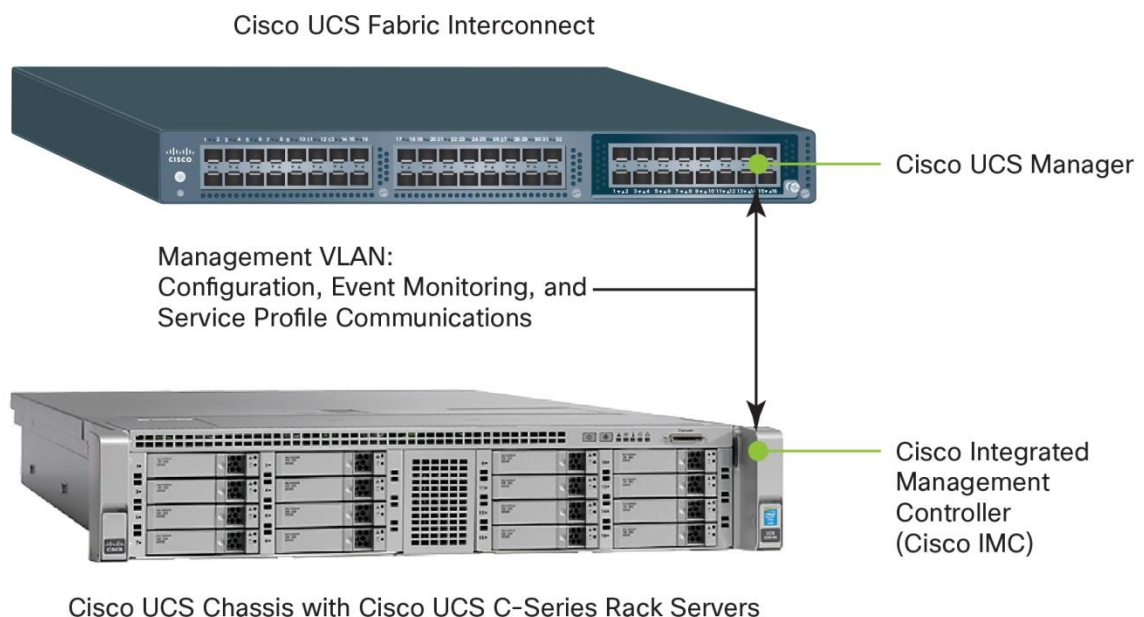
Diagnostic and health monitoring features provided with Cisco IMC include:

- SNMP
- XML API event subscription and configurable alerts
- System event log
- Audit log
- Monitoring of field-replaceable units (FRUs), HDD faults, dual inline memory module (DIMM) faults, network interface card (NIC) MAC addresses, CPU, and thermal faults
- Configurable alerts and thresholds
- Watchdog timer
- RAID configuration and monitoring
- Predictive failure analysis of HDD and DIMM
- Converged network adapters (CNAs)
- Reliability, availability, and serviceability (RAS)
- Network Time Protocol (NTP)
- Graphical and command-line client

Figure 2.   Cisco UCS C-Series Single Wire Management Enables Management and Data Traffic to Flow Across a Single Cable
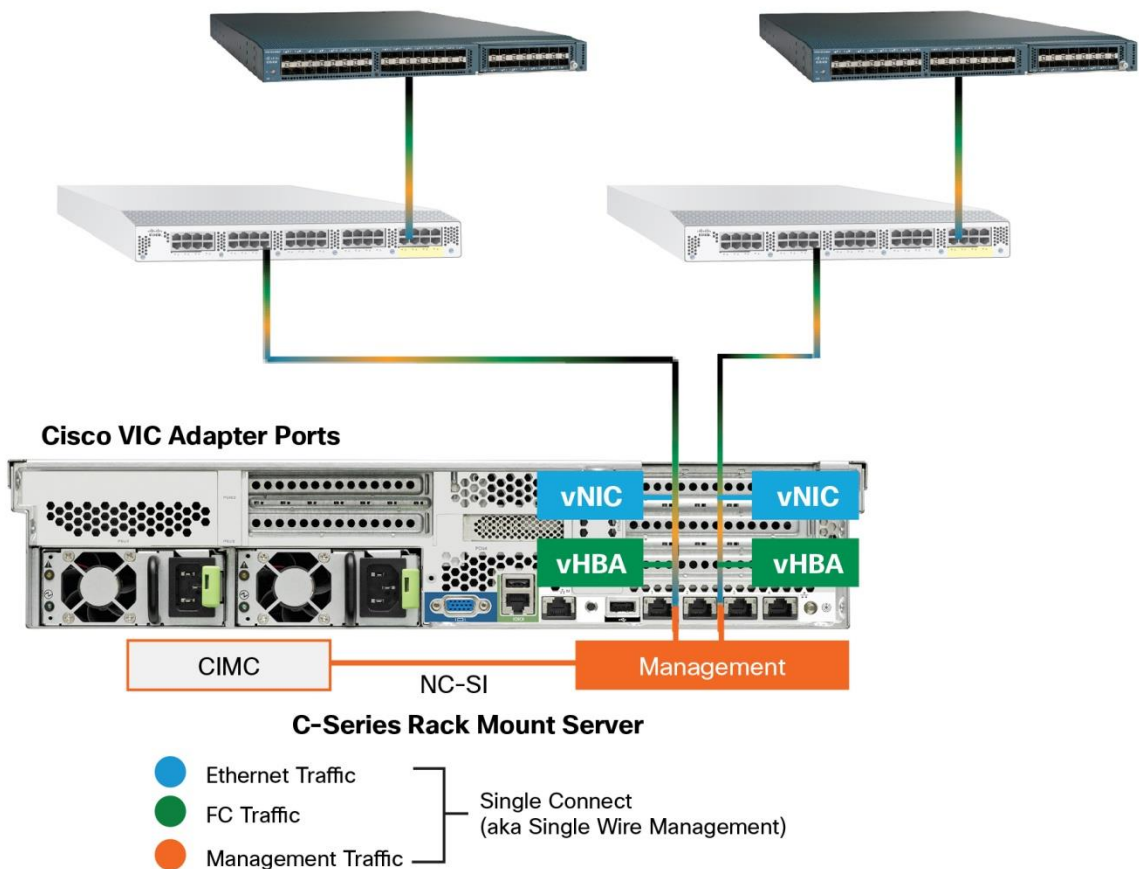
Cisco IMC in Standalone Mode on Cisco UCS C-Series Servers

Many customers deploy Cisco UCS C-Series servers in a standalone environment as x86 servers (see Figure 2 above). In such a deployment, the servers are not integrated with other Cisco UCS components, such as the fabric interconnects, fabric extenders, or Cisco UCS Manager. When Cisco UCS C-Series servers are operating in standalone mode, administrators can use Cisco IMC as an industry-standard BMC through a web-based GUI, a secure shell (SSH)–based command-line interface (CLI), or the native API to configure, administer, and monitor the server. IMC provides users full control of the server, allowing complete configuration and management. It can be configured to operate in several different network modes, taking advantage of the dedicated management port or sharing the same physical interface as the host in Shared LOM or Cisco Card mode. With Cisco IMC, administrators can perform the following server management tasks:

- Power on, power off, power cycle, reset, and shut down the server
- Toggle the locator LED
- Configure the server boot order
- View server properties and sensors
- Complete out-of-band storage configuration
- Manage remote presence
- Firmware management
- Create and manage local user accounts and enable authentication through Active Directory and LDAP
- Configure network-related settings, including NIC properties, IPv4, IPv6, VLANs, and network security
- Configure communication services, including HTTP, SSH, and IPMI over LAN
- Manage certificates
- Configure platform event filters
- Monitor faults, alarms, and server status

Cisco IMC is included with each Cisco UCS C-Series server at no additional cost to customers.

The latest release of IMC, version 3.0(1), introduces a number of new features to better align with the needs of our customers. Most of these new capabilities are the HTML5 web UI and KVM, Redfish support, and XML API transactional support. HTML5 provides customers with a simplified user interface and, along with a reliable KVM, eliminates the need for Java to use IMC.

The IPMI interface is not able to address the scale-out and cloud-based requirements for simplicity and security available in modern programming interfaces, so Intel and other server vendors have developed the new Redfish standard. Redfish is an open industry standard specification and schema that specifies a RESTful interface and uses JSON and OData to help customers integrate solutions within their existing tool chains. It establishes a new management for system control that is scalable, easy to use, and secure. Redfish is sponsored by the Distributed Management Task Force (DMTF), a peer-review standards body recognized throughout the industry. Cisco UCS has adopted support for the Redfish standard on IMC version 3.0.

Redfish introduces a RESTful API to the IMC and is a simple, secure replacement for IPMI. Finally, XML API transactional support is catered toward users who utilize the programmability aspects of the IMC. Users can now configure multiple managed objects in a single transaction, allowing for quicker, simpler deployments.

Along with the many new software capabilities, Cisco has enhanced several of the utilities that rely on the IMC:

- Cisco IMC Emulator
- Non-Interactive Server Configuration Utility (NI-SCU)
- Separation of SCU and diagnostics
- Driver Update (Linux)

Scaling Management with IMC Supervisor

When you need to support multiple locations and/or different Cisco UCS servers, you can use IMC Supervisor as a centralized console. IMC Supervisor can scale to support up to 1,000 servers. It enables centralized management for standalone Cisco UCS C-Series Rack Servers as well as Cisco UCS S-Series Storage Servers and Cisco UCS E-Series Servers located across multiple locations. IMC Supervisor provides insight into the platforms being managed, including information about system inventory and health. Managed systems can be assigned to user-defined groups to help keep platforms organized based on criteria important to the administration team. Across and within these groups, each system can be assigned one or more tags to assign searchable metadata to the server. Administrators can perform basic management tasks on individual systems such as power on, power off, and vKVM launch. Tasks for multiple platforms, including noninteractive firmware updates and diagnostic tools, are also supported.

Conclusion

Cisco offers two options for managing Cisco UCS C-Series Rack Servers. IMC is an IPMI-compliant, industry-standard BMC. It is included with each Cisco UCS C-Series server at no additional cost to customers. Used in standalone Cisco UCS C-Series servers, Cisco IMC as a BMC empowers administrators to proactively manage and monitor the servers. Cisco has added support for the Redfish standard to IMC to embrace this new industry standard and to address scale-out and cloud-based requirements. It offers many options for integration with industry-leading tools and interfaces and delivers a variety of functions designed to keep traditional or unified computing environments operating reliably and efficiently to handle some of the most demanding enterprise workloads.

Cisco UCS Manager is an embedded unified manager for Cisco UCS. When IMC is used together with Cisco UCS Manager, it complements Cisco UCS Manager and contributes a range of server diagnostic and management features to the comprehensive feature set of Cisco UCS Manager. Cisco UCS Manager enables a policy-based management approach through the use of service profiles and just-in-time provisioning of physical resources. Centralized management through Cisco UCS Manager is one of the major features contributing to a lower total cost of ownership (TCO) and easier and faster operations with Cisco UCS.

For More Information

- Cisco UCS Services: Accelerate Your Transition to a Unified Computing Architecture: http://www.cisco.com/en/US/services/ps2961/ps10312/Unified_Computing_Services_Overview.pdf
- Cisco UCS C-Series Servers Integrated Management Controller CLI Configuration Guide, Release 3.0: http://www.cisco.com/c/en/us/td/docs/unified_computing/ucs/c/sw/cli/config/guide/3_0/b_Cisco_UCS_C-Series_CLI_Configuration_Guide_301.html
- Setup for Cisco IMC on Cisco UCS C-Series Servers: http://www.cisco.com/en/US/partner/products/ps10493/products_configuration_example09186a0080b10d66.shtml

- Cisco UCS C-Series Rack-Mount Servers:
  http://www.cisco.com/en/US/partner/products/ps10493/tsd_products_support_series_home.html

- Unified computing: http://www.cisco.com/en/US/partner/netsol/ns944/index.html

- Intelligent Platform Management Interface (IPMI) Specifications:
  http://www.intel.com/design/servers/ipmi/spec.htm

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