White Paper

Cisco Delivers Better Management Capabilities for Rack Servers

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Cisco offers better management capabilities than other vendors, no matter how you deploy your rack servers.

Highlights

Deploy Rack Servers Your Way
Cisco UCS® C-Series Rack Servers can be deployed alone or as part of the Cisco Unified Computing System™ (Cisco UCS).

Consistently Manage Servers at the Scope You Need
Cisco® management tools give you the freedom to manage individual standalone servers, scale-out standalone server deployments, and unified fabric environments with a consistent methodology.

Manage Standalone Servers
The Cisco Integrated Management Controller (IMC) provides comprehensive remote management for Cisco UCS C-Series servers.

Manage Scale-Out Deployments
Cisco IMC Supervisor provides centralized management, system inventory, fault reporting, and policy-based templates for Cisco UCS C-Series servers across one or more sites.

Managed Environments with Fabrics
Cisco UCS management allows you to manage all your Cisco UCS infrastructure components, including storage systems.

Introduction

Your business users and applications require different types of computing resources, from individual blade and rack servers to integrated systems. Other vendors treat these computing resources as discrete components that can't be mixed and matched when deployed, and they don't offer comprehensive management tools that let you optimize and control your resources in a consistent way.

Cisco UCS® C-Series Rack Servers extend unified computing innovations to a rack-mount form factor. They can be used standalone or as part of the Cisco Unified Computing System™ (Cisco UCS), which unifies computing, networking, management, virtualization, and storage access into a single integrated architecture. This deployment flexibility makes Cisco UCS C-Series Rack Servers the preferred choice for many IT organizations, whether they need high I/O bandwidth, large memory configurations, or high-capacity internal disk space for applications.

Unified and Simplified Rack Server Management Capabilities

Managing Cisco UCS C-Series servers is simple. The servers are equipped with a standards-based set of management interfaces that let you take advantage of innovative rack server features in your heterogeneous data centers. These comprehensive management tools work together to provide visibility into and optimal control over your IT infrastructure, whether you deploy a few standalone servers or hundreds or thousands of rack servers in multiple Cisco UCS domains.

What makes this approach different is the use of a consistent way to refer to, define, configure, and manage server resources. In this approach, every component is incorporated into an object model that maintains a single source of truth regarding

system inventory and configuration. Each type of resource in the system is defined: from individual CPUs, memory chips, ports, and networking interfaces to the entire server, as well as internal disk storage systems. This object model is made available to Cisco® management tools through a unified API that adds capabilities for each management scope. You can manage your infrastructure with fine-grained control at any level you choose—at the standalone server, group of servers, or integrated system level—using the same concepts to take advantage of staff skills and knowledge (Figure 1).

Programmatic Access at Every Level

The use of a consistent object model and unified API results in simplicity for your administrators writing scripts, your programmers developing tools, and your budget. Because the object model is consistent throughout your Cisco UCS deployment, your staff can learn the API one time and apply it as the scope of whatever they are managing changes. For example, your staff can program at the individual component level to higher-level systems and global policies, and they can apply the investment they've made in learning the API as they move to other areas of infrastructure management. They simply add new objects at each level of infrastructure and scale—without the need to change the data model or software architecture.

Programmatic access is available for many tasks, including server, platform, firmware, and user management tasks. Your administrators can work with configuration management tools such as Puppet, Chef, and Ansible and with scripting frameworks such as Python and Microsoft PowerShell (using Cisco UCS PowerTool) to program common and routine tasks for improved consistency and efficiency. With fast and easy scripting capabilities, your IT staff can create the scripts and workflows they need without the increased costs of advanced licensing packages for add-on solutions.
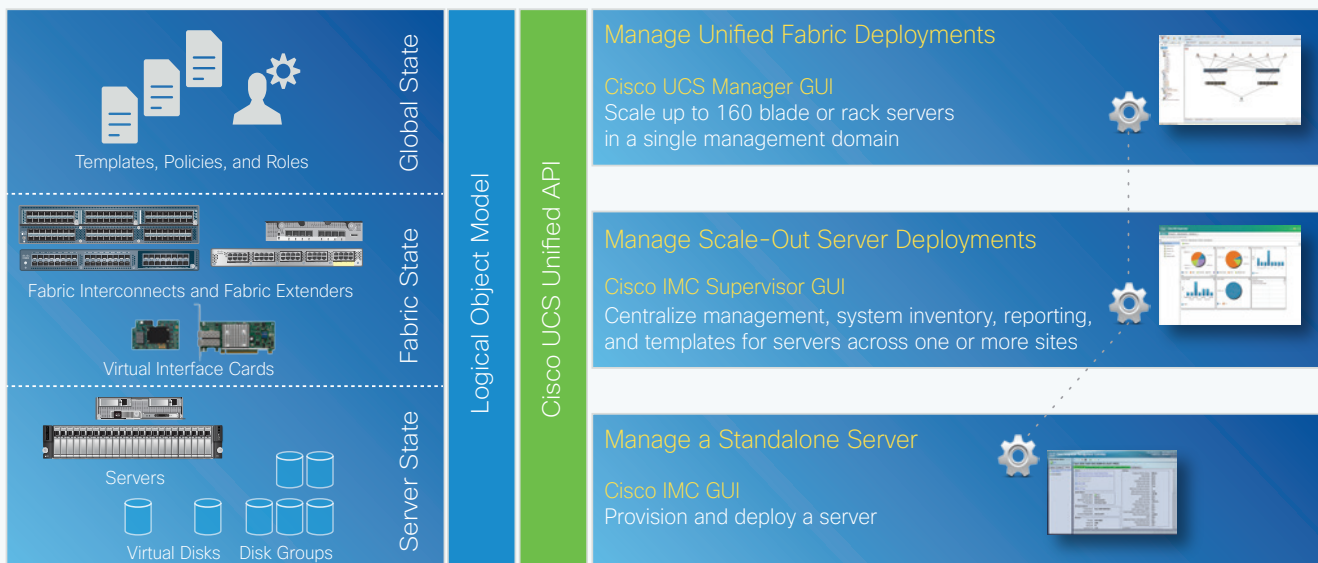
Figure 1 Cisco Management Tools Make It Easy to Manage Standalone Servers, Scale-Out Deployments, and Unified Fabric Environments

What Makes Cisco IMC Different?

The Cisco IMC offers more features than HPE Integrated Lights-Out 4 (iLO 4) Standard at no additional cost (Table 1).

Table 1 Cisco IMC Versus HPE iLO 4

| Item	Cisco IMC	HPE iLO 4
Remote Administration		
No additional licenses required for essential server management features	Yes	No
Virtual power on and off	Yes	Yes
Virtual KVM (vKVM)	Yes	Yes
Global team collaboration	Yes	Accessible through .NET; advanced license required
Chat support for vKVM	Yes	No
Console record and replay	Yes	Advanced license required
Virtual media (remote and scriptable)	Yes	Advanced license required
Remote serial console	Yes	Yes
Simplified Server Setup and Configuration		
BMC firmware upgrade	Yes	Yes
NIC configuration	Yes	No
Local firmware updates	Yes	Yes
Storage controller configuration and management	Yes	No
Boot-order control	Yes	Yes
Power Measurement and Control		
Dynamic power capping	Yes	No
Power monitoring and reporting	Yes	No
Embedded System Health Monitoring		
Programmatic event subscription	Yes	Yes
System event and audit logs	Yes	Yes
Watchdog timer	Yes	Yes
Hard-disk and DIMM faults	Yes	Yes
Security		
Secure Sockets Layer and SSH	Yes	Yes
LDAP support	Yes	No
RBAC, login support, and locally stored accounts	Yes	Yes

Managing Standalone Rack Server Deployments

Every Cisco UCS C-Series Rack Server includes the Cisco Integrated Management Controller (IMC), a management interface that gives you the tools you need to easily and quickly control and manage a standalone server. Unlike other management solutions that are built on traditional baseboard management controllers (BMCs), the new Cisco IMC solution is based on an innovative Cisco UCS Manager state machine design that identifies the locations of objects and their workflow operations.

Embedded in Cisco UCS C-Series servers, the IMC defines the core object model and provides an easy way to provision and deploy a standalone server. Your IT administrators can control and manage servers, including management of network configuration; remote keyboard, video, and mouse (KVM) devices; power states; and firmware revisions. Out-of-band server management and virtual media support for CD and DVD drives for remote operating system and application software installation are accessible through standard protocols, command-line interfaces (CLIs), and web-based interfaces (Figure 2).

Using the IMC, your IT administrators can:

- **Provision a server and perform lifecycle management tasks:** The IMC allows your IT staff to provision, reprovision, and manage standalone servers whether they are deployed in your data center or across distributed branch-office locations. BIOS signing, firmware management capabilities, and precision boot order control mechanisms make it easy for your IT staff to support multiple boot devices and help ensure that configurations stay up-to-date with the latest firmware revisions.

- **Configure and manage networking components and interfaces:** The IMC can be used to locally or remotely configure Cisco UCS virtual interface card (VIC) networking components and network interface cards (NICs) installed in
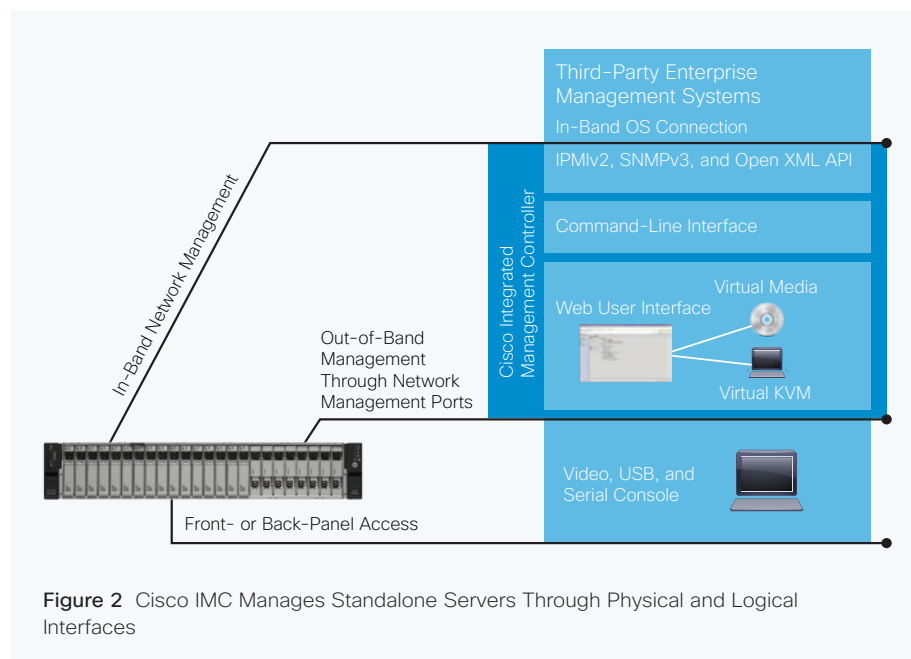
Figure 2 Cisco IMC Manages Standalone Servers Through Physical and Logical Interfaces

What Makes Cisco IMC Supervisor Different?

Cisco IMC Supervisor offers a complete platform for managing scale-out standalone computing environments compared to tool-based solutions such as Dell OpenManage Essentials (OME) (Table 2).

Table 2 Cisco IMC Supervisor Versus Dell OME

Item	Cisco IMC Supervisor	Dell OME
Standalone Server Management		
Device discovery	Yes	Yes
Discovery of devices that can't be managed	No	Yes
BMC authentication required only at discovery	Yes	No
Single API	Yes	No
Native API	Yes	No
Policy Definition and Application		
Individual policy definition and application	Yes	No
Licensing		
BMC licensing required	No	Yes
Central licensing	Yes	No
Deployment Simplicity		
Ready-to-run virtual appliance	Yes	No
Additional resources recommended for more than 500 servers	No	Yes
Operating system installation required	No	Yes
Database software installation required	No	Yes
Operating system prerequisites	No	Yes
Database software prerequisites	No	Yes

the server. This capability eliminates the need to configure the network through the operating system. The VIC allows more than 256 static PCI Express (PCIe) interfaces to be configured on demand without requiring special driver software. As a result, you can adapt your servers to meet the best-practices needs of operating systems and hypervisors.

- **Help ensure the use of secure communication protocols:** Support for modern and secure communication using HTTPS with signed update checking helps ensure that server communication is encrypted to keep your data safe.

- **Configure and manage local disk storage:** Through the IMC, your IT staff can manage and configure the server's physical local storage with advanced RAID configuration options.

- **Use industry-standard protocols:** The IMC supports many protocols, including the Intelligent Platform Monitoring Interface Version 2 (IPMI v2), Simple Network Management Protocol versions 2 and 3 (SNMP v2 and v3) and SNMP Phase4 (with added storage changes), Internet Protocol Version 6 (IPv6), and the Cisco UCS unified API that uses open XML programming so that you can integrate your servers and Cisco IMC with third-party management tools.

- **Reduce licensing costs:** Other vendors charge extra for licensing the management software associated with their rack servers. In contrast, the IMC is an embedded part of Cisco UCS C-Series servers, and no host agents are required to access the software, reducing your management licensing costs.

- **Train and test with a standalone platform emulator:** The Cisco UCS Platform Emulator lets you use the IMC and the Cisco UCS unified API without requiring physical hardware. This innovative tool can help you shorten development cycles, create and test scripts and programs, and train new IT administrative staff using the software installed on a laptop.

Managing Scale-Out Rack Server Deployments

When you have multiple rack servers deployed, it's impractical for your IT staff to log into each system individually. Building on the capabilities of the IMC, Cisco IMC Supervisor allows your IT administrators to centrally manage multiple standalone Cisco UCS C-Series servers located across one or more sites. The software automatically creates an inventory of your Cisco hardware platforms and gives your IT staff visibility into all the servers being managed, including visibility into system inventory and faults and error conditions that can keep your users from getting work done.

Rapid Deployment

Unlike systems management console solutions from other vendors, IMC Supervisor uses the concepts of hardware profiles and policies to simplify management of scale-out rack server deployments. These profiles allow your IT staff to create a model of a desired server configuration and then configure the server simply by associating the model with the physical resources. Policies extend these capabilities, allowing you to specify the way that servers and disk drives should be identified, configured, connected, and used. You can configure hundreds of servers as easily as you can configure one, in a repeatable and consistent manner.

Policies can be configured for server BIOS settings, boot order, VICs, disk groups and RAID levels, Lightweight Directory Access Protocol (LDAP) settings, Simple

Network Management Protocol (SNMP) use, and user access. Global and platform-specific settings can be defined and updated to further simplify large-scale server deployment and management tasks. Multiple policies can be aggregated in a policy template that can be deployed to one or more servers concurrently, accelerating server provisioning and deployment.

Safe and Simplified Firmware Management

When it's time to update server firmware, your server administrators can use IMC Supervisor to access Cisco.com for firmware updates. Using an embedded update manager, your IT staff can download, manage, and update firmware across multiple servers using the IMC Noninteractive Host Update Utility. These capabilities help your IT administrators see how well your rack servers are performing and schedule firmware management tasks for one or more standalone Cisco UCS Series-C servers in an efficient manner.

Insight into Server Status and Rapid Problem Resolution

Your users, applications, and business rely on your servers staying up and running. With IMC Supervisor, your IT administrators can determine the health status of your deployed servers regardless of where they are located. The capability to determine the fault status of multiple systems in a single pane combined with easy-to-read charts and tables gives your IT staff the insight needed to initiate diagnostic processes, including remote diagnostic processes that don't require human intervention.

In the event of a server failure, Cisco Smart Call Home capabilities let your IT staff proactively receive notifications for accelerated problem identification and resolution. The platform can be configured to automatically register specified faults with the Cisco Technical Assistance Center (TAC), simplifying problem reporting and facilitating fast problem resolution.

Managing Deployments with Fabrics

Many IT organizations use blade and rack servers, allowing IT staff to match applications to server characteristics. The original vision for blade servers was that they would form a pool of computing resources that would share a set of environmental, networking, and storage resources rather than replicating all resources for all servers, as is the case with traditional rack-mount servers.

Cisco UCS takes a different approach by allowing both blade and rack servers to be deployed in the same racks and connected to the same fabric. Industry-standard x86-architecture blade and rack servers are combined with networking, storage and storage access, and management resources to create a single integrated system. The system transcends the boundaries of chassis and racks, transforming the physical infrastructure into a pool of resources that can be managed globally and provisioned to support any workload in minutes.

What Makes It Different: Programmable Infrastructure

What makes Cisco UCS different is that it is designed from the beginning as programmable infrastructure. This unique approach abstracts the personality, configuration, connectivity, and storage information for server and I/O resources so that these attributes can be configured automatically rather than set manually

What Makes Cisco UCS Manager Different?

Cisco UCS Manager offers a comprehensive management platform compared to ad-hoc solutions such as Dell OME (Table 3).

Table 3 Cisco UCS Manager Versus Dell OME

Item	Cisco UCS Manager	Dell OME
Configuration and Deployment		
Built-in service profiles	Yes	No
Built-in policy templates	Yes	No
Granular policy-based settings	Yes	No
Profile portability for stateless computing	Yes	No
Built-in server provisioning	Yes	No
Device discovery	Yes	Yes
Hardware abstraction	Yes	No
Management		
Monitoring and alerting	Yes	Yes
Fabric-based management	Yes	No
Active-active data plane	Yes	No
Automated firmware upgrades for infrastructure, servers, and components	Yes	No
Resiliency		
No reliance on additional-cost hypervisor features for fault tolerance	Yes	No
Interface and Integration		
Open, feature-rich API	Yes	No
Platform emulator	Yes	No

through individual element managers. All configuration parameters for both blade and rack servers can be set and managed through Cisco UCS Manager, eliminating the physical barriers that used to prevent applications from sharing resources and allowing all Cisco UCS solutions to be managed in a uniform way.

Cisco UCS Manager is specifically built for DevOps and is designed based on a model of desired state configuration through policies, not top-down scripting from a virtual appliance. At this management scope, the Cisco UCS unified API provides security, extensibility, and role-based access control (RBAC), and thousands of users around the world have created libraries and robust ecosystems for a variety of production use cases. The API understands both the current state and desired state, and executes these policies accordingly, allowing secure and consistent configuration of more than 100 settings. Desired state allows these profiles and templates to span both blade and rack servers and across multiple generations of servers.

Shared Bandwidth
When deployed in Cisco UCS, Cisco UCS blade and rack servers can share I/O bandwidth. The system is integrated with a standards-based, high-bandwidth, low-latency, and virtualization-aware unified fabric with a new generation supporting true end-to-end 40-Gbps connectivity. Fabric resiliency is designed into the system. The fabric interconnects allow port pinning and awareness with features such as hardware fabric failover as an alternative to NIC teaming in the operating system.

The system is wired once to support the desired bandwidth, and it carries all IP, storage, management, and virtual machine traffic with security isolation, visibility, and control equivalent to that of physical networks. With up to 40 unified ports of 40-Gbps connectivity, you can achieve up to 160 Gbps to a single server to deliver high performance. And the use of universal ports means you can connect native Fibre Channel networks and Fibre Channel over Ethernet (FCoE) devices and use fewer ports in the process for easier management and lower costs.

The system supports bandwidth on demand to allow all servers in the domain to share and flexibly use I/O bandwidth as needed. With network quality of service (QoS) as part of each server's profile, you can right-size bandwidth for your applications without concern for performance degradation during periods of seasonal or high-demand workloads.

Easy Firmware Updates
The system is always aware of the hardware configuration: for instance, the server type (blade or rack), generation (CPU and chipset), and revision (of server hardware and peripherals). It associates firmware with the server and prechecks all states to help ensure a smooth firmware update process while auditing the entire domain for faults and conditions that could affect scheduling and staging. High-availability checks occur before and during firmware upgrades, and maintenance modes allow for easy rollback to previous versions.

Choice and Flexibility
The open and extensible Cisco UCS unified API leads third-party integration and DevOps with more than 50 partners integrated, including Puppet, IBM, SolarWinds, Splunk, Symantec, BMC, CA, Citrix, Zenoss, Microsoft, JouleX, Python, and even

HPE. The community of developers creating libraries and simplifying their operations grows daily, and open integration with storage partners EMC, NetApp, IBM, Nimble Storage, Pure Storage, etc. brings choice to our customers who demand best-in-class solutions.

All major operating systems and hypervisors are supported on Cisco UCS servers and Cisco UCS hyperconverged systems as well as open-source software including Microsoft, VMware, Red Hat Enterprise Linux, SUSE Linux, Citrix XenServer, OpenStack, and others.

Global Management

Cisco UCS Central Software uses Cisco UCS Manager and lets you manage multiple, globally distributed Cisco UCS domains with thousands of servers from a single pane, allowing you to simplify your operations at scale. It provides global policies, global RBAC, and global backup and recovery of local domains.

Conclusion

If your business needs to improve IT agility, consider Cisco UCS C-Series Rack Servers. These innovative systems extend unified computing innovations to a rack-mount form factor, and can be used alone or as part of Cisco UCS. And managing these servers is simple. Whether you deploy a few standalone servers or hundreds of chassis filled with blade and rack servers, Cisco UCS management tools give you what you need for improved IT productivity.

For More Information

For more information about Cisco IMC, visit http://www.cisco.com/c/en/us/support/servers-unified-computing/ucs-c-series-integrated-management-controller/tsd-products-support-series-home.html

For more information about Cisco IMC Supervisor, visit http://www.cisco.com/c/en/us/products/servers-unified-computing/integrated-management-controller-imc-supervisor

For more information about Cisco UCS Manager, visit http://www.cisco.com/c/en/us/products/servers-unified-computing/ucs-manager/index.html.

For more information about the Cisco UCS unified API, visit https://developer.cisco.com/site/ucs-dev-center.