White Paper

Optimally Manage the Data Center Using Systems Management Tools from Cisco and Microsoft

What You Will Learn

Cisco is continuously innovating to help businesses reinvent the enterprise data center and deliver superior IT services for greater business impact. To that end, Cisco has developed robust infrastructure management tools for your Cisco Unified Computing System™ (Cisco UCS™) data center that work with and extend tools you may already use to monitor, provision, configure, and orchestrate your Microsoft server and application software. To achieve this unified operations approach, Cisco has:

- Developed the Cisco UCS Management Pack for Microsoft System Center Operations Manager, enabling IT staff to monitor health status for 1-to-N Cisco UCS domains
- Built the Cisco UCS Integration Pack for Microsoft System Center Orchestrator, helping administrators automate and standardize Cisco UCS management
- Integrated Cisco UCS with Microsoft Windows PowerShell through the Cisco UCS PowerTool, enabling administrators to manage infrastructure alongside operating systems and applications on Cisco UCS B-Series Blade Servers, Cisco UCS C-Series Rack-Mount Servers, and stand-alone Cisco UCS C-Series servers by using a command-line interface (CLI)

Together, these technologies can help IT administrators and IT managers holistically manage and orchestrate server and networking infrastructure and the software stack. Organizations can build on this foundation to achieve a data center that is:

- Integrated, with the network as the core foundation for innovation
- Highly available within and between data centers
- Secure, integrating safeguards at all levels to reduce risk
- Open, through support for standards and innovation for the best possible integration across systems

The Complexities of Delivering Business Impact Through the Data Center

To contribute to your company's success, your IT department needs to think differently about how to design, operate, and deliver services from the data center. Effective delivery starts with evolution from reactive delivery to delivery of IT as a service (ITaaS) and alignment of IT services and costs for the greatest business impact while adeptly navigating and solving a variety of challenges, including:

- **High expectations:** You need the data center to provide greater benefits with less consumption of resources, deliver existing services consistently and reliably, and support new initiatives and services in response to new business opportunities. You also need to protect sensitive information and comply with government regulations.
- **More options and greater complexity:** Companies have more options than ever to deliver technology-based value to the business. Chief Information Officers (CIOs) and their teams are challenged to create a

strategy and architecture that help them use the best services to maintain existing systems, enable new business innovation, and better align IT capital and operating costs and resources with the demands of the business.

The means of delivering technology-based value to the business can take many forms, including unified data center technologies, externally hosted solutions, and a variety of on-demand, private cloud-computing services. New options can increase capital and operating costs and create additional complexity, because there are more physical assets to deploy, update, maintain, and patch and more firmware updates to install. Managing these assets, virtual machines, and software applications is requires manual work, requiring a high ratio of administrators to servers and contributing to high operating costs.

- **Lack of unified, programmatic control:** In the past, when setting up a computing center, administrators could use software tools to provision everything up to the operating-system level, but programmatic management of hardware with automated tools was not possible. This programmatic control is central to the provisioning of public and private cloud infrastructure, and companies that want to enable self-service provisioning have sought a solution.

Cisco UCS Manageability

By developing the Cisco UCS XML API, Cisco introduced programmatic control over server hardware, making it possible to better automate data center setup, provisioning, and management—starting at the bare metal and operating system and extending all the way to the applications and even the cloud for both physical and virtual environments. Designed for streamlined management, Cisco UCS comes with robust manageability tools that help Cisco UCS stand out among data center platforms and help your team deliver a positive impact on your business through the data center.

Cisco UCS

Cisco UCS is the first converged data center platform that combines industry-standard, x86-architecture servers with networking and storage access in a single converged system. The system is entirely programmable using unified, model-based management to simplify and accelerate deployment of enterprise-class applications and services running in bare-metal, virtualized, and cloud-computing environments. The system's unified I/O infrastructure uses a unified fabric to support both network and storage I/O, while Cisco® Fabric Extender technology extends the fabric directly to servers and virtual machines for increased performance, security, and manageability.

Cisco UCS Manager

Cisco UCS Manager is central to programmatic management of a Cisco UCS data center. Cisco UCS Manager is embedded device management software that controls, monitors, and configures all components of Cisco UCS and unites them as a single, logical domain. Cisco UCS Manager provides unified, embedded management of all software and hardware components of Cisco UCS across multiple chassis and rack-mount servers and thousands of virtual machines as one logical, highly available entity with flexible service profiles.

Embedded in Cisco UCS products, Cisco UCS Manager:

- Enables server provisioning, auditing, and statistics collection
- Provides device discovery, inventory, configuration, diagnostics, monitoring, and fault detection in the Cisco UCS platform

- Automatically detects, inventories, manages, and provisions system components that are added or changed
- Enables rapid provisioning and scaling of IT infrastructure
- Provides flexible role-based and policy-based management by using service profiles and templates and facilitates processes based on the IT Infrastructure Library (ITIL) concepts
- Is built on a comprehensive XML API framework that gives customers options when choosing management tools

By enabling better automation of processes, Cisco UCS Manager helps data center administrators achieve greater agility and scale in their server operations while reducing complexity and risk.

Cisco Management Tools for Data Centers Running Microsoft Software

With Cisco systems, you have choices for your data center management software. Cisco offers powerful management capabilities in its data center offerings, and Cisco management tools also complement and extend the management capabilities of the tools you are using.

For businesses in which Microsoft is a core part of the IT strategy, Cisco offers tight integration between the Microsoft System Center suite of products and Cisco data center offerings such as Cisco UCS, Cisco UCS Manager, and Cisco Nexus® Family network switches. Tools like Microsoft System Center Operations Manager and System Center Orchestrator can take advantage of the programmatic control Cisco provides through the Cisco UCS Manager XML API framework. This approach allows architects and administrators to monitor, manage, and orchestrate both hardware and software by using Cisco management technologies with Microsoft System Center server management tools and a Cisco feature that integrates with Microsoft Windows PowerShell, called Cisco UCS PowerTool.

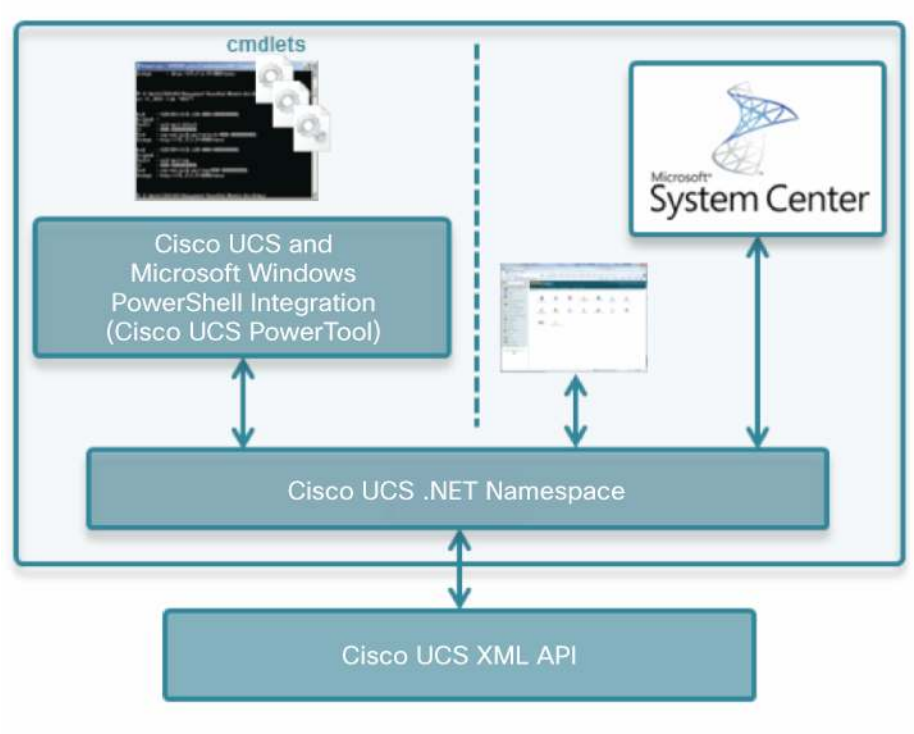
This unified approach to infrastructure and software management in the data center is part of the Cisco Unified Data Center, a complete IT infrastructure platform for the operation and management of computing, networking, storage, and application resources. Cisco designed the platform with its view that data center solutions should be optimized for exceptional performance in a highly networked environment.

Cisco data center offerings such as Cisco UCS together with Microsoft System Center and Windows PowerShell provide a complete data center solution for users of Microsoft software to simplify operations and streamline service delivery. This integration helps IT personnel consolidate and unify the operation and management of the data center so that architects and administrators can manage ITaaS more confidently, efficiently, and economically and deliver value to the business through:

- More efficient operations
- Increased agility
- Greater flexibility
- Enhanced visibility and control

Figure 1 and the following sections describe the intersection of Cisco and Microsoft management tools and their benefits.

Figure 1. Interoperability of Cisco Data Center Offerings and Microsoft Systems Management Tools



Cisco UCS Management Pack for Microsoft System Center Operations Manager: Monitor Health Status for 1-to-N Cisco UCS Domains

The Cisco UCS Management Pack for Microsoft System Center Operations Manager lets you monitor the health of Cisco UCS by using Microsoft System Center Operations Manager. It monitors Cisco UCS devices such as Cisco UCS blades, chassis, and rack servers. In addition, the management pack enables correlation of faults and events between Cisco UCS infrastructure and both bare-metal and virtualized operating systems that you manage with Microsoft System Center Operations Manager.

The Cisco UCS Management Pack for Microsoft System Center Operations Manager simplifies management by enabling IT personnel to:

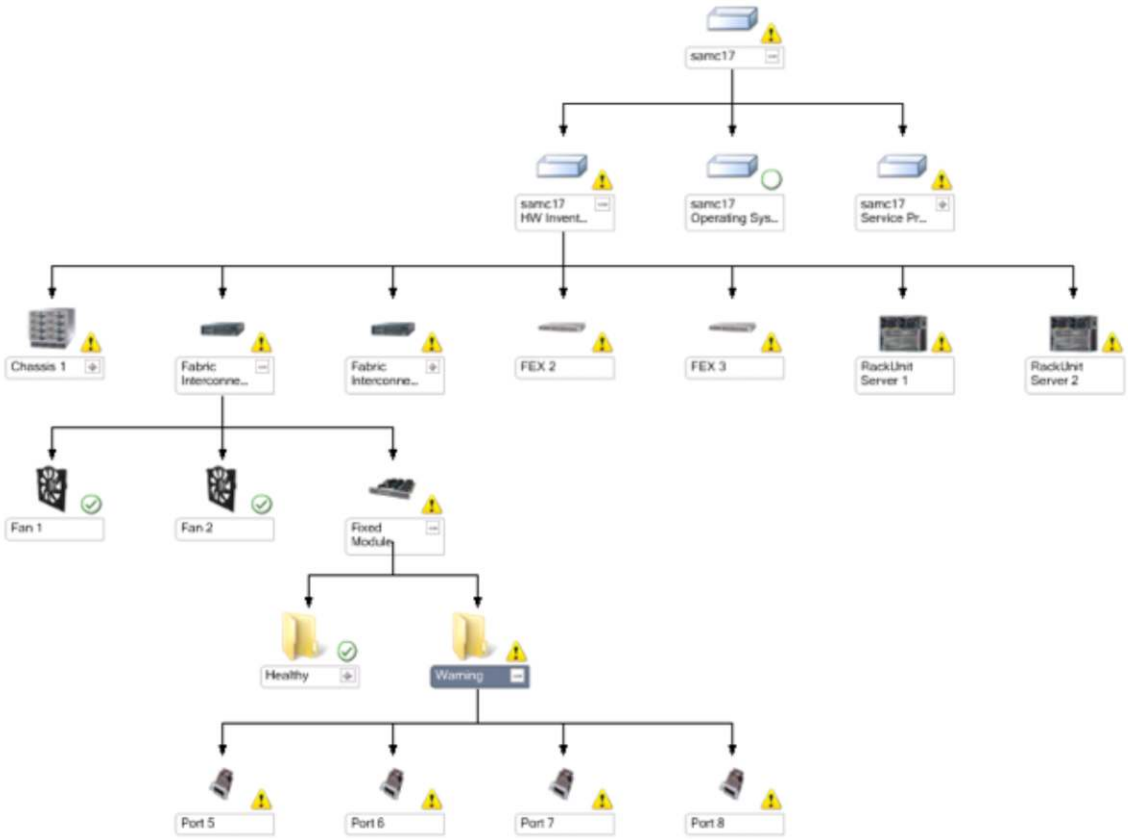
- View Cisco UCS hardware, service profiles, operating systems, and virtual machines on a single interface
- View the health of Cisco UCS hardware and subsystems in the native Microsoft System Center Operations Manager format
- Visually correlate blades, service profiles, and host operating systems by using Microsoft System Center Operations Manager status views to quickly determine how an event will affect the overall system

Cisco UCS Management Pack for Microsoft System Center Operations Manager graphically depicts Cisco UCS hardware, service profiles, host operating systems, and virtual machines, as seen in Figure 2. Correlation of events with the blades and service profiles that they affect simplifies identification of root causes, accelerating problem resolution.

Cisco UCS Management Pack for Microsoft System Center Operations Manager provides many advantages by preserving features that you have come to rely on, including:

- **Simpler systems management:** Administrators use a single interface for the physical and virtual environments. They gain a unified view of the application environment across the network, Cisco UCS server blades, and operating systems.
- **Role-based administration:** Preserve the current division of responsibilities for applications, hardware, operating systems, and network management.
- **Availability:** Gain early awareness of potential problems before they affect service availability or the user experience.
- **Customizability:** Because the management pack is based on the Cisco UCS Manager XML API, administrators can easily customize the management experience for monitoring and managing Cisco UCS.

Figure 2. Cisco UCS Management Pack for Microsoft System Center Operations Manager: Cisco UCS Hardware, Service Profiles, Host Operating Systems, and Virtual Machines



In addition, fabric interconnects in Cisco UCS make it dramatically easier to manage large Cisco UCS installations. With Microsoft System Center connected to the fabric interconnect of Cisco UCS instead of to each individual blade in Cisco UCS, IT departments can reduce the number of connections. By consolidating connections through the fabric interconnect, administrators gain access to detailed information, such as server status and health, for an entire chassis, not just an individual blade. This approach makes scaling easier, because

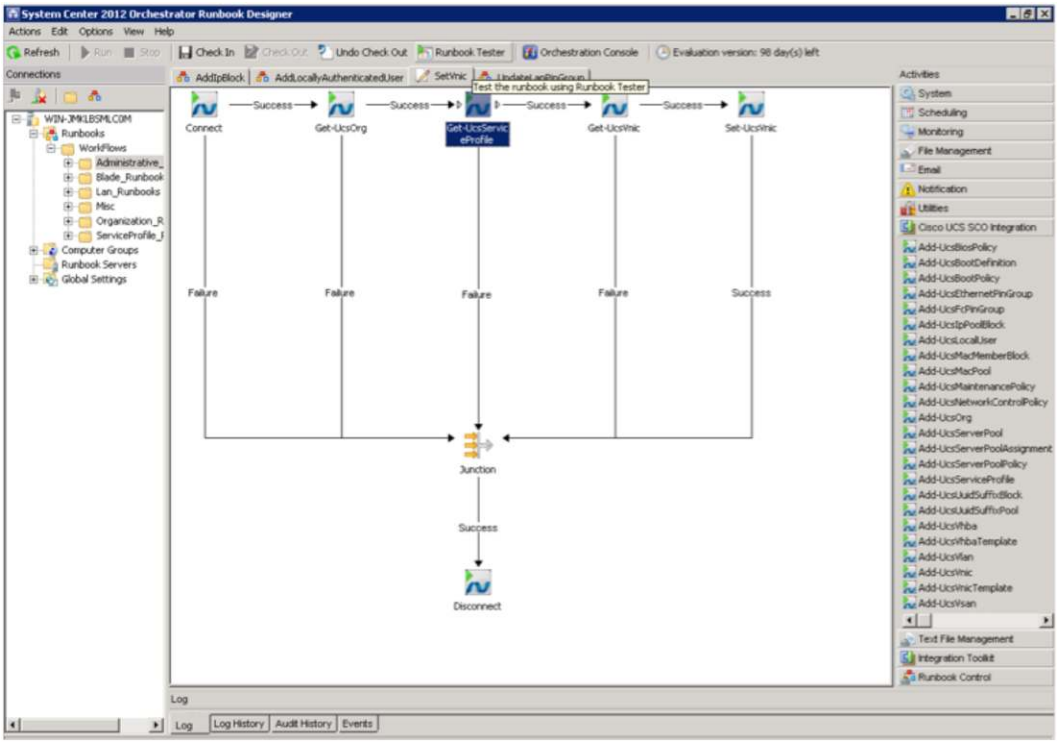
when you need to add a Cisco UCS domain, you need to add (and subsequently monitor) only one more connection to Microsoft System Center.

Cisco UCS Integration Pack for Microsoft System Center Orchestrator: Automate and Standardize UCS Management

The Cisco UCS Integration Pack for Microsoft System Center Orchestrator exposes prebuilt runbook actions that cover every management aspect of Cisco UCS, as shown in Figure 3. It is built on the same Cisco UCS Manager XML API framework as Cisco UCS Manager and enables runbook actions designed in Microsoft System Center Orchestrator to connect to Cisco UCS. This integration pack enables IT administrators to:

- Automate Cisco UCS management, improving predictability, expediting delivery, and reducing human errors
- Deliver scalable and reliable Cisco UCS management through orchestrated workflows, to provide consistent service across multiple systems and departments; the Cisco UCS Manager XML API provides a powerful, supported interface for workflow operations in Microsoft System Center Orchestrator
- Optimize and extend Cisco UCS capabilities, enabling integration with third-party management tools

Figure 3. Cisco UCS Integration Pack for Microsoft System Center Orchestrator Provides a Graphical Runbook Designer



Together, Cisco UCS Manager and the Cisco UCS Integration Pack for Microsoft System Center Orchestrator help administrators automate and orchestrate infrastructure provisioning and teardown and software installation processes. This capability helps reduce bottlenecks, lower the workload burden on IT staff, and improve and accelerate services. Administrators can also standardize and automate repeatable processes, enabling business units to serve themselves. For example, administrators can provision a virtual machine by using existing infrastructure and preestablished profiles or configurations.

Microsoft Windows PowerShell Integration (Cisco UCS PowerTool): Manage Infrastructure, Operating System, and Applications

Cisco has placed comprehensive infrastructure management, including the management of Cisco UCS B-Series Blade Servers, Cisco UCS C-Series Rack-Mount Servers, and stand-alone Cisco UCS C-Series servers, under the control of Microsoft Windows PowerShell by developing a user-friendly CLI-based Cisco UCS management tool called Cisco UCS PowerTool. Microsoft Windows PowerShell is the task automation framework used across all Microsoft operating systems and applications as well as a growing number of third-party platforms. With Cisco UCS PowerTool, you can more easily create scripts for Cisco UCS management tasks by using an extensive library of purpose-built commands called cmdlets. Cisco UCS PowerTool is based on the Cisco UCS Manager XML API framework and relies on standard Microsoft Windows PowerShell design principles, including:

- Inline help support
- Full pipelining support
- Fully classed object definition
- All legal verbs

With Cisco UCS PowerTool, your operations team can more easily tie together the management of storage components, computing components, and software applications into a custom, end-to-end management solution that is easy to use and easy to script. By using Cisco UCS PowerTool with similar tools based on Microsoft Windows PowerShell from third-party vendors to manage all components in the data center, your team can:

- Vastly streamline operations across the entire system
- Manage updates within the allotted time windows
- Protect systems and data; by simplifying update management, you help ensure that updates, patches, and firmware are applied regularly; safeguard important information; and help ensure regulatory compliance
- Reduce operating and capital expenses
- Support continuity of IT services and business operations by reducing downtime and outages
- Significantly reduce your server-to-personnel ratio

Table 1 shows a sample of the operational agility you can achieve by managing Cisco UCS with Cisco UCS PowerTool.

Table 1. Example of Management of a Cisco UCS Data Center with Cisco UCS PowerTool

Resource	Capability
Administrators	1
Server remote monitoring agents	13
Server problems resolved	7
DIMM replacements	32
Physical locations	2
Number of servers	835
Number of firmware endpoints (BIOS, local storage controllers, network adapters, and Cisco UCS management infrastructure)	28,800
Time to update firmware endpoints by using Microsoft Windows PowerShell	Approximately 6 hours
Firmware updated without service disruption in a production environment?	Yes

Cisco UCS Manager XML API: Use a Common Programmatic Integration Point with Cisco UCS

The Cisco UCS Manager XML API provides a programmatic way to interact or integrate with Cisco UCS. This full-featured interface is based on XML standards and was designed specifically for Cisco UCS. Because XML is the native language of Cisco UCS Manager, there are no restrictions on what partners and developers can do through this interface. Cisco UCS PowerTool and Microsoft System Center Operations Manager and System Center Orchestrator interact with Cisco UCS through the same Cisco UCS Manager XML API framework.

Table 2 shows a sample of the objects and assets that the Cisco UCS Manager XML API exposes.

Table 2. Examples of the Objects and Assets That the Cisco UCS Manager XML API Exposes

Sample of Supported Objects and Assets	
Service Profiles • Policies (firmware, boot order, and host bus adapter [HBA] and network interface card [NIC] configuration) • Pools (worldwide port name [WWPN], worldwide node name [WWNN], universal user ID [UUID], and MAC address) • Configuration of HBA, NIC, boot order, and local hard drive • Faults • Power, cooling, environmental, and statistical data **Blades** • Hardware (CPU, memory, mezzanine cards, Cisco Integrated Management Controller [IMC] IP, and Intelligent Platform Management Interface [IPMI] configuration) • Faults • Power, cooling, environmental, and statistical data **Chassis** • Faults • Power supply and fans • Power, cooling, environmental, and statistical data	**Fabric Interconnect** • Faults • Power supply unit and fans • Power, cooling, environmental, and statistical data and networking information **Configuration** • Pools (WWPN, WWNN, UUID, and MAC address) • Service profile template creation and consumption • Service profile template cloning • Simple service profile creation (with a limited scope of what is available to configure) • Expert service profile creation (using variablized XML with configuration file) • Management IP pool creation

Conclusion: Consider the Possibilities

Although many vendors have attempted to change the economics of the data center for their customers, most fall short of a truly unified architecture designed and built from the foundation to reduce the costs of management. Cisco and Microsoft provide the architectural flexibility, openness, and technology alignment on which you can build your enterprise.

Companies running Microsoft applications can gain operational advantages from the technologies Cisco has developed to tie together data center offerings such as Cisco UCS, Cisco UCS Manager, Cisco Nexus Family network switches, and Cisco Network Services Manager with Microsoft systems management tools such as Microsoft System Center and Windows PowerShell.

By using Cisco technology such as Cisco UCS together with Microsoft tools for IT management, IT administrators and managers can balance performance and consolidation and control both the infrastructure and the computing environment—whether physical or virtual—to help you efficiently deliver and maintain IT services and achieve:

- Higher server-to-administrator ratio
- Easier, less time-consuming, and more automated management of updates, patches, and firmware
- More streamlined monitoring
- Lower capital and operating expenses
- Increased business agility

Next Steps

Download the Cisco UCS Management Pack for Microsoft System Center Operations Manager (no cost) from http://www.cisco.com/cisco/software/navigator.html?a=a&i=rpm.

Why Cisco?

The Cisco Unified Computing System unites applications, networking, storage, and Cisco Unified Network Services support for virtualization and cloud computing into a cohesive system that helps reduce overall costs, increase organizational agility, and improve energy efficiency. The Microsoft and Cisco alliance extends the value of Cisco UCS and Cisco Unified Network Services by integrating the operating system, application, and management stacks, which are optimized for virtualization and supported by Cisco Validated Designs and support services.

Our partner ecosystem, including value-added resellers and global systems integrators, provides benefits for Microsoft partners and Cisco partners and customers alike.

For More Information

For more information, contact your Cisco or Microsoft representative or visit http://www.cisco.com/go/microsoft.

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