Cisco UCS Business Advantage Delivered: Data Center Capacity Planning and Refresh

Highlights

Consolidate More Effectively

· Cisco Unified Computing System™ (Cisco UCS™) delivers comprehensive infrastructure density that reduces the cost per rack unit at the solution level.

Eliminate Network Sprawl and Complexity

· Cisco UCS provides greater network density with less cabling and complexity.

Simplify and Accelerate Server Refresh Operations

· Cisco UCS automates configuration so that server identity, personality, and I/O connectivity characteristics can be applied on demand.

Make Virtualization More Effective

· Cisco UCS supports more virtual machines per server with improved visibility, reducing physical server sprawl and breaking down management silos.

Get Capacity Without Complexity

· Cisco UCS reduces the number of physical components to make more effective use of limited space, power, and cooling while providing enhanced computing capabilities.

Capacity planning and system refresh operations are inseparable in data centers. The holistic approach provided by the Cisco Unified Computing System helps IT organizations address physical, virtual, network, and management complexity.

IT organizations are constantly performing a balancing act. The demand to address real-time business needs and initiatives while providing more services to a rapidly expanding user community places increasing pressure on an already burdened IT infrastructure. Although the tactic of simply adding more hardware worked for years, data centers are reaching capacity.

The Cisco Unified Computing System™ (Cisco UCS™) is the first data center platform that integrates industry-standard, x86-architecture Intel® Xeon® servers with networking and storage access into a single unified system. Providing a purpose-built platform for virtualized environments, Cisco UCS is programmed through a single, model-based management interface to accelerate the deployment and performance of physical, virtualized, and cloud-computing environments.

Capacity Expansion Through Technology Refresh

In many data centers consolidation and virtualization attempts are falling short. Efforts to reduce the number of physical servers have left IT staff struggling to cope with hardware that cannot support demand. Now IT must manage a profusion of virtual servers, switches and cables run seemingly everywhere, and management tools are failing to deliver the coordination and automation that is needed. An optimum approach ties capacity expansion to the regular server refresh cycle, enabling IT to plan for demand and gain computing power in an intelligent manner.

Do More with Less

IT organizations that integrate Cisco UCS into capacity planning and server refresh cycles really can do more with less. IT staff can perform more tasks with less effort, manage infrastructure better with fewer tools, and increase capacity in a smaller footprint.

With Cisco UCS, servers, networking, storage, and intelligent management work together in a self-aware and self-integrating system. This design delivers greater computing density, virtualization, and network simplicity in a smaller footprint that reduces operating costs. For example, with the combination of powerful Intel Xeon processors, some of the largest memory capacities available in blade servers, and up to 160 Gbps of I/O bandwidth per server, Cisco UCS delivers enhanced performance and makes optimal use of limited space.

In traditional systems, virtual infrastructure is just as inflexible and complex as the physical infrastructure it replaced. Cisco UCS provides the capability to simplify virtual infrastructure and deploy systems with ease. Physical and virtual servers can be configured and repurposed at a moment's notice to support dynamically changing workloads and growing capacity demands. In addition, built-in management functions provide exceptional visibility into and control over the entire infrastructure to streamline and coordinate administrative effort and eliminate common errors that delay deployment and disrupt operation.

More Effective Data Center Consolidation

IT organizations are continually expanding the capacity of their existing infrastructure to support growing demand. Over time, the constant influx of servers, switches, storage, and cabling results in a sprawling, complex infrastructure that places excessive demand on power and cooling resources and is costly and difficult to manage. As a result, many data centers are simply running out of space and power. Greater infrastructure density is needed if data centers are to recapture valuable floor space and have room to grow.

Increase Data Center Density

Most vendors focus on server density and virtualization without considering how they affect the data center as a whole. Cisco UCS delivers comprehensive infrastructure density—servers, switches, cabling, and management—that reduces the cost per rack unit at the solution level and increases operation efficiency at the data center level.

Transcending the boundaries of traditional blade chassis and racks, Cisco UCS creates a physically distributed, centrally managed system that supports blade and rack-mount servers to deliver scalability and performance. A unified fabric supported by a single, distributed virtual switch interconnects all server resources. Servers and virtual machines are interconnected equally and consistently,

Over 90 Percent Smaller Footprint and Less Power Use with a US$600,000 Savings

Facing further cuts to an already tight budget, the University Information Systems (UIS) group at the University of Colorado was forced to reevaluate its existing infrastructure. Keith Lard, director of enterprise cloud services at UIS says, "We had scaled our data center in a horizontal fashion, and we had reached the limit of what we could power and cool in our existing data center."

UIS deployed a number of Cisco UCS B-Series Blade Servers, Cisco Nexus® 1000V Series Switches, and Cisco Nexus 1010 Virtual Services Appliances for optimal performance and capacity and dense virtualization. Ultimately, UIS consolidated 300 servers in 24 racks into 10 Cisco UCS servers in 2 racks, reducing the university's data center footprint from approximately 5000 square feet to 200 square feet, and reducing its power and network cabling by 1000 cables.

By shrinking the physical capacity of its data center by 96 percent, and consequently reducing power consumption by 90 percent, the UIS team saves approximately US$600,000 per year.

http://www.cisco.com/en/US/solutions/collateral/ns340/ns517/ns224/U_of_Colorado_casestudy_final.pdf

eliminating multiple layers of switching. This radically simplified architecture packs more computing power into less space while allowing IT to choose from a portfolio of servers to deliver massive computing density and

scalability. Workloads can be sized to meet application needs and moved to larger systems as demand grows. The Cisco UCS approach yields greater management and space efficiencies for consolidation, and integrates and simplifies refresh planning and implementation for increased computing capacity.

With Cisco UCS, scaling is more graceful and cost effective than with traditional blade server architectures. The addition of the next blade server chassis does not require installation of tens of thousands of dollars of additional networking infrastructure. Each Cisco UCS increment of scale brings enhanced manageability and control without adding layers of management tools.

Overcome the Challenges of Siloed Architectures

The architectural silos that result from an ad hoc approach to capacity scaling create additional challenges. Isolation from other areas of the infrastructure creates barriers to resource sharing and requires additional dedicated servers standing by to take over work in the event of a failure. Cisco UCS eliminates architectural silos through on-demand provisioning. Any computing resource potentially can be used for any application at any time. The infrastructure is "wire once" with all configuration managed through Cisco UCS Manager, eliminating the physical barriers that used to prevent applications from sharing resources.

Blade Scalability at Up to Half the Cost and Complexity

Server costs are significant, but so is the cost of infrastructure to support each server. Cisco® Fabric Extender Technology architecture (FEX Technology) dramatically reduces the number of interfaces, cables, and switches needed to support Cisco UCS blade servers. As a result, the average per-server infrastructure cost is US$2343 for Cisco UCS compared to US$3761 for an HP system—a 38 percent savings.* Starting with the second chassis, adding an additional HP chassis can increase infrastructure costs by US$39,000 to US$45,000 more than the efficient Cisco UCS design (Figure 1).
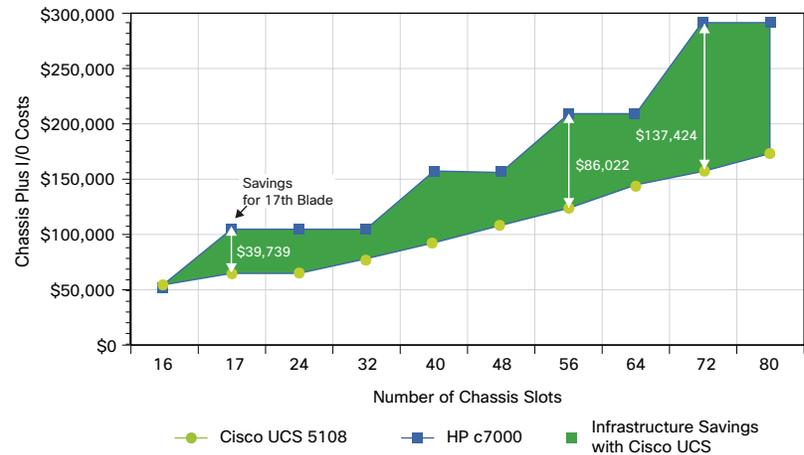
*Based on the Cisco UCS manufacturer's suggested retail price (MSRP) and HP retail price on November 2, 2011

Figure 1. Comparison of Cisco UCS and HP Infrastructure Costs (in US Dollars)

The intelligent infrastructure provided by Cisco UCS enables the entire configuration to be programmed through the intuitive Cisco UCS Manager GUI and open standard XML API. While other vendors support the automatic configuration of a few parameters, Cisco UCS Manager includes nearly 100 server identity parameters, eliminating the need for manual tasks or the creation of scripts or the use of tools and agents that further complicate the IT environment. With Cisco UCS Manager,

IT organizations can plan capacity on a holistic, data center wide basis, sharing infrastructure across applications and harnessing it to best meet business priorities and service-level agreements (SLAs).

Eliminating Network and Cable Sprawl and Complexity

Using traditional implementations, the connection of servers and storage systems to growing numbers of user

applications and services requires extensive networking infrastructure. The resulting dramatically increased connectivity uses massive numbers of cables, creating significant management challenges. Administrators find it difficult to locate ports for new servers, to map and zone connectivity, and to track and locate sources of failures. In addition, this cable proliferation and sprawl requires vast numbers of switch ports and switches, which consume power and increase management complexity.

Simplified Network Infrastructure

Addressing the increasing need for better design and control, Cisco UCS provides greater network density with less cabling and complexity. Cisco's unified fabric integrates Cisco UCS servers with a single high-bandwidth, low-latency network that supports all system I/O. This fabric carries IP, storage, and management traffic over redundant 10 Gigabit Ethernet and Fibre Channel over Ethernet (FCoE) networks. This approach simplifies the architecture and reduces the number of I/O interfaces, cables, and access-layer switch ports that are required for traditional platforms. This unification can reduce network complexity by up to a factor of three, and the system's wire-once network infrastructure increases agility and accelerates deployment with zero-touch configuration.

All I/O traffic meets at a single specific and redundant point at which it is efficiently and consistently managed, increasing network security, simplifying management, and reducing errors. This approach eliminates blade-server and hypervisor-resident switching,

condensing three network layers into one and reducing capital and operating costs. With the capability to interconnect physical servers and virtual machines as functional equivalents, the architecture delivers outstanding visibility and control that lets virtual networks be managed with the same level of control as physical networks.

Simplifying and Accelerating Server Refresh Operations

The ad hoc approach to expansion used in many data centers makes it difficult to refresh and consolidate the environment. Cumbersome processes that are tied to a complicated physical and virtual infrastructure hamper IT's ability to install and configure new systems and to rehost virtual servers and applications. Administrators must perform tedious, repetitive, and time-consuming tasks that are often the source of errors or result in inconsistent configurations or application of corporate policies and security. These delays and inconsistencies affect application and service redeployment and keep the IT organization from supporting real-time business needs and priorities.

Automated Configuration for Fast Deployment

Cisco UCS simplifies and accelerates server refresh operations through automated configuration. The intelligent infrastructure abstracts server identity, personality, and I/O connectivity from the hardware, enabling these characteristics to be applied on demand. Every aspect of a server's configuration, from firmware revisions and BIOS settings to network profiles,

can be assigned through the system's open, documented, standards-based XML API or Cisco UCS Manager GUI. As a result, server configurations can be replicated easily. A new server can appear to the software stack just like the old server, making server refresh operations as simple as applying a Cisco service profile and rebooting to launch the new system.

Service Profiles Support Prestaging

Cisco service profile templates establish policy-based configuration for server, network, and storage resources and can be used to logically preconfigure these resources even before they are deployed in the data center. By preparing service profiles in advance, administrators can prestage IP addresses and storage world-wide names (WWNs) and attach mappings to components. In addition, Cisco UCS blade server slots can be set to automatically configure blade servers upon insertion with network and storage settings that are in compliance with the policies established by appropriate data center administrators. Configuration also can be performed as a manual process as needed, with full server identity parameter control and integration with network and storage resources.

Making Virtualization More Effective

As data centers reach the limits of their physical capacity, virtualization strategies to consolidate workloads onto fewer resources can be important aids. Yet the virtualization efforts deployed by many data centers have resulted in new challenges. The use

of blade server chassis-resident networks and hypervisor-resident software switches creates a complex set of switching layers that makes managing, debugging, and securing virtual networks difficult. Server sprawl continues unabated, with a proliferation of physical servers added to the environment to support a vast array of virtual machines, delivering ever-increasing numbers of applications and services. With a patchwork of technologies in place, physical and virtual systems are deployed, connected, and managed in many different ways, further complicating infrastructure administration and management.

More Virtualization at Less Cost

Cisco UCS enables IT organizations to meet ever-increasing guest operating system memory footprint demands on fewer physical servers. The system's high density, high-performance design, including Cisco Extended Memory Technology, increases consolidation ratios for 2-socket servers, saving the capital, operating, physical space, and licensing costs of running virtualization software on larger, 4-socket servers. With support for up to 1 terabyte (TB) of high-speed memory in a 2-socket server, organizations can host applications using less-expensive servers without sacrificing performance. As a result, IT organizations can put more virtual machines on each server, reducing physical server sprawl and breaking down management silos.

Greater Visibility and Control

IT organizations need to simplify physical infrastructure to break down silos and make the data center more effective. They also need to improve their virtual infrastructure so that it can be managed just as simply and easily as it scales. Traditional virtualized environments require the use of software-based switches that reside in the hypervisor. The insertion of a new switch can cause a loss of visibility from the physical network interface to virtual machines. The result is a network of virtual machines with connection points that cannot be seen. If connections cannot be seen, they cannot be managed or secured.

Cisco UCS uses virtualization-optimized networking that makes managing virtual machine networks equivalent to managing physical networks. Cisco FEX Technology architecture extends the visibility of network and storage access all the way to individual virtual machines, without hypervisor intervention. These connections terminate in the fabric interconnects as virtual ports that are managed exactly the same way as physical ports. Virtual
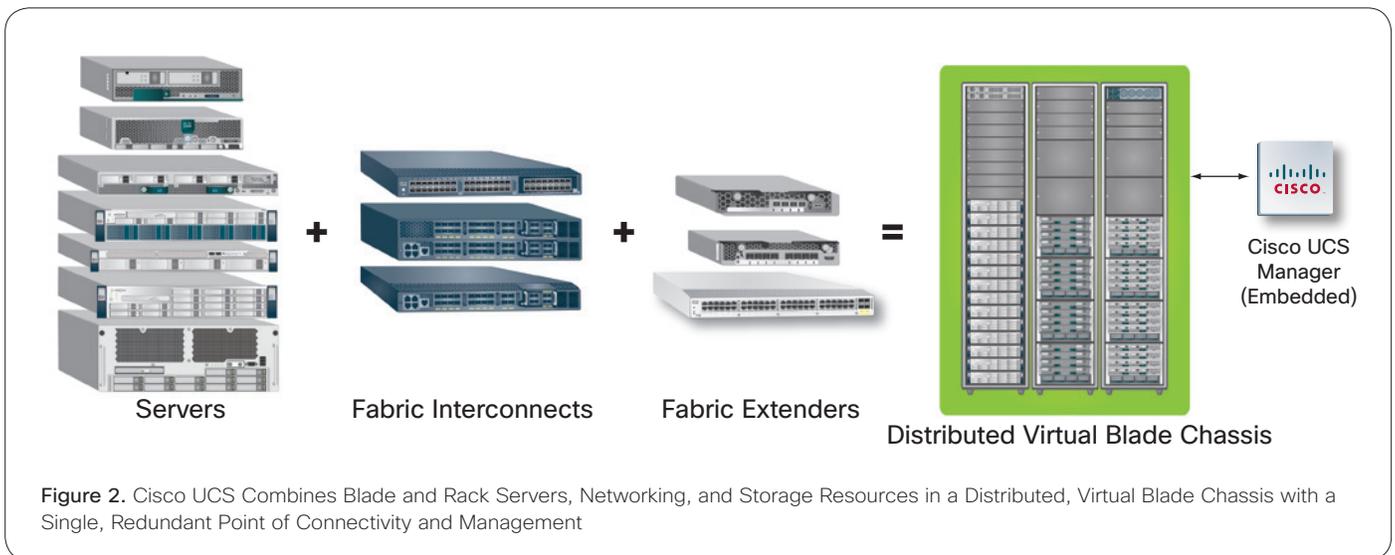
Figure 2. Cisco UCS Combines Blade and Rack Servers, Networking, and Storage Resources in a Distributed, Virtual Blade Chassis with a Single, Redundant Point of Connectivity and Management

Servers + Fabric Interconnects + Fabric Extenders = Distributed Virtual Blade Chassis / Cisco UCS Manager (Embedded)

network interface cards (vNICs) are attached to virtual machines, and their network profiles remain constant and attached, even when virtual machines are moved from one physical server to a different server, enhancing mobility and security. Workloads can be migrated between physical devices, optimizing performance and maintaining security protocols and policies, without requiring intervention by the network team to reset quality of service (QoS) and security for each migrated virtual machine.

The Cisco UCS design results in a distributed, virtual blade chassis that combines the performance and management of physical networks with the scalability of virtual networks. Administrators can use familiar management models on virtual machines and take advantage of built-in automation and intelligence to gain outstanding visibility into, and control over, virtualized environments. For example, bandwidth can be flexibly and dynamically managed with a QoS policy to help guarantee bandwidth for priority workloads running in virtual machines, while also helping ensure that overall bandwidth is used efficiently and not wasted (Figure 2).

More Capacity and Reduced Complexity

Data center infrastructure management has become a complicated challenge. The proliferation of management points and the physical devices to which they are connected has resulted in a new kind of sprawl that must be contained. Typically, administrators have to use a variety of element managers to interact with dozens of management touch points that are distributed across multiple servers, blade chassis, racks, networking, and storage resources. Unfortunately, most vendors attempt to solve this management challenge by introducing additional layers of management tools that are patched together into an accidental architecture that creates more work for administrators.

Less Complex and Easier to Manage
The unified infrastructure and architecture-by-design approach of Cisco UCS delivers the scalability needed to perform capacity planning and refresh activities without the complexity of traditional systems. The dramatic reduction in the number of physical components results in a system that makes effective use of limited space, power, and cooling by deploying less infrastructure to perform the same, or even more, work.

The system's unified fabric results in fewer NICs, host bus adapters (HBAs), cables, and upstream switch ports, and eliminates the need for a parallel Fibre Channel end-to-end network. Traditional blade server chassis resident switches are replaced by a low-cost, low-power, zero-management fabric extender that enables the entire system to scale across multiple blade chassis and rack servers without adding management points. All hardware and software components are managed through the unified, embedded Cisco UCS Manager to improve operation efficiency with seamless scaling.

Conclusion

Deployment of Cisco UCS systems enables data centers to reap the benefits of a simplified infrastructure. By consolidating from a large-footprint rack or complex and network-intensive blade environment to Cisco UCS, IT organizations can reduce the footprint and complexity of the entire datacenter. Server refresh and consolidation operations become easy, scalable, and repeatable exercises that optimize data center investments.

Learn More

To learn more about Cisco UCS, visit http://www.cisco.com/go/ucs or contact your local account representative.