

Unified Computing Overview

What You Will Learn

Virtualization has created a market transition in which IT departments are trying to reduce costs and increase flexibility. Despite this, IT organizations are constantly working against existing rigid, inflexible hardware platforms. As a consequence, data center administrators have had to spend significant time on manual procedures for basic tasks instead of focusing on more strategic, proactive initiatives.

This document highlights crucial issues in today's data center and introduces Cisco's vision for resolving existing challenges and setting data center operating practices on a more scalable and sustainable path: unified computing.

Unified Computing Overview

The next step in the Cisco® Data Center 3.0 vision, unified computing is a data center architecture that unites compute, network, storage access, and virtualization into a single, highly available, cohesive system designed to reduce total cost of ownership (TCO) and increase business agility.

Based on industry standards, unified computing is designed to:

- Streamline data center resources
- Scale service delivery
- Radically reduce the number of devices requiring setup, management, power/cooling, and cabling

Cisco's unified computing architecture dramatically reduces data center TCO while increasing IT agility and responsiveness, providing:

- Increased business agility through just-in-time provisioning and mobility support for both virtualized and nonvirtualized environments
- Dramatic reduction in TCO at the platform, site, and organizational levels

The Problem with Data Centers Today

The history of enterprise computing has been marked by compromises between scale and simplicity. As the number of data center systems has scaled, they have also increased in complexity, and as complexity has increased, so has the expense of deployment and ongoing management.

Today, the vast majority of IT budgets are spent just maintaining and managing existing infrastructure. As a result, IT departments must continually invest in more people, time, and other resources to maintain a growing, inflexible infrastructure instead of rapidly and effectively responding to business needs. Now more than ever, IT departments struggle to be more responsive to the business at lower cost. Power, cooling, real estate, and the ever-increasing demand for computing, storage, and application resources all continue to push costs higher.

In recent years, the majority of IT departments around the world have moved beyond data center and infrastructure consolidation to virtualization. In 2008, 38 percent of all IT workloads were virtualized. This trend is continuing as the majority of IT executives are planning to virtualize more than 50 percent of their computing infrastructure within the next two years. 70 percent of these executives are implementing virtual machine mobility for better load balancing and business continuity. In 2008, the average enterprise deploying virtualization could expect a return on investment (ROI) of more than 400 percent and payback within 12 months. This payback is largely the result of server consolidation, increased utilization, and higher availability.

However, customers are facing challenges in achieving the full benefits of virtualization. Despite the widespread adoption of virtualization, data center operating costs are at an all-time high. Server capacity and performance have increased exponentially faster than data center cooling capacity. This disparity accelerates the obsolescence of data center infrastructure. In fact, for every kilowatt hour (kWh) purchased to power a server in today's data center, 1.5 kWh must be purchased to power the supporting data center infrastructure. According to Forrester (December 2008), more than 70 percent of today's average IT budget is spent maintaining today's inflexible and siloed data center equipment. Data center owners are challenged with unifying and scaling separate virtualized environments. They are struggling to:

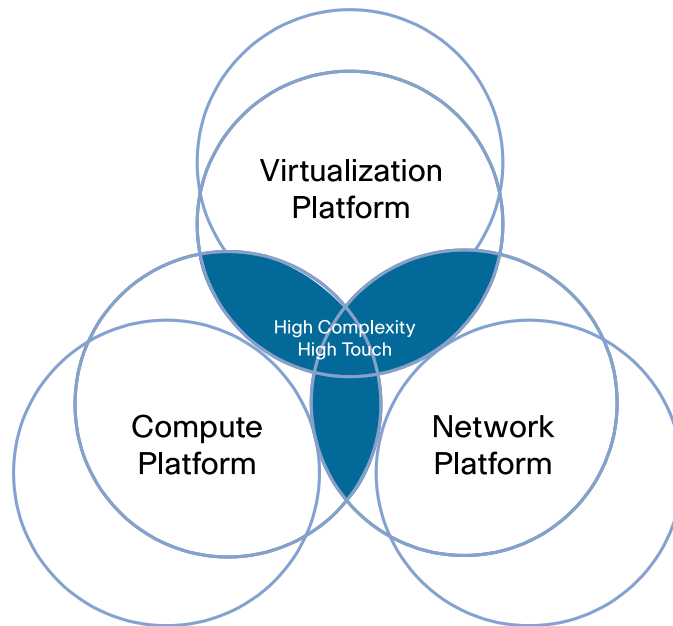
- Maintain consistent and coherent infrastructure policies in this new virtualized environment
- Adapt current management tools and methods to the changing and increasingly interdependent roles of data center administrators
- Simplify operations when their infrastructure is inflexible, underutilized, and lacking cohesive integration

These challenges have led to limited scalability and overly complex management frameworks. This results in higher data center costs and decreased IT responsiveness to rapidly changing business demands.

Achieving Unified Computing

Cisco believes the next-generation data center needs to be viewed across all the discrete technology domains as a single, integrated design. Flexible data center automation is achieved by unifying compute, network, storage access, and virtualization within a single, highly available, cohesive system, decreasing costs and increasing flexibility.

As a result of the virtualization revolution of the past few years, new standards, technologies, and integration conventions are emerging. These innovations enable the design of a preintegrated data center solution from industry-standard components, rather than requiring IT staff or consultants to integrate their own network, computing, and virtualization platforms to create a data center solution.

Figure 1. Continued Architectural Complexity

This market transition, which Cisco is embracing as unified computing, marks the natural evolution of the data center to link data center resources within a cohesive management framework, bringing infrastructure policy consistency and transparency, traditionally delivered by the network, to the virtual machine level. In essence, the network is becoming the foundational infrastructure of the data center.

This architectural shift will have a profound, positive effect on traditional data center administrator roles. Unifying and embedding management at the system level creates the opportunity to increase flexibility and incorporate multiple administrator roles within the same system. With embedded role-based management, organizations can make more efficient use of their administrator resources.

This concept allows organizations to increase effectiveness by maintaining IT disciplines and accountability while increasing teamwork and collaboration. Server, network, and storage administrators can preserve accountability for their domain policies while interoperating within a single integrated management environment. Computing infrastructure can then be provisioned without the clumsy time-consuming coordination required by legacy infrastructure. As data center roles and policies evolve, individual responsibilities and system privileges can be easily modified and new roles quickly created.

Administrators can focus on defining proactive strategies and the policies needed to provision computing infrastructure and network connectivity. Administrators can collaborate on architectural issues, with basic server configuration now automated.

Unified computing will accelerate adoption of virtualization and magnify the returns. Unification of virtualization, network, and compute resources creates the opportunity to provide the same level of network visibility for virtualized environments that is expected and required for physical servers. Migration of virtual machines while maintaining network policies becomes almost effortless. Administrators can now have transparent visibility into the network all the way to the virtual machine, helping them diagnose and ensure policy consistency with ease and confidence.

Unified computing integrates policy-based virtual machine connectivity, mobility of network properties with the virtual machine, and a consistent operational model for both physical and virtual environments. This approach simplifies network and security policy enforcement when virtual machines are migrated from one host to another.

Dramatically Simplified Architecture

Unified computing, as Cisco envisions it, simplifies the way that servers and networks are deployed today. It centralizes switching resources, reducing network access-layer fragmentation by eliminating switching inside the blade chassis. The architecture uses a unified fabric, which provides transport for LAN, storage, and high-performance computing traffic over a single, cohesive infrastructure. This approach can consolidate or entirely eliminate multiple server adapters, chassis switches, cables, and other supporting infrastructure. This simplification can reduce by half the supporting infrastructure requiring power, cooling, management, and security compared to traditional computing environments.

With management simplified and embedded, data center administrators can now use centralized management capabilities within a unified management domain that serves as a central nervous system of unified computing. Embedded device-management software can manage a system with hundreds of servers and thousands of virtual machines as a single, highly available, coherent system. This embedded approach allows multiple administrator roles to interact dynamically in managing infrastructure and its policies. Now, administrators can encapsulate the infrastructure policies needed to deploy applications into mobile, repeatable constructs known as service profiles. This construct improves IT productivity and business agility. Now infrastructure can be provisioned in minutes instead of days, shifting IT's focus from maintenance to strategic initiatives.

End-to-End Optimization for Virtualization

The unified computing architecture is optimized for virtualized environments, from the processor to the aggregation layer. The latest industry-standard processor technology enables better virtualization performance, superb scalability, and enhanced flexibility. In the server, by balancing CPU and I/O capabilities while increasing memory capacity, more virtual machines can be hosted per server than ever before. By providing visibility and portability to network policies and security all the way to the virtual machine, a consistent operational model can be implemented between the physical and virtual environments. In combination with embedded management and the service profile construct, this automation increases responsiveness and reduces the opportunities for human error, improving consistency and reducing server and network deployment times.

Ecosystem of Technical Partnerships

Cisco believes that a strong partner ecosystem is a critical element in the delivery and support of the unified computing architecture. A partner ecosystem provides a comprehensive solution, including network, compute, storage, virtualization, management, and application resources, that are preintegrated and tested to help ensure success. Partnerships extend beyond technical integration and provide a single point of accountability for sales, services, and end-to-end support for unified computing.

Architecture That Continues to Meet Future Needs

A unified computing architecture gives data centers room to scale while anticipating future technology developments. Unified computing elements are preengineered to accommodate future technologies such as 40 Gigabit Ethernet when it becomes available. The architecture's simplicity allows data centers to scale in size, performance, and bandwidth without the historic added complexities of older platforms. This approach helps increase ROI today while protecting that investment over time.

Why Is Cisco Focusing on Unified Computing?

Cisco has been an innovator in networking technologies and has a long heritage of working collaboratively with other IT technology and services providers in the data center. Cisco understands how to use the network to rapidly provide information anytime, anywhere, to anybody.

The unified computing architecture continues Cisco's long history of innovation in delivering integrated systems for improved business results based on industry standards and using the network as the platform. Recent examples include IP telephony, LAN switching, unified communications, and unified I/O.

Cisco began the unified computing phase of its Data Center 3.0 strategy several years ago by assembling an experienced team from the computing and virtualization industries to augment its own networking and storage-access expertise. As a result, Cisco delivered foundational technologies, including the Cisco Nexus™ Family, supporting unified fabric and server virtualization.

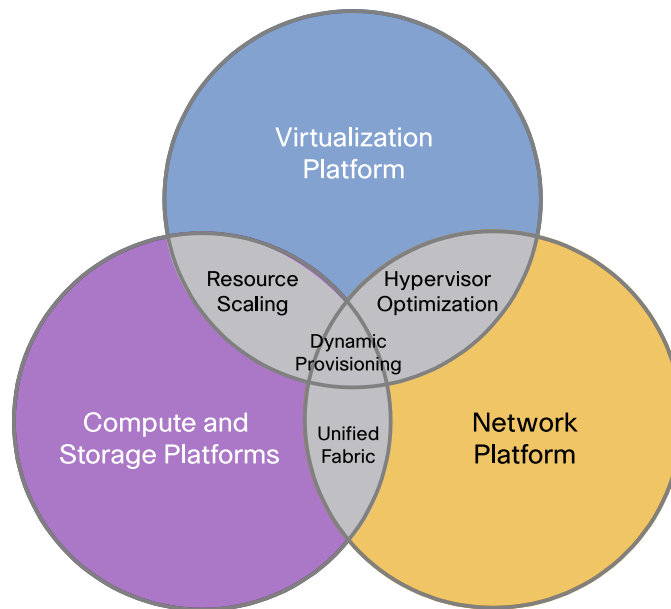
Building on the results of this collaboration with other technology and services providers, Cisco is well-positioned to deliver this innovation by taking a systems approach to computing that unifies network intelligence and scalability with innovative application-specific integrated circuits (ASICs), integrated management, and standard computing components.

Main Benefits for IT

A unified computing architecture integrates network, computing, storage access, and virtualization components into a single, highly available, cohesive system. With hundreds of servers and thousands of virtual machines managed as a single system, this approach decouples scale from complexity. Data center owners can accelerate the delivery of new services simply, reliably, and securely (Figure 2).

A unified computing architecture based on industry standards helps customers:

- Reduce TCO (including both capital expenditures and operating expenses) at the platform, site, and organizational levels
- Increase data center staff productivity by accelerating infrastructure provisioning for both virtualized and nonvirtualized environments
- Enable scalability without the increase in complexity typical of older environments, with hundreds of servers and thousands of virtual machines now operating in a single highly available management domain
- Increase data center energy efficiency and resource utilization
- Reduce the number of points of management; with disparate technologies integrated into one cohesive system, management is consolidated and embedded, enabling infrastructure policies to be consistently applied across the system

Figure 2. Orchestration Among Platforms

Conclusion

Unified computing delivers the next step in the Data Center 3.0 vision. It unifies network, compute, storage access, and virtualization resources in a cohesive system to:

- Reduce TCO
- Increase business agility
- Improve productivity

The data center is in the midst of a major transformation. Customers are achieving many benefits of virtualization today, including lower facilities and power and cooling costs, better server utilization, higher service levels, and faster deployment of applications.

However, virtualization reveals a critical problem: the complexity of managing exponentially increasing numbers of disconnected physical and virtual compute, storage, and network resources.

By introducing unified computing, Cisco and its industry-leading partners enable IT to deliver on the promise of data center virtualization with enhanced data center architectures that will be increasingly more manageable, reliable, flexible, and scalable than anything that exists today.

For More Information

For more information, please see <http://www.cisco.com/go/unifiedcomputing/>.



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