White Paper

Cisco Unified Data Center: Redefine the Economics of Your Data Center Infrastructure

What You Will Learn

Organizations implementing Cisco® Unified Data Center (UDC) technologies can reap numerous economic benefits, including savings in capital expenditures (CapEx) and operating expenses (OpEx), cross-organizational productivity improvements, and strategic gains. The total economic benefits that any organization achieves is affected by a number of factors, including the IT initiatives that the organization is trying to implement, the technology with which the organization started, the new technology that the organization has implemented, and the processes and resources that the organization uses.

To help IT departments envision and calculate the impact of their Cisco UDC technology investment, Cisco has developed a series of white papers, titled “Redefining the Economics of Your Data Center.” The goal of these documents is to make it easier for customers to envision and identify both the direct and indirect economic benefits of Cisco UDC.

This document focuses on the economic benefits delivered by Cisco UDC that are associated with infrastructure costs. It will help you calculate costs that you potentially can reduce or avoid and, to some extent, potential revenue gains that you can achieve by using various Cisco UDC elements during infrastructure consolidation and virtualization.

Because savings in the total cost of ownership (TCO) associated with Cisco UDC is a robust topic, other documents in the series will help you complete the analysis, allowing you to identify economic efficiencies that Cisco UDC delivers:

- “Redefining the Economics of IT Productivity”: This document focuses on the productivity improvements, reduction in deployment time, increased agility, and other benefits arising from streamlined management processes, standardization, automation, and reallocated resources—all enabled by Cisco UDC.
- “Redefining the Economics of Business Continuance”: This document highlights the economic benefits delivered by Cisco UDC associated with higher availability, agility, and resiliency.
- “Redefining the Economics of Application Performance”: This document helps you measure the business impact of improvements associated with performance, scalability, elasticity, and higher user satisfaction.

Traditional Data Center Infrastructure Costs: Direct and Indirect

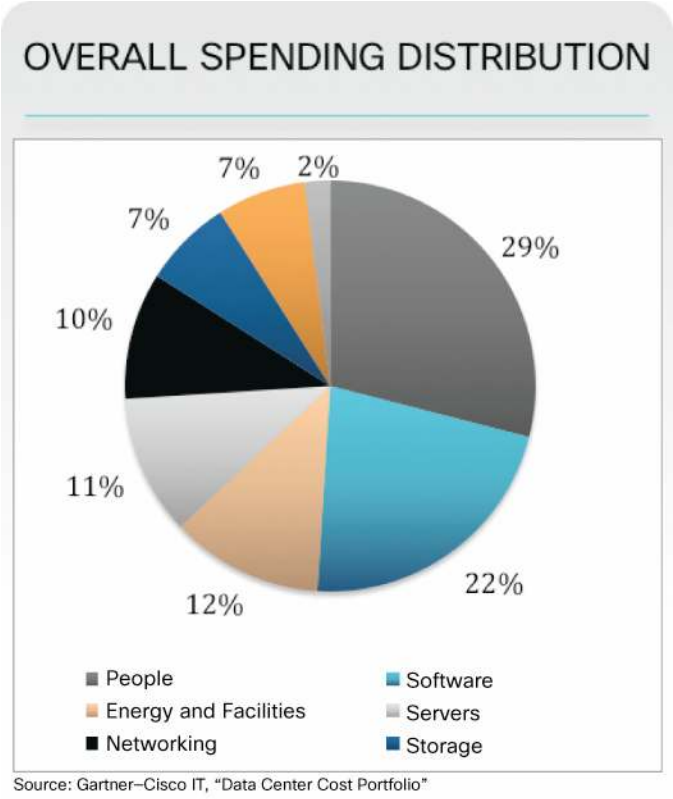
Data centers are the engines of modern enterprises and will only increase in importance. According to the Cisco Global Cloud Index, between 2010 and 2015, global data center traffic will grow fourfold. Simultaneously, the amount of traffic being processed during the so-called busy hour is showing even more dramatic growth. By 2015, busy-hour traffic will be more than 2.5 times greater than average-hour traffic. This dynamic is causing data center architects to search for new ways to scale their data center processing power and help ensure business continuity so that quality of service (QoS) for users does not degrade.

Data centers have historically been expensive to build and operate, however. According to Gartner, data centers typically account for up to 44 percent of overall IT spending. The traditional model of data center investment was to build in silos—often with dedicated resources for lines of business—and to design for peak environments.

This model, however, had inherent inefficiencies because resources could not be shared, increasing costs because of underutilization of resources.

IT feels the impact of these silos in both direct and indirect costs. The direct cost of data center infrastructure—servers, networks, storage, software, energy required for power and cooling, and service contracts—represents almost 70 percent of IT's total investment in the data center. The remaining 30 percent, however, is also affected by data center silos, because IT resources must manage the complexity of the siloed environment. For instance, while the cost of server hardware has been flat or declining for the past 15 years, the cost of managing and operating servers has been growing steadily and now represents two-thirds of the total spending associated with servers. The problem has been exacerbated by virtualization because higher utilization of traditional servers has come at the price of increasing management complexity. Because a wide variety of different servers, software systems, and storage have been used and implemented in silos, most system management functions are complicated because these systems were never designed to work together (Figure 1).

Figure 1. Data Center Spending



Source: Gartner–Cisco IT, "Data Center Cost Portfolio"

Two other costly IT challenges result from the existing siloed data center infrastructure. The first challenge is security and compliance. Siloed data center resources limit IT's ability to automate processes and help ensure uniformity of deployment. Lack of automation increases IT's reliance on manual processes as well as the potential for breaches that result from human errors.

The second challenge is the opportunity cost to the organization from the inability to implement IT projects because of lack of funding. Strategic initiatives that need to wait or are put off indefinitely can take the form of higher costs, missed revenue opportunities, and lost market share.

Although the economic impact of security risk and missed opportunities is challenging to assess, it is real and it is considerable. For instance, the cost to businesses of a security breach that exposes data such as Social Security and credit-card numbers climbed 7 percent in 2011, to an average of US$7.2 million per incident.[1]

Unified Data Center: Overcoming the Disadvantages of Siloed Infrastructure

When Cisco designed its unified data center platform, it did not assess technologies, processes, and people in isolation. Instead, Cisco developed a unified platform composed of three integrated, leading data center technologies: Cisco Unified Fabric, Unified Computing, and Unified Management. The result of using these integrated technologies was a radically simplified architecture when compared with traditional systems. This simplicity lays the foundation for significant cost savings and agility.

For instance, Cisco Unified Fabric, the networking foundation of Cisco UDC, significantly simplifies the data center network by using Fibre Channel over Ethernet (FCoE) to converge what previously were siloed LAN and SANs in traditional environments onto a single network. In contrast to having multiple operating environments in a traditional data center network, Cisco NX-OS Software, the Cisco Unified Fabric operating system for Cisco Nexus® Family switches, acts as a single operating system that runs across every element of the data center network. Consequently, Cisco Unified Fabric reduces network hardware sprawl by eliminating redundant Ethernet and SAN switches and consolidating cabling, and it significantly simplifies data center management.

The Cisco Unified Computing System™ (Cisco UCS®) simplifies data center infrastructure by integrating server, networking, and I/O resources into a single system. Cisco UCS acts as a single point of management, allowing the system to scale without complexity. In addition, because it has a single management and connectivity domain, Cisco UCS integrates all the system's resources into an agile, flexible resource pool.

Cisco UDC delivers significant efficiency gains in management as well. Cisco Unified Management helps ensure that every aspect of a server's personality, configuration, and connectivity can be manipulated through software, rather than through manual assembly of network interfaces, switches, and cables. This capability simplifies and accelerates secure deployment and changes to infrastructure. Cisco Unified Management also automates policy-based dynamic network provisioning to securely enable new services and resources with the right network connectivity and bandwidth. Through automation tools like Cisco Intelligent Automation for Cloud (IAC) and Cisco Network Services Manager (NSM), organizations can automate delivery of cloud services and deploy new IT resources for new initiatives quickly and cost effectively, often providing these resources in minutes, instead of days or weeks as in the past.

Calculating Direct and Indirect Infrastructure Savings with Cisco UDC

In the journey to virtualization and cloud computing, no two organizations start with the same data center, implement exactly the same configurations of technology, and operate their data centers in exactly the same way. Consequently, each organization's infrastructure savings will differ, depending on its existing infrastructure and vendor ecosystem, its specific infrastructure requirements, the products it uses from Cisco, and the IT practices it implements.

[1] Ponemon Institute LLC, Information Security Research Study, 2011

The following sections are designed to help you identify and exploit potential sources of infrastructure savings. This document focuses on the processes of consolidation, virtualization, and delivery of IT as a service (ITaaS), because these are the primary sources of infrastructure savings. The document discusses direct CapEx and OpEx savings achieved in networking, storage, computing, and software infrastructure resources, and service contracts. It also discusses the indirect benefits that can be achieved through security, multi-tenancy, and strategic gains.

As you calculate your current or anticipated savings in these areas, keep in mind that while CapEx savings is typically a one-time gain, OpEx savings is often a recurring benefit. Potential savings associated with human-resource costs, business-continuance advantages, and application performance are not detailed in this document; these topics are included in other white papers in this series.

Economic Benefits of Convergence and Consolidation

The goal of the consolidation phase is typically to accomplish the same IT workloads at a lower cost. IT departments try to gain efficiencies by consolidating their physical servers and current Ethernet and SAN networks to achieve CapEx savings in the form of hardware and software cost reductions, as well as ongoing OpEx savings through reductions in power and cooling, data center space, and the cost of service contracts.

Server Consolidation

Servers used to be designed as discrete resources with a certain number of I/O and storage access ports and a fixed amount of memory. However, this siloed, one-size-must-fit-all approach created barriers to cost-effective scalability. Inadequate memory for large applications and databases meant that memory became exhausted long before CPU resources did, requiring the purchase of additional servers. Similarly, fixed ports often reached full utilization prior to other server elements, necessitating new server purchases. Each additional server came with additional costs—including software, hardware service contracts, network I/0, power and cooling, and data center space—increasing server TCO.

In contrast, because Cisco UCS integrates server, networking, and storage access resources, it is inherently designed to share. Also, because it is managed as a single system—whether it uses one server or hundreds of servers—Cisco UCS decouples scale from complexity. Table 1 presents several measurable examples of how Cisco UCS can lower your TCO through server consolidation.

Table 1. Server Consolidation Use Cases

Server Consolidation		
Challenge: Increasing Computing Power per Rack Unit (RU)		
How Cisco UDC Addresses the Challenge	**CapEx Impact**	**OpEx Impact (Typically Recurring Savings)**
• **More memory capacity:** The Cisco UCS architecture provides 32 DIMM slots per blade slot, with Intel Xeon processor 7500 series. These high-performance processors, coupled with high memory capacity, provide exceptional database and virtualization performance. • **More I/O operations per second (IOPS):** Cisco UCS provides exceptionally high IOPS per blade, with the new Cisco B200 M3 Blade Server reaching up to 80 Gbps.	• More memory capacity and higher I/O capabilities, when coupled with Cisco UCS Manager's advantages, allow greater virtual machine density per physical server while delivering excellent performance. • This capacity dramatically reduces the number of servers required and well as the system footprint. • The reduction in servers also affects the data center at the network layer, dramatically reducing port and switch consumption and the accompanying cable sprawl and management complexity. • When comparing similar Intel Xeon processor 7500 series blade-based servers, Cisco UCS can deliver on average 25% more servers per RU.	• Higher density and fewer servers equates to lower space consumption, fewer management touch points, and lower electric bills for both power and cooling. For power, a smaller footprint enables more effective cooling scenarios, further reducing costs. • Denser computing capacity with improved management and networking accelerates time to production for new servers. This acceleration means faster ROI and a potential competitive advantage in the marketplace. • This savings also has implications for bringing forward previously delayed data center projects and initiatives, allowing increased efficiency and higher returns.
Challenge: Avoiding Unnecessary CapEx Investment for Servers Required Solely to Support Memory-Intensive Applications		
How Cisco UDC Addresses the Challenge	**CapEx Impact**	**OpEx Impact (Typically Recurring Savings)**
• Cisco UCS incorporates Cisco Extended Memory Technology, which provides twice as much memory (384 GB) as traditional 2-socket servers, increasing performance and capacity for demanding and large-data-set workloads.	• By increasing consolidation ratios for 2-socket servers, Cisco UCS conserves both the CapEx and licensing costs of running virtualization software on larger, 4-socket servers. • By increasing server resource utilization, Cisco UCS reduces the number of servers required for comparable workloads, conserving related CapEx.	• Power and cooling savings arise from use of fewer servers as well as the energy efficiency of Cisco UCS. Power supplies are 92% efficient and use automated low-power states to better match power consumption with workloads. • Simplified design improves airflow efficiency and can reduce the number of components that need to be powered and cooled by more than 50% compared to traditional blade server environments. • Cisco UCS requires 37% less space and supports 60% more servers per RU, resulting in a 33% cost savings compared to competitors. • Calculate the associated reduction in the cost of hardware service contracts associated with reduction in servers.
Challenge: Avoiding Unnecessary Investment to Increase Network and I/O Bandwidth		
How Cisco UDC Addresses the Challenge	**CapEx Impact**	**OpEx Impact (Typically Recurring Savings)**
• Cisco UCS incorporates greater network/IO bandwidth to simplify cost-effective I/O scaling. • Cisco UCS incorporates a virtual interface card (VIC) for no incremental I/O cost when scaling from 20 60 GBps, and requires only one additional VIC (no converged switches) for every 20 GB thereafter (estimated cost: US$906 for every additional VIC).[2]	• Traditional servers require 2 converged switches plus a converged network adapter (CNA) card for every additional 20 GBps after the first 20 GB, (requiring additional CapEx of US$39,000 per 20 GB). Calculate the cost difference you can expect by anticipating the number of 20-GB increments you anticipate.	• Calculate OpEx avoidance of incremental power, cooling, and data center space costs associated with additional switches and cards. • Estimate the additional IT resource burden to deploy and manage the incremental cards and switches. • Assess the additional hardware service contract costs associated with additional switches and cards using traditional servers.

[2] Calculations reflect the cost of expanding network I/O with Cisco UCS blade servers compared to HP traditional blade servers based on publicly available pricing as of April 16, 2012.

Challenge: Reducing Management Complexity		
How Cisco UDC Addresses the Challenge	**CapEx Impact**	**OpEx Impact (Typically Recurring Savings)**
• Cisco UCS Manager serves as the single management software platform for server, networking, and storage access resources, delivering a flexible pool of computing, networking, and storage access resources that can be allocated and reallocated.	• Calculate the reduction in software licensing costs associated with multiple software platforms that are no longer required (traditional infrastructures often require as many as 9 separate platforms).	• Calculate reduced costs for administrator training (calculate hours no longer required for training by multiplying the number of platforms you were able to reduce by the weighted cost of the resource).
Challenge: Improving Network Efficiency to Ensure QoS Despite Centralization of Servers		
How Cisco UDC Addresses the Challenge	**CapEx Impact**	**OpEx Impact (Typically Recurring Savings)**
• Consolidation of servers can remove them from local branch sites, where proximity used to help ensure a high-quality user experience. Using Cisco Wide Area Application Services (WAAS) helps enable LAN-like performance for centralized applications across the WAN, helping ensure high server performance regardless of location.	• Cisco UDC removes a barrier to extensive server consolidation and the CapEx and software licensing cost reduction benefits that accompany consolidation.	• Cisco UDC supports further reductions in data center space, power and cooling costs, and the cost of hardware service contracts that are associated with server consolidation.

Network and Storage Convergence

The process of network consolidation enables extensive cost reductions. In a traditional environment, a typical enterprise server might have six to eight network connections extending from it, including data and storage connections as well as those dedicated to management or backup. Each of these connections, however, adds incremental costs:

- A PCI card is needed for each interface.
- A slot is needed for each card.
- To help ensure sufficient slots, larger servers may be required. Larger servers consume more space and power.
- Storage interfaces are required to link to both Ethernet and Fibre Channel storage network infrastructure (including switches, host bus adapter [HBA] ports, and network adapters).
- Each interface requires a cable, and labor costs are required to connect that cable.
- Each cable needs to connect to a switch port, increasing the need for additional switches, which also require space, power, and cooling.

Cisco Unified Fabric allows organizations to collapse those six to eight connections into two 10 Gigabit Ethernet ports. In addition, Cisco Unified Fabric allows IT to consolidate the two storage networks—Ethernet and Fibre Channel—into a single physical infrastructure. This consolidation eliminates the need to procure, maintain, and manage two sets of switches, which require related CapEx (for example, costs for network interface cards [NICs], HBA ports, and networking adapters) and OpEx (costs for power, cooling, and space). The combination of both these advances in network convergence delivers the benefits presented in Table 2.

Table 2. Network and Storage Convergence Use Cases

Network and Storage Convergence		
Challenge: Reducing the Cost and Complexity of Network Connections		
How Cisco UDC Addresses the Challenge	**CapEx Impact**	**OpEx Impact (Typically Recurring Savings)**
• Cisco Unified Fabric collapses what was typically 6 to 8 connections into two 10 Gigabit Ethernet ports, dramatically reducing the number and associated costs of PCI cards, server slots required (which required larger servers), and cables.	• Reduce CapEx costs by 50 to 75% per server. • Reduce the number of slots required by 60 to 71%, allowing an organization to buy smaller servers or delay purchases of larger servers (with associated OpEx savings). • According to IDC, the lifetime cost per cable is US$500 to US$1000. Customers using Cisco Unified Fabric often reduce the number of cables required by 75 to 80% (for example, from 400 to 100 for an average data center).	• The combined effect of significant reductions in the cable volume and ability to purchase smaller servers (or delay purchases of larger servers) translates into savings in power and cooling and data center space • Labor costs decrease because fewer cables need to be installed.
Challenge: Reducing the Cost Associated with Siloed LAN and SAN Infrastructure		
How Cisco UDC Addresses the Challenge	**CapEx Impact**	**OpEx Impact (Typically Recurring Savings)**
• Cisco UDC converges Ethernet and Fibre Channel networks and allows evolution of the SAN with Ethernet switches.	• Costs associated with SAN infrastructure switches, NICs, HBA cards, and cables required in traditional LAN architectures are reduced.	• Achieve a 50% reduction in power and cooling costs and the racks and floor space associated with the duplicate network. • Reduce management cost with simpler infrastructure. Customers have achieved 20% reduction in associated labor costs.[3] • Although some startup costs may be associated with the redesign of the LAN and SAN and with employee retraining, the recurring OpEx savings more than compensate.

Virtualization: Increasing Resource Utilization, Agility, and Productivity with Virtual Machines

Cisco UDC achieves pervasive virtualization cost effectively through all its elements: Cisco Unified Fabric, Unified Computing, and Unified Management. Unlike the consolidation phase, which emphasizes increasing efficiency while supporting the same IT workloads, the virtualization phase focuses on doing more using virtual machines: becoming more agile, making changes more easily, more easily moving applications, etc.

Virtualization is a broad continuum, including everything from initial virtualization, in which the goal is to establish virtual machines; to pervasive virtual machine mobility; to virtual machine and infrastructure optimization. Cisco UDC infrastructure savings in this area therefore includes some additional direct-cost savings associated with virtualization of the infrastructure as well as the incremental benefits an organization achieves when it can gain the use of multiple servers and data centers and make dynamic changes (improving performance, accelerating applications, securely moving resources between data centers to increase efficiency, prioritizing a virtual machine, achieving improvements in business continuity and availability, etc.).

Server Virtualization

When you evaluate the TCO of servers in a virtualized environment, your requirements are far different than they were for traditional servers. Instead of viewing an individual server as a discrete entity, you evaluate how well that server can function as part of a high-performance resource pool. Server virtualization will be successful only if the servers can support the large applications common in these environments and consistently meet performance and

[3] The ROI of Converged Networking Using Unified Fabric (IDC white paper, 2011)

reliability service-level agreements (SLAs). In addition, the servers must excel in their ability to respond to change quickly and effectively.

Cisco UCS is optimized for virtualization, earning more than 60 world performance records, including 2012 VMware VMmark benchmarks that measure virtualization and cloud-computing performance. Cisco UCS packs tremendous computing power, memory, networking resources, and I/O bandwidth into a given space while boosting performance of virtualized environments. Through the automation power of Cisco UCS Manager, it also breaks records in speed of deployment and reprovisioning. Table 3 presents some use cases.

Table 3. Server Virtualization Use Cases

Server Virtualization		
Challenge: Increasing Server Utilization and Virtual Machine Density Through Pervasive Virtualization		
How Cisco UDC Addresses the Challenge	**CapEx Impact**	**OpEx Impact (Typically Recurring Savings)**
• Cisco UCS integrated architecture coupled with innovations such as extended memory, the latest Intel processors, memory access that is 27% faster than in competing solutions, and innovations such as VICs that improve network performance by up to 38% (while freeing CPU cycles speeds) have contributed to the consistently leading performance of Cisco UCS in worldwide benchmarks across a wide variety of applications and supporting thousands of virtual machines.	• Increased server utilization helps reduce CapEx and the cost of associated software licenses. • For example, by using Cisco UCS virtualization capabilities, NetApp was able to consolidate 51 blade server chassis and 714 servers into 15 Cisco UCS chassis and 120 servers for one of its cloud-based services.	• Further reductions in hardware service contracts, power and cooling, and data center space result from increases in server utilization. • For example, Terremark replaced its traditional servers with Cisco UCS and was able to increase server utilization by 400% while maintaining the same power and cooling costs.
Challenge: Enabling Cost-Effective Dynamic Provisioning and Change		
How Cisco UDC Addresses the Challenge	**CapEx Impact**	**OpEx Impact (Typically Recurring Savings)**
• Cisco UCS is a self-integrating, self-aware system that allows every aspect of a server's personality, configuration, and connectivity to be manipulated in minutes through software using service profiles. • As business demands increase, Cisco UCS Manager can automatically provision additional resources to maintain service levels. • The wire-once dynamic configuration capability of Cisco Unified Fabric embedded in Cisco UCS results in enhanced capability to respond to changing business conditions and characteristics of the infrastructure (for example, security, bandwidth, and latency) without the need to rewire.	• Use of service profiles and wire-once technologies to automate provisioning and change help reduce resource utilization, conserving CapEx. • Because servers automatically join resource pools, the need for duplicative "burst capacity" servers is reduced. These servers can now be shared across multiple application groups.	• Calculate direct OpEx savings resulting from automation by assessing the average number of provisioning and configuration changes your organization requires and estimating the improvement in IT productivity. • Estimate the potential benefits to the business of implementing these resources and changes more quickly (effect on customer experience, capability to improve system availability, etc.).

Network and Storage Virtualization

Having a server capable of outstanding virtualization is only part of the equation. To reduce overall data center TCO, your network and storage solutions also must be optimized for virtualization to increase utilization and reduce risk.

From a networking perspective, reliance on dedicated network switches, physical security appliances, and manual operations creates obstacles to virtualization and increases the likelihood of human error. As you increase virtual machine mobility, moving virtual machines from rack to rack and data center to data center, the network must have the intelligence to automate each virtual machine's network and security policies together.

Similarly, from a storage perspective, virtualization solutions need to increase storage utilization rates while maintaining data separation and compliance.

Table 4 presents examples of how Cisco technology can help you obtain the TCO benefits of increased network and storage virtualization and utilization while helping ensure security and compliance.

Table 4. Network and Storage Virtualization Use Cases

Network and Storage Virtualization		
Challenge: Increase Network and Storage Utilization Through Virtualization		
How Cisco UDC Addresses the Challenge	**CapEx Impact**	**OpEx Impact (Typically Recurring Savings)**
• Because Cisco UCS is integrated with the network and storage access through Cisco Unified Fabric, all IP, storage, and management traffic is delivered to each Cisco UCS server: every server has access to exactly the same resources. • A single Cisco Nexus 7000 Series Switch chassis can be used as 4 logical switches. The Cisco Nexus 7000 Series provides IT with the flexibility to vertically consolidate switches (for example, placing core, aggregation, and access switches in a single chassis while retaining the three levels) or to consolidate horizontally (for example, combining multiple aggregation switches in a single chassis).	• Cisco UCS integration with the network and storage eliminates a barrier to storage and network virtualization, increasing utilization and lowering TCO. For instance, an IDC report found that customers using Vblock™ Infrastructure Packages (which pair Cisco UDC with EMC storage in preengineered converged infrastructure) typically increased storage utilization by more than 60% and doubled network port utilization. • With the Cisco Nexus 7000 Series, IT can condense what would have required a CapEx investment for 4 switches into a single virtualized switch. In addition, the capability to virtualize switches means that you need to add a switch only when all available ports have been fully used.	• Increasing network and storage utilization promotes efficient use of associated power, cooling, and facilities space. • By using a Cisco Nexus 7000 Series Switch instead of 4 separate switches, customers can reduce hardware service contract costs, power and cooling expenses, and data center space requirements compared to the requirements for 4 individual switches.
Challenge: Improving Security, Compliance, and Productivity as Virtual Machine Mobility Increases		
How Cisco UDC Addresses the Challenge	**CapEx Impact**	**OpEx Impact (Typically Recurring Savings)**
• Cisco UDC increases network intelligence. Cisco Unified Fabric embeds virtual machine–aware security and intelligent services directly into the network fabric, delivering transparent services throughout the data center in a consistent and uniform manner. The Cisco Nexus 1000V Switch and Cisco Nexus 1010 Virtual Services Appliance enable automated, secure, virtual machine mobility, improving compliance, security, and IT productivity and allowing greater virtualization and agility, • Cisco UDC virtualizes the security appliance. Physical security appliances create complexity in virtualized environments and rely on manual operations. By using the Cisco ASA 1000V Cloud Firewall or Cisco Virtual Security Gateway (VSG) for Nexus 1000V Series Switch, Cisco UCS enables the use virtual security appliances that allow virtual security nodes to be automatically created in proximity to the virtual machine as it travels, and decommissioned when they are no longer needed. • Use of Cisco Virtual Extensible LAN (VXLAN) and Overlay Transport Virtualization (OTV) technologies allows IT to perform live migration over Layer 3 (typically, virtual machine mobility is limited to layer 2), enabling greater virtualization ratios.	• By automating network and security policy mobility with the virtual machine, obstacles to greater virtualization levels are eliminated. The capability to implement live migration at Layer 3 further increases mobility. The combination of these two features can significantly increase server and network virtualization rates, reducing CapEx. • Virtual security appliances eliminate the need for additional CapEx investment in physical security appliances, which cost from US$50,000 to US$200,000 each. The need for additional appliances is usually the result of network growth, with appliances typically needing to be purchased to support peak volumes. Although there are costs associated with the purchase of the Cisco VSG appliances and the CPU cycles they consume, this is a variable cost that can be adjusted up or down as needed.	• The IT resource burden associated with virtualization and compliance audits is decreased. • The chance that human error will result in a security or compliance problem is reduced. • Cisco UDC eliminates hardware service contract costs, power and cooling expenses, and data center space costs that would otherwise have been associated with additional physical security appliances.
Challenge: Implementing Secure Multi-Tenancy		
How Cisco UDC Addresses the Challenge	**CapEx Impact**	**OpEx Impact (Typically Recurring Savings)**

• By using Cisco ASA 1000V Cloud Firewall, VSG, and VXLAN, organizations gain the capability to offer secure multi-tenant services, delivering trusted, consistent security across physical, virtual, and cloud infrastructures. • IT departments can write a policy and have it work in both the physical and virtual environments.	• Avoid duplication of resources previously needed to maintain separation of data and operations, conserving CapEx. • There are potential revenue gains associated with implementing trusted multi-tenancy (for example, service provides can use the same infrastructure for new revenue-producing services).	• Avoid the power and cooling, data center, and IT resource burden associated with duplication of resources.
Challenge: Helping Ensure Efficient and Secure SAN Virtualization		
How Cisco UDC Addresses the Challenge	**CapEx Impact**	**OpEx Impact (Typically Recurring Savings)**
• Implement SAN virtualization by using Cisco Inter VSAN Routing (IVR) technology, which allows access to resources across VSANs while maintaining data separation and compliance.	• Avoid duplication of resources previously needed to maintain separation of data and operations, conserving CapEx. • There are potential revenue gains associated with implementing trusted multi-tenancy (for example, service provides can use the same infrastructure for new revenue-producing services).	• Avoid the power and cooling, data center, and IT resource burden associated with duplication of resources.

Delivering ITaaS and Cloud Services

So far, this document has looked at the cumulative benefits of different elements of Cisco UDC separately. However, to understand the TCO implications of the provisioning and reprovisioning of integrated data center resources and the capability to enable automated deployment of cloud services, these topics must be viewed from the perspective of the entire data center and its integration within the network.

Through Cisco Unified Management, Cisco delivers some powerful tools that simultaneously lower the cost and accelerate the delivery of new data center resources and cloud services.

- Cisco Intelligent Automation for Cloud is a self-service provisioning and orchestration software solution for cloud computing and data center automation. It helps enable secure, on-demand, and highly automated IT operations for both virtual and physical infrastructure across computing, networking, storage, and application resources.
- Cisco Network Service Manager helps organizations automate the deployment of cloud services. It incorporates virtualization capabilities that facilitate the transformation of static, rigid networks into a dynamic infrastructure that responds automatically to the demands of virtual and cloud environments on the basis of rules and business policies defined by administrators. It can create, deploy, persist, modify, and tear down network services in a fully automated fashion based on business policies that provide governance and control, without compromising control, compliance, or security.

Table 5 presents some examples of how a unified and automated approach to ITaaS delivery and cloud services deployment can help achieve significant reductions in infrastructure costs and time to market.

Table 5. ITaaS and Cloud Services Delivery Use Cases

ITaaS and Cloud Services Delivery		
Challenge: Accelerating Delivery of New Virtualized Resources Required for IT Projects		
How Cisco UDC Addresses the Challenge	**CapEx Impact**	**OpEx Impact (Typically Recurring Savings)**
• Cisco Intelligent Automation for Cloud helps organizations provision virtualized data center resources (computing, networking, and storage) in minutes.	CapEx is reduced in two ways: • When data center resources required for internal development become more highly utilized, technology ROI increases. • When internal organizations know they can rapidly receive additional resources	• Achieve significant reductions in the IT staff time required to deliver and support resources for internal use. • Improve employee productivity for those relying on access to new resources. • For example, using Cisco IAC, Cisco IT

	if necessary, they typically do not oversubscribe, promoting efficient resource use.	reduced the time required to provision new data center resources from days or weeks to minutes.
Challenge: Automating the Deployment of Cloud Services While Preserving Compliance and Security		
How Cisco UDC Addresses the Challenge	**CapEx Impact**	**OpEx Impact (Typically Recurring Savings)**
• Cisco Network Services Manager allows virtualized computing resources to be combined with network access and security models into a single service chain—a cloud service—that is fully automated and can be deployed, on demand, to selected end users. From the activation of a business policy that defines a new cloud service, Cisco Network Services Manager automatically initiates the creation of the network access and security models across all required infrastructure devices (routers, switches, and firewalls).	• Faster deployment of cloud services increases resource utilization, lowering overall TCO.	• The entire process is completed in minutes, with everything defined through business policy and deployed automatically without any chance of command-line mistakes by network engineers that may introduce security gaps.

Calculating the Indirect Benefits of Cisco UDC infrastructure Savings

The cumulative infrastructure savings delivered by Cisco UDC can be estimated by systematically measuring the CapEx benefits and recurring OpEx benefits of consolidation, virtualization, and ITaaS.

However, the greater economic good could, in fact, come from the investments you make with the money, personnel resources, and time you save. As you evaluate each stage of your infrastructure cost savings, keep track of the short-term and long-term benefits listed in Table 6.

Table 6. Indirect Benefits

Reinvestment of Infrastructure Savings	Short-Term Benefits	Long-Term Benefits
Reinvestment of CapEx and OpEx savings in additional IT infrastructure	• Track the immediate impact on the business of the additional infrastructure and the applications and initiatives it supports.	• Track the long-term implications of having better infrastructure applied sooner.
Benefits of ongoing OpEx savings in power and cooling and facilities space costs	• Capability to meet green corporate objectives • Capability to delay expansion of IT facilities (consider building and land costs, facilities management costs, and operating costs)	
Percentage of IT resources invested in innovation instead of maintenance activities	• As the percentage of IT staff involved in innovation (instead of maintenance activities) increases, track the new projects that IT is able to deliver, or deliver sooner, and add those initiatives to the points discussed in the next two items in this table.	• As more IT staff members work on innovation, does your organization experience a decrease in IT staff turnover?
Additional internal initiatives accomplished with freed IT resources and additional infrastructure	• Improvement in employee productivity or satisfaction	• Impact of departmental innovations that were implemented, or implemented sooner
Additional external (customer) initiatives accomplished with freed IT resources and additional infrastructure	• Increase in customer satisfaction • Short-term revenue or profitability implications of delivering new services and higher QoS resulting from the initiative, or the capability to deliver these benefits sooner	• Competitive implications • Improvement in customer loyalty • Change in market share • Long-term impact on revenue and profitability

Infrastructure Savings Cisco UDC Customers Are Experiencing

Because no two organizations implement the same IT infrastructure in the same way, Table 7 compares the infrastructure savings achieved by a range of customers who have implemented Cisco Unified Data Center.

Table 7. Infrastructure Savings for Cisco Customers

	TravelPort	NTT Data	Cineca
Company Description	U.S.-based provider of transaction-processing solutions for companies in the global travel industry	Global telecommunications provider	One of the largest supercomputing centers in Italy
Objectives	• Cost-effectively scale server and network to meet business needs • Reduce time to deploy server architecture	• Reduce TCO for in-house IT system platforms through virtualization • Reduce server provisioning lead time	• Reduce operating costs by 25% despite rapid growth in data volumes • Improve server virtualization and process automation
Existing State	• 4800 physical servers and 1700 virtual servers • Multiple access layer switches • Several person-weeks required for each server and virtual machine host	• 130 aging physical servers	• 450 physical servers approaching end-of-life
Cisco Unified Data Center Products Used	• Cisco UCS • Cisco Unified Fabric: Cisco Nexus 7000 and 5000 Series Switches • Cisco UCS Manager	• Cisco UCS • Cisco Unified Fabric: Nexus 7000 Series Switches and Cisco Data Center Virtual Machine Fabric Extender (VM-FEX) technology • Cisco ASA 5500 Series Adaptive Security Appliances	• Cisco UCS • Cisco Unified Fabric: Cisco Nexus 7000 Series and Cisco Nexus 1000V
Infrastructure Cost Savings	• Eightfold savings on racking, cabling, server, and network costs • 70% savings in total power and cooling costs • 86% savings in data center floor space • Consolidation of 12 switches into 4	• Initial investment reduced by 58% • Maintenance costs reduced by 17% • Rack costs reduced by 58% • Overall reduction in TCO exceeds 50%	• Easily migrated 96% of physical servers to virtual machines • Decommissioned 20% of physical servers, from 450 to 360, retiring 10 racks • Achieved sixfold increase in server utilization • Reduced server power consumption by one third
Other Savings	• 86% reduction in total support hours • Reduced time to install 190 servers from many weeks to 6 hours	• 50% reduction in provisioning time • CO2 emissions reduced by 79% over 5-year period, a cumulative reduction of 3540 tons	• 75% reduction in provisioning time

For More Information

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Printed in USA C11-713600-00 09/12