Cisco Desktop Virtualization Solutions: Providing Scalable, Secure, Cost-Effective Access to Server-Hosted Virtual Desktops

What You Will Learn

Cisco is bringing to market a portfolio of Desktop Virtualization Solutions which provides the infrastructure for various types of virtual desktop. Working together with other desktop virtualization industry leaders, Cisco is delivering solutions intended to address the broadest set of IT and user requirements. This paper addresses virtual desktop infrastructure (VDI), which is one of the fastest growing approaches to Desktop Virtualization.

Virtual Desktop Infrastructure (VDI) fundamentally changes the way that employees, partners, and consultants work by providing anytime, anywhere secure access to desktops hosted and managed in the data center. Cisco's VDI solution addresses the needs of an increasingly mobile and geographically dispersed workforce that is adopting an evolving and expanding suite of heterogeneous end-point devices. Cisco's VDI solution gives enterprises a path to pervasive and persistent control and security of hosted virtual desktops, applications, and data delivered through a highly scalable and rapidly deployed infrastructure, while improving the overall end user experience and reducing costs. Cisco's VDI Solution offers an innovative solution that addresses the evolving business IT environment, including desktop hardware refresh cycles, Microsoft Windows 7 migration, security and compliance initiatives, remote and branch offices and offshore facilities, and mergers and acquisitions.

Cisco's VDI solution combines best-in-class Cisco and partner products, service offerings, and best practices into an end-to-end solution that offers scalability, security, an outstanding user experience, and control of both capital expenditures (CapEx) and operating expenses (OpEx). Cisco offers the first end-to-end VDI solution that uses an open platform and architectural approach that includes computing, hypervisor, network, storage, security, and management in a single, cohesive system designed to increase business agility and reduce total cost of ownership (TCO).

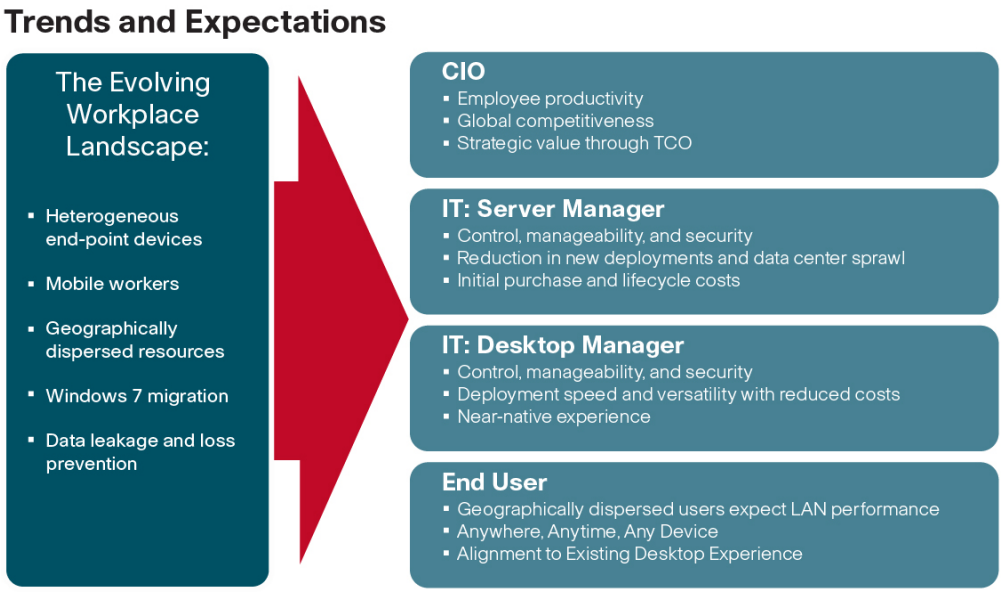
Cisco's leadership in creating an architectural advantage for its clients in networking, collaboration and unified computing is enabling it to come to market with a truly differentiated end-to-end solution that addresses the challenges of implementing desktop virtualization.

This document describes why VDI is becoming increasingly important and discusses VDI requirements and challenges. It then details the end-to-end Cisco solution for VDI.

Evolving Business Environment

Today's IT departments are facing a rapidly evolving workplace environment. The workforce is becoming increasingly diverse and geographically dispersed, including offshore contractors, distributed call center operations, knowledge and task workers, partners, consultants, and executives connecting from locations around the globe at all times.

Figure 1. The Evolving Workplace Landscape



This workforce is also becoming increasingly mobile, conducting business not just in traditional offices, but in conference rooms across the enterprise campus, in home offices, on the road, in hotels, and even in the local coffee shop over Wi-Fi. Workers also want to use a growing array of client computing and mobile devices that they can choose based on personal preference.

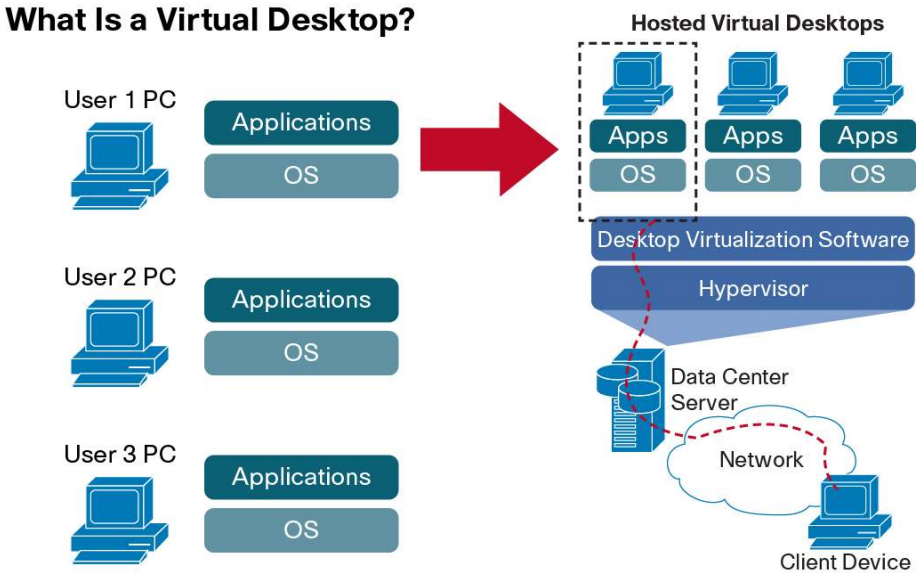
These trends are increasing pressure on IT to help ensure protection of corporate data and prevent data leakage or loss through any combination of user, endpoint device, and desktop access scenarios.

These challenges are compounded by desktop refresh cycles to accommodate aging PCs and bounded local storage and migration to new operating systems, specifically Microsoft Windows 7.

What Is Virtual Desktop Infrastructure (VDI)?

VDI is the fastest growing approach to desktop virtualization, allowing IT departments to centrally host and manage user desktops on a virtual machine residing in the data center. Users can access their server-hosted virtual desktops, including their applications and files, from anywhere there is connectivity and from a broad range of end-user devices using one of several remote display protocols.

Figure 2. What is a Virtual Desktop?



The end-user device can be a:

- Traditional thick client (such as a standard PC or laptop computer)
- Thin client, which provides an optimized, lower-cost device designed specifically to interact with a hosted virtual desktop
- Display terminal that supports keyboard, video, and mouse only, interacting with a hosted virtual desktop
- Secure corporate workspace or virtual desktop within the user's own personal PC or laptop computer: a "bring your own PC" approach (for example, for contractors)
- Tablet or smartphone that acts as a thin client

Desktop virtualization can be achieved through various additional proven approaches including terminal services, desktop streaming, and application streaming. VDI is Cisco's first solution in this market.

Market Readiness

Although VDI technology has been available for more than half a decade, only now are technical and cost barriers to large-scale deployments being addressed. Within the data center, cost-effective and virtualization-optimized stateless computing infrastructure now offers the total cost of ownership (TCO) and flexibility required for large-scale deployments. At the same time, there is growing trust in cloud-based solutions that lend themselves well to this centralized, hosted model for end-user computing. With these solutions coupled with cost-effective and ubiquitous broadband connectivity and advanced WAN optimization techniques for bandwidth management and rich media transport, IT managers now have the resources to extend VDI to a very mobile population of users who demand a diversity of form factors and are deployed globally.

At the same time, IT must address growing upgrade and endpoint maintenance costs. By some estimates, VDI may save 70 percent in ongoing maintenance costs across the infrastructure, as well as reduce the 30 percent IT budget spent annually on hardware and software acquisition. VDI also permits IT to more efficiently deploy data center and desktop resources, and an improved user experience results in increased productivity. By 2013, more than 50 million users, accounting for more than 10 percent of the total user population, will access corporate resources through VDI, reflecting a 92 percent compound annual growth rate (CAGR). Given the growing importance of smartphones and tablets in the workplace, natural platforms for VDI, these estimates may turn out to be conservative.

Challenges

The call for VDI reflects the limitations of current approaches in addressing the challenges of security, changing global business dynamics, TCO requirements, and an increasingly mobile and diverse workforce. IT managers must regain control of the desktop while meeting end-user expectations.

- **Compliance, Security and Control:** Compliance with corporate, industry, or governmental regulations such as HIPAA by providing role-based access based on organization and job title is critical. While the centralization of corporate data and applications within the data center helps addresses concerns about data loss and leakage through endpoint devices, it raises new challenges related to the policy, security, and control of virtual machine-hosted desktops and the computing infrastructure on which they reside. The need for virtual machine-level awareness of policy and security is significantly increased, especially given the dynamic and fluid nature of virtual machine mobility across an extended computing infrastructure. The ease with which new virtual desktops can proliferate magnifies the importance of a virtualization-aware network and security infrastructure.
- **Rapid deployment and scaling:** The purchasing, provisioning, and deployment of new desktops and OS loads needs to happen more quickly than ever, whether to keep up with the changing user environment because of growth, mergers, acquisitions, or the need to migrate to Microsoft Windows 7 or to mitigate outages to meet service levels. All these cases require a VDI solution that is easy to provision, deploy, manage, troubleshoot, and update, with a centralized integrated single pane of glass for management. In addition, secure desktops must be deployed in seconds rather than days or weeks. These requirements are amplified by the expectation that VDI will enable a “bring your own computer” (BYOC) approach that facilitates rapid employee access and platform diversity.
- **User experience:** Freeing the user from location and device constraints while maintaining near-native application performance is both the promise and challenge for traditional VDI solutions. This experience includes rich-media optimization and application support. While newer display protocol technologies have emerged that promise increasingly enhanced multimedia capabilities, effective WAN optimization is required for remote and branch-office users to mitigate and address the associated increase in bandwidth consumption and the effect of WAN latency. Helping ensure predictable responsiveness by allocating resources on demand and avoiding performance bottlenecks are also crucial requirements and include CPU and memory allocation within the computing infrastructure, centralized storage throughput and I/O, and optimization of print services traffic and USB redirection.
- **Total Cost of Ownership:** VDI can enable IT to regain control and visibility into lifecycle costs to positively affect budgets, productivity, and competitiveness. Meeting this challenge entails centralizing desktop operations, simplifying the network and data center architecture, improving resource utilization, and implementing virtualization-aware networking. Main areas of focus for VDI therefore are:
  - Density of virtual desktops hosted on each server blade
  - Simplification of the cabling infrastructure
  - Streamlining of the operational and process model required to create, provision, and maintain each virtual machine or desktop and its underlying policy attributes
  - Cost of the networking infrastructure and its ability to scale to the required number of concurrent user sessions while supporting rich media applications

Stakeholder Expectations

As IT departments evaluate VDI as a means of addressing these challenges, each desktop computing stakeholder brings important expectations that any new solution must address:

- Today's CIOs need to maintain IT as a competitive advantage while controlling costs and help ensure high employee productivity
- IT server and desktop managers need to help ensure the control, manageability, and security of IT resources and data as well as of client computing devices that access mission-critical data and applications
- Most important, end users need to be able to do their jobs well anywhere, any time they choose, using the applications and services they need on the devices they prefer

End users are often the most challenging group and ultimately determine the success or failure of any deployment. Users span multiple organizations and perform many types of tasks, and they have a variety of requirements:

- Local rich media services such as video, collaboration, and interactivity, while maintaining LAN performance at the branch office and when mobile
- Anywhere connectivity across multiple device types, both online and offline
- Application and security experience aligned with their current experience and expectations

The selected architecture and vendors must meet needs of the relevant stakeholders while responding to critical business and technology factors and addressing traditional obstacles associated with VDI adoption.

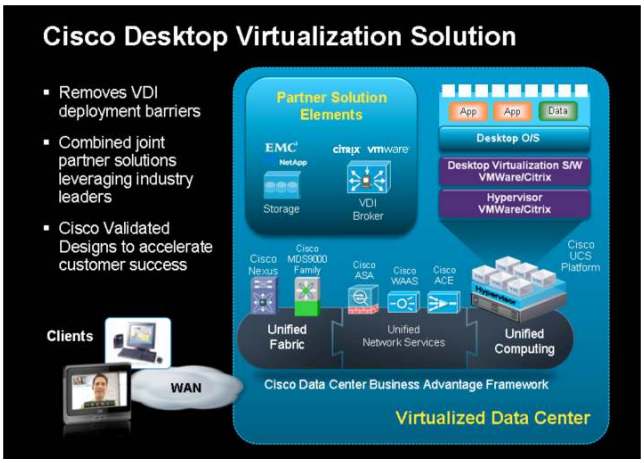
Cisco's Solution for VDI

To position clients for immediate return on Investment (ROI) and long-term growth, Cisco evolved its data center vision and developed the Cisco Data Center Business Advantage framework to help address the changing economic environment, meet emerging IT challenges, and deliver compelling business value.

Cisco's VDI Solution is a proof point of the Cisco Data Center Business Advantage framework, combining best-in-class Cisco and partner products that together offer exceptional VDI security, control, scalability, and manageability and reduce TCO while preserving a near-native end-user computing experience. It helps increase employee productivity, eliminating perceived compromises, and offers the enterprise a dynamic and cohesively managed system, with all elements - computing, network, storage, and desktop - optimized. This solution is built on an open platform that supports the emerging and heterogeneous mix of client computing options preferred by end users across the enterprise.

Cisco's VDI solution is the first in the industry to bind together the three critical elements of an end-to-end deployment - the end user, the network, and the data center - and the four main factors in the movement toward VDI - control and security, rapid deployment and scalability, the user experience, and control of TCO. It draws on Cisco's architectural advantage to provide a solution that supports the diversity of endpoint devices, extends pervasive security and policy management to each virtual desktop, uses a new and innovative virtualization-optimized stateless server computing model, and uses the power of the WAN infrastructure to deliver rich media applications without compromise. These Cisco, partner, and services components combine to deliver the Cisco solution for VDI (Figure 3).

Figure 3. Cisco Desktop Virtualization Solution



Base Cisco and Partner Components

- Computing platform: Cisco UCS B-Series Blade Servers
- Fabric interconnect: Cisco UCS 6120XP 20-Port Fabric Interconnect
- Hypervisor: VMware vSphere 4 or Citrix XenServer
- VDI connection broker: Citrix XenDesktop or VMware View 4.5

Additional Differentiated Solution Components

- Computing platform: Cisco UCS C-Series Rack-Mount Servers
- Cisco Unified Fabric: Cisco Nexus 7000, 5000 Series Switches and Nexus 2000 Series Fabric Extenders
- Storage: NetApp or EMC
- Virtual machine-aware networking and security: Cisco Nexus 1000V Series Switches, Cisco VN-Link technology, and Cisco Virtual Firewall
- Network security: Cisco ASA Adaptive Security Appliances
- WAN optimization: Cisco Wide Area Application Services (WAAS) and Virtual WAAS (vWAAS)
- Server load balancing: Cisco Application Control Engine (ACE)
- SAN: Cisco MDS 9500 Series Multilayer Directors

Cisco Services

- VDI Strategy Service
- VDI Planning and Design Service

Cisco's VDI Solution Benefits

Outstanding Control and Security for Virtual Desktops

Controlling and securing traditional desktop and laptop computers dispersed throughout the organization is difficult. Cisco's VDI solution gives IT outstanding control of desktop and laptop environments, securing the entire infrastructure, including computing, network, and data resources. This results in reduced user downtime, increased employee productivity, decreased likelihood of loss of corporate data located on a desktop or laptop computer, and better compliance with industry or government regulations.

- **Business-critical data stays in data center:** Cisco's VDI solution centralizes the location, management, and protection of desktop user data on centrally managed networked storage rather than on end-user device local hard disks. The Cisco VDI solution provides an open platform to use the network-attached storage (NAS) or

SAN storage of choice and allows use of tiered storage to meet the needs of different groups or desktop service profiles.

  - Cisco Unified Computing System™ stateless architecture allow desktops to be deployed with access to centrally managed standardized desktop images and access to personalized data stored on networked storage.
  - Cisco Unified Fabric provides optimized access to either NAS or SAN networked storage over a range of protocols including Ethernet, Fibre Channel, and Fibre Channel over Ethernet (FCoE).

- **Enhanced data backup and recovery:** Cisco's VDI solution provides an infrastructure to support exceptional levels of business continuance, backup, and recovery of user desktops and data through centralized management of virtual desktops and data.
  - Integration between the Cisco Unified Computing System and the hypervisor management layer allows the migration and rapid recomposition of virtual desktops affected by hardware or software disruptions.
- **No more compromised security for mobility and agility:** Cisco's VDI solution enables users to access their personal desktop from any location, at any time, transparently supporting and extending corporate security policies globally.
  - Cisco Unified Network Services, including Cisco Virtual Firewall and Cisco vWAAS, in combination with the Cisco Nexus 1000V Series and VN-Link and the integration between Cisco Unified Computing System and the hypervisor, enable virtual machine-level assignment and management of policy, security, network, and application- and network-optimization profiles. The desktop virtual machine's profile moves with the desktop when the virtual machine moves from one physical host to another, helping ensure continuous protection of the desktop, its data, and its applications. This behavior allows dynamic creation and simplified continued administration of virtual workgroups that require isolation from other workgroups, and secure access to back-end enterprise applications and resources (human resources, finance, engineering, etc.).
  - Cisco ASA provides an industry-leading, award-winning security and VPN solution for VDI that supports partner solutions that require an external VPN solution to supplement existing VDI security servers. Designed as a critical component of the Cisco Secure Borderless Network, Cisco ASA provides a proactive threat defense that stops attacks before they spread through the network, controls network activity and application traffic, and delivers flexible VPN connectivity.
  - Cisco ACE can provide server load balancing for VDI security servers and use server-load-balancing (SLB) policy to monitor the health of security servers, passing SSL connections to the most appropriate security server on the basis of the SLB policy. Additionally, Cisco ACE can provide SSL offload between the client and Cisco ACE, with SSL reestablishment from the Cisco ACE to the security server (through HTTPS), thereby lessening the SSL load on the security server. Cisco ACE can also provide SSL termination, with Cisco ACE communicating with the security server over HTTP, allowing resource-intensive SSL operations to be offloaded to the Cisco ACE, providing hardware-based SSL offload.
- **Virtual network visibility and control equivalent to physical visibility and control:** If the network cannot be seen, it cannot be secured and protected. Cisco VN-Link technology provides exceptional visibility into the virtual network within a system all the way to the virtual machine and virtual desktop. This visibility enables security and control policy to be defined just once for the entire physical and virtual network.
- **Compliance with corporate, industry, and governmental regulations:** The Cisco Unified Computing System and the VDI broker enable the use of templates to speed desktop provisioning and help ensure consistent deployment in compliance with regulations. Centralization of desktop data helps enable consistent data management across the enterprise, protecting the data to meet industry and government regulations.

Rapid Deployment and Scaling of Desktops and Supporting Infrastructure

Purchasing, provisioning, and deploying traditional desktops can take weeks. With Cisco's solution for VDI, new virtual desktops can be deployed to new employees or contractors in seconds.

- **Keep up with business changes:** Whether you are keeping up with the changing user environment resulting from growth, mergers, and acquisitions, migrating to Microsoft Windows 7, or simply trying to mitigate outages to meet service levels, Cisco's VDI solution is easy to provision, deploy, manage, troubleshoot, and update. With a centralized integrated single pane for management, secure desktops can be deployed in seconds rather than days or months.
  - Cisco UCS Manager and Cisco UCS service profiles help move new server resources from the loading dock into production, or repurpose existing server resources, in minutes, rather than in the hours, days, or weeks required to provision traditional servers. This speed becomes an asset as IT needs to move users to virtual desktops as groups are ready or companies are acquired.
  - Cisco Unified Computing and Extended Memory Technology give IT departments more headroom and flexibility to host the number of desktops per server that best suits the needs of the user experience and performance.
- **Integrated management of virtual and physical infrastructure:** This integration speeds policy-based deployment and support of virtual desktops and the underlying hardware infrastructure, resulting in simplified desktop management and fewer service calls. Management integration between the VDI broker and Cisco Unified Computing System improves control and security of user data, simplifying desktop management and significantly reducing the number of service calls.
- **Delivery of personalized desktops at any time, anywhere, and online or offline as a managed service or internal cloud:** Perform provisioning and ongoing management of all desktops centrally, enabling access globally and at any time.

Improved User Experience

Give users an improved overall working experience by freeing users from constraints that result from being tied to a specific device, while helping ensure application responsiveness and performance at a level equal to or higher than traditional desktop models. Cisco's VDI solution allows users to access their desktops from a range of endpoints, letting them choose the endpoints that best meet their needs and allowing them to work productively from anywhere there is a thin client and connectivity.

Cisco's VDI solution also provides users with high desktop and application responsiveness through the application of virtual desktop service profiles (including computing, memory, and I/O configurations) customized to changing user application demands (for example, the demands of a knowledge worker, task worker, call center worker, etc.). In addition, service levels can be optimized through application-optimization services for remote users, quality-of-service (QoS) definitions on a per-desktop virtual machine basis, and improved security and recovery practices.

- **Better, more consistent responsiveness:** Centralized desktop computing must be responsive to users if it is to be accepted. Cisco's VDI solution incorporates several architectural elements that help ensure a high level of application responsiveness in large-scale VDI implementations.
  - The use of the Cisco Unified Computing with Cisco Extended Memory Technology and Cisco UCS Manager customized user service profiles increases Cisco VDI responsiveness by giving each desktop virtual machine sufficient memory to respond to user needs and increasing responsiveness after idle periods. The user experience is provided consistently and independent of the user endpoint device in use.

- VDI performance bottlenecks are often attributed to storage I/O-operations-per-second (IOPS) performance. Cisco Unified Fabric architecture provides a lossless 10 Gigabit Ethernet ultra-low-latency Ethernet fabric that converges LAN and multiprotocol storage traffic, helping ensure the highest levels of storage array throughput and IOPS to support primary and replicated user desktops, applications, and data.

- **Performance aligned with user requirements:** Cisco's VDI solution provides an outstanding user experience with rich media, delivered using a WAN optimization solution.
  - Cisco WAAS provides a comprehensive WAN optimization solution that accelerates virtual desktop protocols, including Independent Computing Architecture (ICA) and Remote Desktop Protocol (RDP), as well as application delivery to branch offices and mobile users, while lowering IT cost and providing an outstanding user experience. Cisco WAAS enables branch-office infrastructure consolidation and reduces bandwidth demand for desktop, application, and rich multimedia delivery while maintaining user productivity and scaling the number of branch-office users.
  - Cisco WAAS Mobile provides a flexible WAN optimization solution software component (purpose-built for Microsoft Windows) for telecommuters, mobile users, and branch- and home-office users who access corporate networks and need accelerated application performance and reduced bandwidth demand for virtual desktop, application, and rich-media delivery.
- **Print services support:** Cisco's VDI solution supports a variety of print strategies, including centralized remote network print servers, standalone branch-office printer servers, and USB-attached printers.
  - Centralized print performance can be dramatically improved and WAN data reduced by using print-specific Cisco WAAS optimization.
  - Branch-office Cisco WAAS Appliances provide print servers locally to branch-office users by running Microsoft Windows print services.
  - In combination with USB redirection, Cisco WAAS offers optimization of the printing traffic redirected to locally attached peripherals (such as USB-connected printers) at the branch-office client device by reducing bandwidth utilization and WAN latency.

Gain Control of Desktop TCO

Control of the long-term costs associated with physical desktop environments. Centralizing desktops simplifies management of the desktop environment, enabling uniform business policy and best practices to be easily applied consistently across the environment. Cisco's VDI solution, with its radically simplified architecture and integrated management, enables just-in-time provisioning of desktops for even greater reduction in TCO.

- **Reduced costs of moving to a centralized desktop solution:** The radically simplified architecture of Cisco's VDI solution, using Cisco Unified Fabric, reduces the number of network adapters (network interface cards [NICs] and host bus adapters [HBAs]) and devices that need to be purchased to power, cool, configure, manage, and secure the system compared to other centralized and decentralized desktop deployments.
- **Centralized desktop operations for greater efficiency:** Moving from a decentralized to a centralized desktop environment increases operational efficiencies, control, compliance, and security. Cisco's VDI solution streamlines desktop operations with integrated management and service profiles that accelerate the turn-up and provisioning of new hosts when scaling virtual desktops.
- **Improved resource utilization:** Utilization levels for desktop and laptop computers typically are less than 5 percent, yet these computers are powered and cooled all the time, every day. Cisco's VDI solution enables greater consolidation ratios for increased utilization of business assets and reduced capital costs and power and cooling expenses. The Cisco Unified Computing System builds on this capability with Cisco Extended

Memory Technology and hardware-accelerated, virtualization-aware networking to deliver the industry's highest ratio of consolidated virtual desktops on a single server.

- **Optimized data center and WAN infrastructure:** Cisco WAAS supports high numbers of concurrent virtual desktop users over a WAN link. Cisco WAAS enables network administrators to optimize the amount of bandwidth consumed by VDI traffic and thereby more effectively manage WAN costs through a suite of Cisco WAAS technologies:
  - Optimization of display protocol traffic, including ICA and RDP, by reducing latency and bandwidth, as well as optimization for multimedia redirection (MMR) and USB redirection for further reduction in the bandwidth required for rich media and use of USB peripherals (video on demand [VoD], printing, etc.)
  - Advanced compression using data redundancy elimination (DRE) and Lempel-Ziv (LZ) compression, greatly reducing or eliminating redundant packets that traverse the WAN, thereby conserving WAN bandwidth and reducing associated costs while improving application transaction performance and significantly reducing the amount of time needed for repeated bulk transfers of the same application
  - Transport file optimization (TFO), improving throughput and reliability for clients and servers in WAN environments to help ensure that maximum throughput is sustained in the event of packet loss
  - Application-specific accelerators (CIFS, NFS, HTTP, SSL, MAPI, and Video-RTSP); Cisco WAAS enhances the performance and accelerates the operation of a broad range of these chatty application protocols, thus improving the overall user experience of all these application protocols over the WAN

Cisco Services for VDI

VDI services from Cisco and our partners help customers achieve the full business value of IT investments faster. Backed by proven expertise in networking, computing, storage, and application services, an architectural approach, and a broad ecosystem of partners, Cisco Services enable customers to design and build a highly secure, scalable VDI.

- **Cisco's VDI Strategy Service** helps customers understand the financial consequences and business benefits of migration to a virtual desktop architecture so they can make informed technology investments. This service also provides the expertise to help customers assess the operational readiness of a VDI solution that fits their IT strategy.
- **The Cisco's VDI Planning and Design Service** builds on the Cisco VDI Strategy Service by using the architecture and operational outputs to develop a detailed plan of action for implementing the VDI solution. Main deliverables include a high-level design, preproduction pilot plan, low-level design, and other components to validate the solution and help ensure a successful transition to a production implementation.
- Through a single toll-free number for technical support, customers have access to a virtual team of cross-trained experts in technologies spanning the virtual experience infrastructure, including security, storage, computing, application performance, and networking. By using collaboration tools for case management, providing global always-available access to technical support resources, and a single point of accountability, Cisco delivers rapid issue resolution and escalation.

Cisco Validated Designs for VDI

Cisco Validated Designs consist of systems and solutions that are designed, tested, and documented to facilitate and improve customer deployments. These designs incorporate a wide range of technologies and products into a portfolio of solutions that have been developed together with our partners to address the business needs of our customers. You can review the Cisco Validated Design for Cisco Desktop Virtualization with Citrix XenDesktop by clicking here or visiting: http://www.cisco.com/en/US/solutions/ns340/ns414/ns742/ns743/ns993/dVirt_deskVirt.html.

Cisco's VDI Ecosystem Solutions and Partnerships

Cisco Desktop Virtualization Solution with Citrix XenDesktop

Cisco has transformed data center architecture with next-generation IT infrastructure that unites computing, networking, virtualization, and storage access resources into a single cohesive system with integrated, embedded management. Citrix offers a desktop virtualization solution that delivers applications and desktops as on-demand services to any user, on any device, anywhere, and at any time. With a high-definition user experience, the combined solution addresses needs ranging from those of call-center operators to those of knowledge workers, supporting the distributed nature of today's businesses while enabling the mobile, global workforce.

The Cisco Desktop Virtualization Solution with Citrix XenDesktop delivers desktops and applications as an on-demand service to users anywhere, at any time, and on their choice of devices. The solution supports a new balance between IT and users. It empowers users with mobility, flexibility, and productivity on a global scale. It gives IT departments the tools they need to better meet the changing demands of today's business concerns, including rapid response to events ranging from mergers and acquisitions to the opening of a new branch office.

The solution incorporates the most flexible, cost-effective and scalable platform for hosting virtual desktops. Built from the ground up to support virtualization. The solution transforms data center operations by simplifying server and workload management, making IT staff more productive. The Cisco Desktop Virtualization Solution with Citrix XenDesktop protects IT investments by expanding and adapting to business needs through incorporation of new technologies without major equipment upgrades.

The solution delivers an uncompromised user experience through Citrix HDX technology and can be customized on a per-user basis. The solution extends its reach propelled by Cisco's leadership in enterprise networking and computing. The Cisco Unified Computing System is powered by Intel Xeon processors that increase performance with data center-class reliability and availability.

Cisco and Citrix together deliver a virtual desktop solution that can transform business operations while increasing the productivity of any organization's greatest asset: its people.

Please see the Citrix Desktop Virtualization Partner page on Cisco.com for more information please visit http://www.cisco.com/go/citrix.

VDI on Virtual Computing Environment Coalition Vblock™ Infrastructure Packages

The Virtual Computing Environment (VCE) coalition, a collaboration of Cisco, EMC, and VMware, offers organizations of all sizes an accelerated approach to data center transformation with dramatic efficiencies that promise significant reductions in both capital and operating expenses. As a result, organizations will no longer have to choose between best-in-class technologies and end-to-end vendor accountability. The VCE coalition has four main elements: Vblock™ Infrastructure Packages; integrated presales, professional services, and support; Acadia joint venture and investment; and the Vblock Partner Ecosystem. You can use these initiatives to accelerate your journey to the private cloud.

Vblock Infrastructure Packages deliver pre-integrated, validated infrastructure to support your business. Vblock 1 simplifies and accelerates time to production, significantly reducing costs and enabling you to support your business initiatives and generate revenue. There are several versions of Vblock Infrastructure Packages varying in capacity, computing power, and throughput.

By using a Vblock solution for your VMware View infrastructure, you can rapidly deploy resources using templates, reducing operating expenses while helping ensure that internal policies for allocation are followed. Using template-based virtualization to allocate and provision resources, an enterprise can reduce performance bottlenecks and configuration errors through automation. Each virtual machine is equipped to run a workload that simulates typical user behavior, using an application set commonly found on desktop environments such Microsoft Outlook, Word,

Excel, and PowerPoint and Adobe Acrobat Reader. Three core technologies are used to perform template-based provisioning and configuration:

- VMware View, to provision, manage, and monitor users and desktops
- VMware vSphere 4, to enable multiple virtual servers to be deployed to handle increased computing demands while existing server templates are in use
- Cisco Unified Computing System, to enable administrators to scale out computational power while limiting the effects on the network infrastructure

Conclusion and Recommended Next Steps

Cisco and its solution partners offer a combined, fully integrated VDI solution that is differentiated from today's traditional VDI solutions in the following ways:

- The Cisco Unified Computing System, stateless computing architecture, and service profiles-based operational model enable rapid deployment and scaling for virtual desktops.
- Cisco's VDI solution delivers exceptional control and security for centralized desktops, helping ensure that network and security policy is maintained at the virtual machine level, regardless of the physical host on which it resides.
- Cisco's VDI solution offers an outstanding user computing experience using Cisco Extended Memory Technology, helping ensure that each desktop virtual machine has sufficient memory to respond to user needs. Also, Cisco WAAS optimizes display protocols, helping ensure a high-quality rich media application experience for the user.
- Cisco's VDI solution also helps IT regain control of desktop TCO with a simplified architecture and integrated management. Improved resource utilization enabled by the Cisco Extended Memory Technology and stateless computing model enable each server blade to deliver a high number of virtual desktops, dramatically reducing TCO.

Desktop Virtualization project leaders should consider the following approach in undertaking the implementation of a hosted virtual desktop solution:

- Define the end-state user experience strategy. What will the service delivery strategy look like in 5 years? Be sure to engage line-of-business, IT, and communications teams from the start.
- Identify the main immediate business and IT priorities, which can include user flexibility, data security, cost savings, IT efficiency, availability, etc.
- Develop a holistic VDI roadmap, engaging application, data center, network, and security stakeholders. Make sure that your roadmap supports data center short- and long-term goals and initiatives.
- Engage your Cisco team and partners, who can accelerate your success through advanced services that cover all phases of the initiative: plan, design, deploy, implement, operate, and optimize.

For More Information

For more information about Cisco's solution for VDI, please visit http://www.cisco.com/go/vdi.

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