White Paper

Be Cloud Ready: Architectural Integration for VSPEX Private Cloud for Microsoft Windows Server with Hyper-V

What You Will Learn

VSPEX™ Private Cloud for Microsoft Windows Server with Hyper-V is a simple, efficient, and flexible private cloud solution, validated by Microsoft's Fast Track Private Cloud program, that accelerates your IT transformation. Find out how VSPEX for Microsoft environments can help your organization deploy a private cloud that supports a broad range of shared storage workloads. VSPEX for Microsoft environments combines Cisco® and EMC industry-leading technologies at the storage and networking layers to create a modular design that works for you, including reference architectures.

Introduction

Organizations require a scalable, tiered, and highly available infrastructure on which to deploy business and mission-critical applications. A Microsoft private cloud enables on-demand delivery of applications as standardized IT services and can offer a new kind of agility, focus, and cost savings. Usually, your choice is between implementing a prepackaged solution or attempting to build a private cloud from the foundation. Accelerate your IT transformation to the Microsoft private cloud by using VSPEX Private Cloud for Microsoft Windows Server with Hyper-V. Designed and validated by industry leaders Cisco and EMC, this simple, efficient, and flexible private cloud solution can help organizations like yours:

- Dramatically reduce the complexity of IT infrastructure by using modular solution building blocks that can scale to your data center's needs
- Quickly deploy a Microsoft Windows-based private cloud solution
- Help ensure flexibility so that you can use existing infrastructure in the VSPEX solution rather than disrupting your IT environment
- Reduce the risk of deploying a private cloud

Infrastructure Considerations for Cloud Computing

Infrastructure is the critical foundation for customers evolving to IT-as-a-Service (ITaaS) and cloud models. The IaaS model delivers a standard set of services through self-service and automation from a shared pool of resources, instead of simply setting up parallel infrastructures. This model can be established through an easily managed and automated architecture delivered through the integration of Cisco Unified Fabric, Unified Computing, and Unified Management with EMC storage and management products. Companies are embarking on cloud computing and ITaaS to increase the speed of IT and achieve a lower cost of operations. By standardizing on a set of IT services available from a pool of shared resources, with self-service automated provisioning, organizations can streamline their operations and spend more of their time and money on innovations within IT. Figure 1 presents the top requirements to consider before developing a private cloud.

Figure 1. Considerations for Cloud Computing Infrastructure

Cloud Requirements	Ideal Infrastructure
Low-Cost Operations	· Simplified Management · Lower Service Provisioning Cost
Infrastructure as a Service (IaaS)	· Intergrated Computing, Networking, and Storage Resources
Self-Service Consumption Model	· Physical Resources Deployed Through APIs and Policies
Elastic Resource Allocation	· Rapid Scaling of Virtual and Physical Resources · Automated Deployment
Shared Pools of Resources	· Virtualization Optimization · Resource Abstraction

VSPEX Architectural Integration

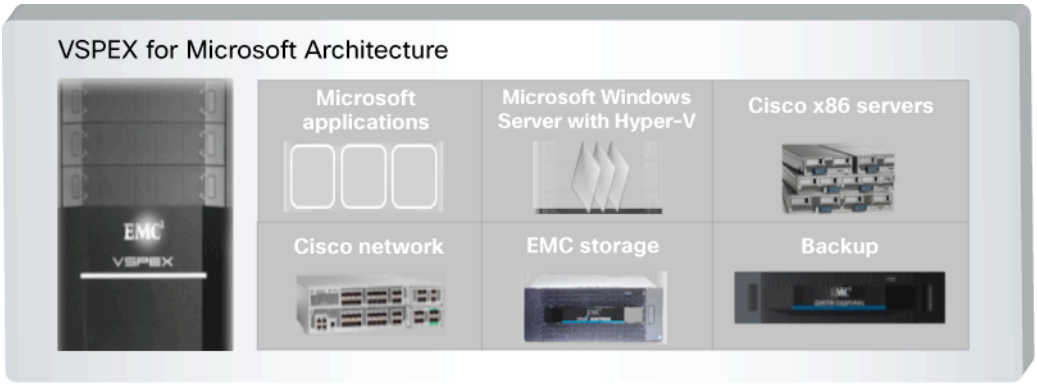
VSPEX reference architectures detail virtualization, server, network, and storage technology, providing a complete, integrated virtualization solution validated by Cisco and EMC and packaged and delivered by your trusted partner. This section describes the characteristics and components of this validated private cloud infrastructure.

Overview

VSPEX Private Cloud for Microsoft Windows Server with Hyper-V is designed to use your existing Microsoft Windows–based IT infrastructure in combination with EMC and Cisco industry-leading technologies at the storage, networking, and data protection layers to create a VSPEX architecture of your own design. VSPEX includes leading technologies from Cisco, EMC, and Microsoft (Figure 2):

- Cisco Unified Computing System™ (Cisco UCS®)
- Cisco Nexus® family of data center switches
- EMC VNX family of storage
- Microsoft Windows Server with Hyper-V and Microsoft System Center Virtual Machine Manager (SCVMM)

Figure 2. VSPEX Private Cloud for Microsoft Windows Server with Hyper-V



Application Availability

Cisco UCS is built from the foundation to support software stacks that run on bare-metal, virtualized, and cloud computing environments. The EMC VNX series provides digital video recorder (DVR)–like application snapshots for point-in-time recoverability. EMC VNX can run virtualized Microsoft SQL databases three times faster and helps you manage and tune virtualized Microsoft SQL Server databases in 80 percent less time.[1]

Reliability

VSPEX Private Cloud for Microsoft Windows Server with Hyper-V is built on industry-leading components, described here. Individually or together, these components support a high degree of availability for your critical business applications. All systems and fabric links offer redundancy, providing high availability across the entire system.

Data Center Solutions: Cisco UCS Server Family and Cisco Nexus Switches

Designed to provide a high level of availability throughout, Cisco data center solutions provide features such as redundant power distribution units, storage paths, networking, and disks.

Cisco UCS uses a 10 Gigabit Ethernet unified fabric as the underlying I/O transport mechanism. The Cisco UCS virtual interface card (VIC) is a standards-compliant converged network adapter (CNA) that enables traditional Ethernet and Fibre Channel traffic to share a common physical transport.

Integrated Network Strategy

An integrated network strategy at the core of Cisco UCS provides 10 Gigabit Ethernet connectivity to all components. Coupling this fabric with a stateless, policy-based server architecture allows vast simplification of the physical infrastructure typically deployed in a new server build-out.

Rather than including localized Ethernet and Fibre Channel switching in each chassis, all fabric aggregation is performed at a top-of-rack type of device called the fabric interconnect. Cisco UCS 6200 Series Fabric Interconnects are line-rate, low-latency, lossless 10 Gigabit Ethernet, Cisco Data Center Ethernet (DCE), and Fibre Channel over Ethernet (FCoE) interconnect switches that consolidate I/O at the system level. Based on the same switching technology as the Cisco Nexus 5000 Series Switches, the Cisco UCS 6200 Series Fabric Interconnects provide the additional features and management capabilities that make up the core of Cisco UCS.

Fabric Interconnects

The fabric interconnects supply a unified fabric that connects every server in the system through wire-once 10 Gigabit Ethernet and FCoE downlinks and flexible 10 Gigabit Ethernet and 1-, 2-, 4-, or 8-Gbps Fibre Channel uplinks. Out-of-band management, including switch redundancy, is supported through dedicated management and clustering ports. The interconnects provide front-to-back cooling, redundant front-plug fans and power supplies, and rear cabling, facilitating efficient cooling and serviceability. Typically deployed in active-active redundant pairs, the fabric interconnects provide uniform access to both networks and storage, eliminating the barriers to deployment of a fully virtualized environment based on a flexible, programmable pool of resources.

Scalability

The VSPEX Private Cloud for Microsoft Windows Server with Hyper-V solution is also modular. After you build a private cloud based on VSPEX, you can easily scale it when requirements change. You can scale it up for greater performance and capacity by adding more resources within a private cloud, without complicating management. When using the Cisco UCS servers, you can add up to 20 chassis with 8 blade servers per chassis (160 blades),

[1] VMX Series overview: http://www.emc.com/storage/vnx/vnx-series.htm

160 Cisco UCS C-Series Rack Servers, or any combination thereof, up to a total of 160 servers per system. If your environment requires it, you can also scale out by adding more VSPEX-based private clouds.

Components

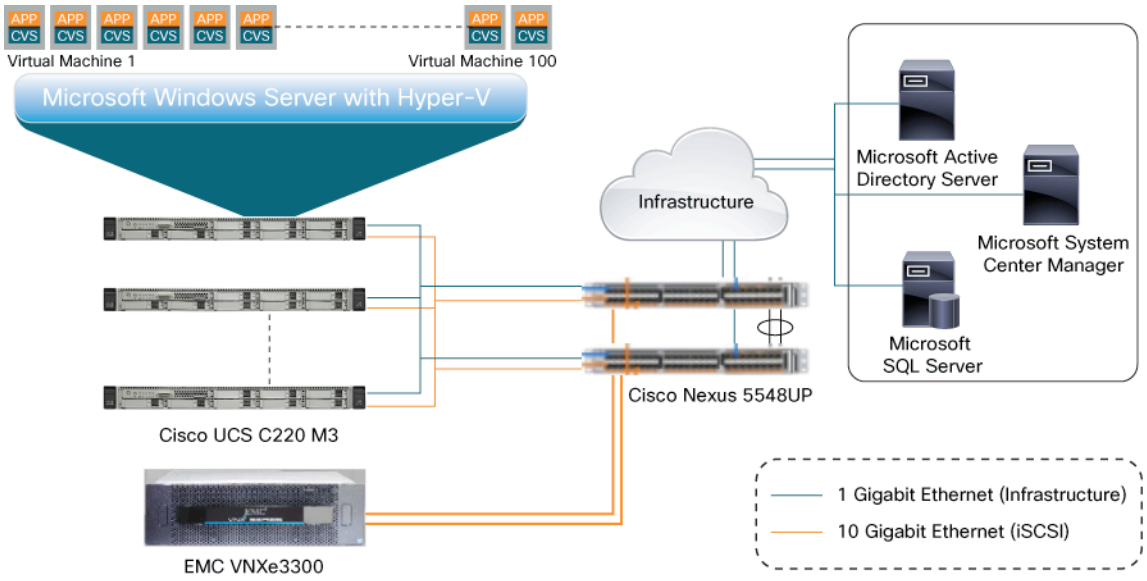
VSPEX Private Cloud for Microsoft Windows Server with Hyper-V combines Cisco and EMC industry-leading technologies at the storage and networking layers to create a modular design that works for you, including reference architectures. Table 1 summarizes the Cisco components for various designs.

Table 1. Primary Cisco Components in Sample VSPEX Reference Architectures

Solution	Networking	Computing
Server virtualization with 50 virtual machines	2 Cisco Nexus 3048 Switches	3 Cisco UCS C220 M3 Rack Servers
Server virtualization with 100 virtual machines	2 Cisco Nexus 5548UP Switches	4 Cisco UCS C220 M3 Rack Servers
Server virtualization with 125 virtual machines	2 Cisco Nexus 5548UP Switches	5 Cisco UCS C220 M3 Rack Servers
Server virtualization with 250 virtual machines	2 Cisco Nexus 5548UP Switches	10 Cisco UCS B200 M3 Blade Servers

Figure 3 provides a sample logical architecture to support up to 100 virtual machines.

Figure 3. Logical Architecture for Up to 100 Virtual Machines



Cisco UCS B-Series Blade Server and C-Series Rack Server and Cisco UCS

Cisco UCS is the first converged data center platform that combines industry-standard, x86-architecture servers with networking and storage access in a single system. The system is entirely programmable using unified, model-based management to simplify and accelerate deployment of enterprise-class applications and services running in bare-metal, virtualized, and cloud-computing environments.

The system's x86-architecture rack and blade servers are powered by Intel Xeon processors. These industry-standard servers deliver world-record performance to power mission-critical workloads. Cisco servers, combined with a simplified, converged architecture, increase IT productivity and provide superior price and performance, reducing total cost of ownership (TCO). Building on the strength of Cisco in enterprise networking, Cisco UCS is

integrated with a standards-based, high-bandwidth, low-latency, virtualization-aware unified fabric. The system is wired once to support the desired bandwidth and carries all Internet protocol, storage, interprocess communication, and virtual machine traffic with security isolation, visibility, and control equivalent to physical networks. The system meets the bandwidth demands of today's multicore processors; eliminates costly redundancy; and increases workload agility, reliability, and performance.

Cisco UCS is designed from the foundation to be programmable and self-integrating. A server's entire hardware stack—ranging from server firmware and settings to network profiles—is configured through model-based management. By using Cisco UCS VICs, even the number and type of I/O interfaces is programmed dynamically, making every server ready to power any workload at any time. With model-based management, administrators manipulate a model of a desired system configuration and associate a model's service profile with hardware resources, and then the system configures itself to match the model. This automation accelerates provisioning and workload migration with accurate and rapid scalability. The result is increased IT staff productivity, improved compliance, and reduced risk of failures caused by inconsistent configurations.

Cisco Nexus fabric extender technology reduces the number of system components that need to be purchased, configured, managed, and maintained by condensing three network layers into one. It eliminates both blade server and hypervisor-based switches by connecting fabric interconnect ports directly to individual blade servers and virtual machines. Administrators can then manage virtual networks in the same way they maintain physical networks and can take advantage of massive scalability. This approach represents a radical simplification compared to traditional systems, reducing capital and operating costs while increasing business agility, simplifying and accelerating deployment, and improving performance.

Cisco UCS helps organizations go beyond efficiency: It helps them become more effective through technologies that increase simplicity rather than complexity. The result is flexible, agile, high-performance, self-integrating information technology; reduced staff costs with increased uptime through automation; and more rapid return on investment (ROI).

Cisco Nexus 5548UP Switches

Cisco Nexus 5548UP Switches deliver innovative architectural flexibility, infrastructure simplicity, and business agility. With support for networking standards for virtualized, unified, and high-performance computing environments, the switches offer many IT and business advantages, including:

- Architectural flexibility
  - Takes advantage of unified ports that support traditional Ethernet, Fibre Channel, and FCoE
  - Synchronizes system clocks with accuracy to less than one microsecond, based on the IEEE 1588 standard
  - Offers converged fabric extensibility, based on the emerging standard IEEE 802.1BR, through the Cisco Fabric Extender Technology (FEX Technology) portfolio
- Infrastructure simplicity
  - Takes advantage of a common, high-density, high-performance, data center–class, fixed-form-factor platform
  - Consolidates LAN and storage
  - Supports any transport over an Ethernet-based fabric, including Layer 2 and 3 traffic

- Manages storage traffic, including Small Computer System Interface over IP (iSCSI), network-attached storage (NAS), and Fibre Channel
- Reduces management points with Cisco FEX Technology.

- Business agility
  - Converges diverse data center deployments on one platform
  - Provides rapid migration and transition for traditional and evolving technologies
  - Offers performance and scalability to meet growing business needs

EMC VNX Family of Storage Products

The EMC VNX family delivers industry-leading innovation and enterprise capabilities for file, block, and object storage in a scalable, easy-to-use solution. This next-generation storage platform combines powerful and flexible hardware with advanced efficiency, management, and protection software to meet the demanding needs of today's organizations.

These features are all available in a choice of systems ranging from affordable entry-level solutions to high-performance, petabyte-capacity configurations servicing the most demanding application requirements. The EMC VNX series is excellent for virtualized application environments, including Microsoft Hyper-V. The EMC VNX family also includes the EMC VNXe series, which provides a simple, application-based approach to management of shared storage that makes it well suited for IT managers and application administrators who may have limited storage expertise, with wizard-based provisioning for Microsoft Exchange, file shares, iSCSI volumes, and Microsoft Hyper-V.

Microsoft Private Cloud Solutions

Built on Microsoft Windows Server with Hyper-V technology and Microsoft System Center solutions, Microsoft private cloud offerings provide the powerful capabilities that you need to build a private cloud infrastructure that will transform the way that your organization delivers IT services.

Microsoft private cloud solutions dramatically change the way that enterprise customers produce and consume IT services by creating a layer of abstraction over pooled IT resources.

Microsoft Hyper-V, the hypervisor in Microsoft Windows Server 2008 R2 and Windows Server 2012, provides a scalable, reliable, and high-availability platform. Features in Microsoft Windows Server increase availability and performance, improve management, and simplify deployment, including live migration.

By using Microsoft Hyper-V with Microsoft System Center, customers gain enterprise-class virtualization, end-to-end service management, and deep insight to keep applications up and running more reliably. Microsoft private cloud solutions enable application-level management and monitoring, providing deep application insights with the capability to automatically orchestrate resources, deliver applications as services, rapidly resolve problems, increase application uptime, and meet service-level agreements (SLAs). In addition, the solutions support Microsoft and third-party hypervisors, operating systems, and open source tools, enabling you to extend your existing infrastructure investments and skills.

Microsoft private cloud solutions offer superior economics by integrating a highly available and easy-to-manage multiserver platform with breakthrough efficiency and ubiquitous automation. They also provide dynamic, multitenant virtualization, storage, and networking infrastructure, providing outstanding flexibility for delivering and connecting to cloud services.

Best-Practices Guidance and Documentation

Cisco and EMC engineers have collaborated to deliver the following documentation to help you launch your project:

- Reference architectures
- End-to-end deployment guides
- Cisco Validated Designs: technical guidebooks that can significantly ease the deployment of VSPEX solutions with Cisco UCS and Cisco Nexus products
- Sizing guide, providing information about how to size a solution, including sample configurations

At the end of this document, you will find links to VSPEX Private Cloud for Microsoft Windows Server with Hyper-V documentation.

Private Cloud Management

Private clouds require a level of automation and self-service that goes beyond the requirements for traditional virtualized environments. Management capabilities built into VSPEX Private Cloud for Microsoft Windows Server with Hyper-V make it easy to manage your private cloud with Cisco UCS Manager. EMC Storage Integrator (an agentless Microsoft Management Console [MMC] snap-in), and Microsoft SCVMM.

The implementation of a stateless computing model is a unique feature of the Cisco UCS architecture. By building a single point of management for all system components across up to 160 server blades, Cisco has created a single-pane view for the entire computing infrastructure.

Accelerate the Journey to Your Microsoft Private Cloud

Microsoft private cloud technology can offer your organization the benefits of cloud computing—on-demand scalability, flexibility, and economics—plus the promise of significant competitive advantages. Engineered with the small and medium-sized business in mind, VSPEX Private Cloud for Microsoft Windows Server with Hyper-V can help your organization simply, quickly, and reliably deploy a private cloud that supports a broad range of shared storage workloads.

Reduce IT Complexity

Integration with Microsoft Windows Server 2008 and Windows Server 2012 with Hyper-V means that VSPEX can help you create an infrastructure that is simple to manage. Together with Cisco's high-bandwidth, low-latency, virtualization-aware unified network fabric and EMC's robust, reliable, high-performance, common storage platform, VSPEX delivers industry-leading innovation and enterprise capabilities in a fully unified and scalable solution.

VSPEX setup wizards enable an IT generalist to provision Microsoft Hyper-V storage through a short series of mouse clicks, with recommended best practices applied automatically.

Enhance Efficiency and Flexibility

The move to cloud computing involves more than just building a private cloud: You want to use existing investments, infrastructure, and skill sets to build the right solutions for your business. Implementing a Microsoft private cloud turns a data center's infrastructure resources into a single ITaaS cloud, in which critical resources are pooled and abstracted into units that can enable you to dynamically provision and scale applications and resources. VSPEX Private Cloud for Microsoft Windows Server with Hyper-V offers the high performance of the

Cisco UCS converged data center platform and the EMC storage and data protection platforms to help you get the most benefit from the virtualized environment.

The Microsoft private cloud is designed from the bare metal up to enable process automation and configuration across platforms and environments, so you are not tied to one operating system, hypervisor, or set of development tools. Cisco and EMC developed VSPEX Private Cloud for Microsoft Windows Server with Hyper-V to support this flexibility of choice, so you get an IT infrastructure that is optimized for your specific requirements. In addition, VSPEX Private Cloud for Microsoft Windows Server with Hyper-V is modular, so you can expand your private cloud as your business grows.

Lower Risk

Complexity and risk typically accompany the process of designing, integrating, and deploying a best-in-class private cloud solution. Mitigate this risk by using VSPEX Private Cloud for Microsoft Windows Server with Hyper-V, which provides predictable performance to help eliminate the planning, sizing, and configuration burden of moving from a physical to a virtual server environment. Cisco and EMC engineers have collaborated to deliver reference architectures, deployment guides, and Cisco Validated Designs: technical guidebooks that can significantly ease the deployment of VSPEX solutions with Cisco UCS and Cisco Nexus products.

Why Cisco and EMC?

Cisco and its strategic alliances with Microsoft and EMC enable businesses to achieve the benefits of comprehensive solutions that draw on powerful technologies from industry leaders. VSPEX brings together the power of Cisco server and network infrastructure with leading EMC storage solutions and a Microsoft technology–based private cloud solution. With VSPEX, your business will be on its way to move to a private cloud quickly, cost effectively, and with little risk.

For More Information

Visit the following sites for more information about VSPEX and related solutions:

- VSPEX Private Cloud for Microsoft Windows Server with Hyper-V: http://www.cisco.com/go/vspex
- Other designs tested and validated by Cisco for Microsoft applications, such as Microsoft Exchange Server, SharePoint Server, and SQL Server: http://www.cisco.com/go/microsoft

Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV Amsterdam,
The Netherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at **www.cisco.com/go/offices.**

Printed in USA C11-717250-00 09/12