Cisco Virtualized Multiservice Data Center Reference Architecture: Building the Unified Data Center

What You Will Learn

The data center infrastructure is critical to the evolution of IT from a cost center to a business enabler. This transition helps IT become an active participant in the business, enabling profit centers by delivering the infrastructure and applications required rapidly and efficiently. Virtualization and cloud technologies have changed the way IT managers think about the data center. Applications no longer map to a single physical server (or set of servers) and storage device. Virtualization is the first step at leveraging pools of compute and storage resources to optimize the underlying infrastructure. Cloud delivers this infrastructure and these platforms as a service. This, in turn, helps IT itself to be delivered as a service.

The transition to IT as a service (ITaaS), in which IT services internal "customers," uses the same technology and design principles that can be applied to organizations wanting to monetize their service offerings. Service providers can use the same technology to deliver cloud or hosting services. Enterprises can take excess data center capacity and sell these services in a community cloud model.

The Cisco® Unified Data Center changes the economics of the data center by unifying computing, storage, networking, virtualization, and management resources into a single, fabric-based platform designed to increase operating efficiency, simplify operations, and provide business agility. Unlike other solutions, which add layers of complexity to achieve integration, the Cisco Unified Data Center is specifically designed for virtualization and automation, and enables on-demand provisioning from shared pools of infrastructure across physical and virtual environments in a simpler and more cost-effective approach. This approach allows IT to move from being a cost center to being a provider of IT services that create competitive advantage.

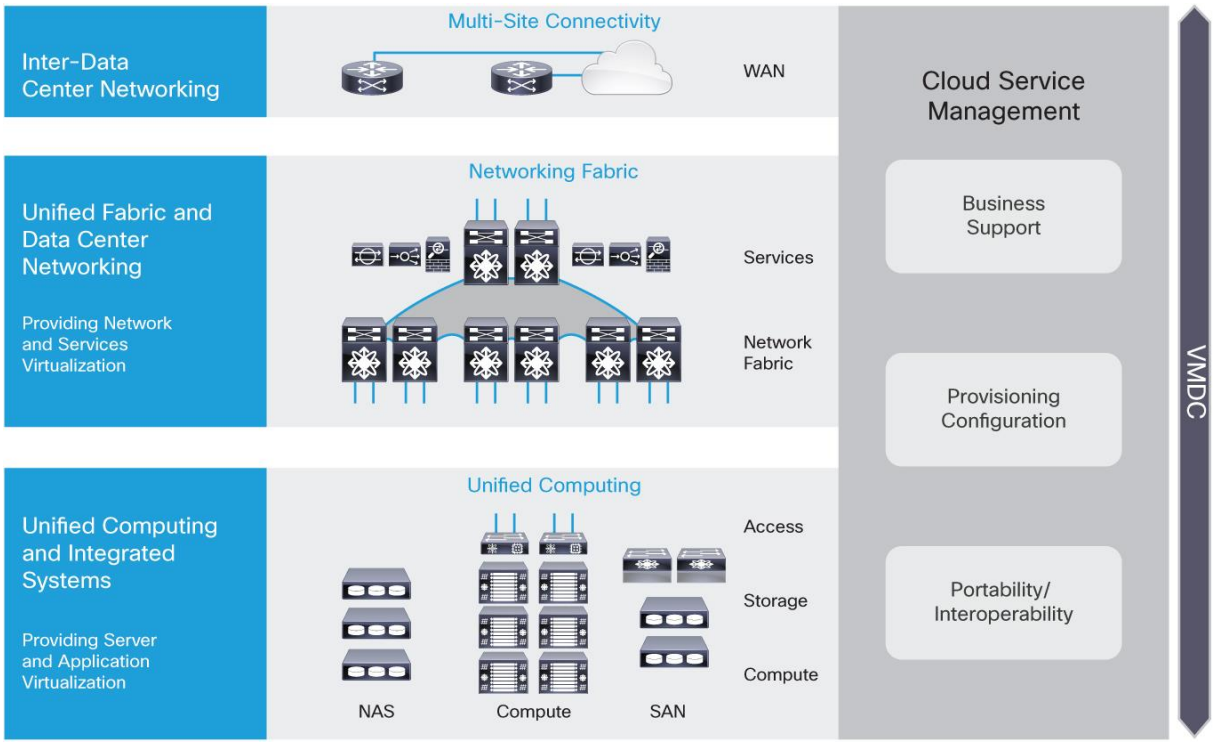
Cisco Virtualized Multiservice Data Center Reference Architecture

Many IT and services departments are challenged to take advantage of the technologies enabled by virtualization and cloud computing while still maintaining existing applications. They want to use new kinds of applications such as business analytics and "big data" applications, while making sure that these applications can be accessed through any device in any place throughout the world. With a vast array of new technology choices and an installed base of infrastructure, it is important to have a place to start: a reference architecture that provides a framework for using these technologies and capabilities.

The Cisco Virtual Multiservice Data Center (VMDC) reference architecture provides a framework for building fabric-based infrastructure using the Cisco Unified Data Center platform. Cisco VMDC provides design guidelines that demonstrate how customers can integrate Cisco and partner technologies such as networking, computing, integrated computing stacks, security, load balancing, and system management into a data center architecture that supports critical IT initiatives such as consolidation and virtualization, including desktop virtualization; application migration and rollout; public, private, and hybrid cloud deployments; business continuance and disaster recovery; and the build out of new data centers.

The Cisco VMDC architecture uses the Cisco Validated Design process to test and document solutions that bring together networking, computing, and storage resources and services (Figure 1).

Figure 1. Cisco Virtualized Multiservice Data Center Reference Architecture



This architecture delivers several benefits. The IT department can deploy Cisco technology at its own pace, using best practices and recommendations for deploying the Cisco Unified Data Center platform while continuing to use existing skill sets and investments. The architecture provides the flexibility to deploy physical and virtual applications on a common platform, while being ready to accommodate emerging applications and technology trends, such as big data, massively scalable data centers, and high-performance computing (HPC). One of the biggest challenges in deploying new technology or changing the IT model is risk. The Cisco VMDC architecture mitigates risk through extensive testing and validation of reference guidelines by Cisco. This validation results in accelerated value: IT can change the economics of the data center, achieving IT simplicity, financial efficiency, and business agility through rapid deployment of validated infrastructure.

Customers can use the Cisco VMDC reference architecture in two ways:

- As infrastructure solutions that help customers optimize infrastructure and add new capabilities
- As a fully validated system testing initiative that provides a prescriptive framework with test results

The Cisco VMDC reference architecture has proven value for enterprises, service providers, and public-sector organizations that are integrating networking, computing, storage, and management building blocks into a cohesive architecture.

Infrastructure Solutions

Whether IT is in the process of consolidating and virtualizing assets, standardizing infrastructure and operations, or automating service delivery, it faces a variety of technology challenges and choices. The infrastructure solutions enabled and validated by the Cisco VMDC architecture are designed to address these challenges, compare and contrast the choices and options available, and document the reference solution (with configuration examples). Using the information provided, data center practitioners will gain confidence in deploying these solutions and making appropriate customizations.

Table 1 documents these challenges and solutions.

Table 1. Infrastructure Challenges and Solutions

Solution	Challenge	Solutions
Fabric resilience	Design a highly available network that delivers deterministic and rapid failover, uses all available links and switches, and provides the foundation for physical and virtual workloads.	• Deploy active-active link topologies using Cisco FabricPath, virtual PortChannel (vPC) technology, and routing protocols. • Use top-of-rack and end-of-row switching technologies (Cisco Fabric Extender Technology [FEX Technology], Cisco Data Center Virtual Machine Fabric Extender [VM-FEX], and Cisco Nexus® Switches). • Configure load balancing, security, and services.
Fabric convergence	Understand how and when to converge network fabrics to simplify networking infrastructure while supporting multiprotocol storage.	• Support any SAN or network-attached storage (NAS) protocol on a single fabric. • Consider dual-fabric architectures and how to evolve to a unified fabric. • Use Fibre Channel over Ethernet (FCoE) best practices and employ fabric and network resilience.
Network virtualization	Understand how server virtualization and cloud characteristics change the network requirements.	• Connect and manage the virtual and physical using Cisco Nexus 1000V Series Switches and Cisco Data Center VM-FEX. • Use virtual security and management services.
Converged infrastructure	Standardize infrastructure to rapidly build and deploy applications	• Use the storage platform of choice (EMC, NetApp, HDS, etc.) in an integrated stack. • Build and integrate FlexPod, Vblock™ Infrastructure Packages, EMC VSPEX, and HDS.
Interconnection of multiple data centers	Scale the data center to multiple sites for business continuance, elasticity of resources, data protection, and recovery.	• Maintain continuity of the Layer 2 and 3 domains between sites with location independence. • Integrate with storage partner products for data mirroring, backup, and replication.
Secure separation	Help ensure separation of workloads and virtual machines to meet customer separation, security, compliance, and service-level requirements.	• Create virtual containers within the data center infrastructure. • Enable levels of security and separation based on the service being delivered (internal services compared to monetized services).
Orchestration and automation	Orchestrate and automate physical and virtual resources for cloud, business, and big data applications.	• Integrate the network services manager, intelligent automation, and baseboard management controller with the physical and virtual architecture. • Tune the orchestration or automation platform for resource automation and service catalog use.
Dynamic resource elasticity	Move resources within a private cloud environment to handle planned or unplanned spikes in capacity requirements.	• Use automation, orchestration, and Cisco UCS® Manager to rapidly allocate and reallocate computing resources.

Cloud Validation Infrastructure Lab

Many IT departments, particularly those at service providers or large enterprises, want prescriptive design and deployment information based on a reference design. To meet that requirement, Cisco has built an extensive cloud validation infrastructure consisting of several large-scale test beds that serve as the foundation for large-scale performance, availability, security, and manageability testing and validation programs. Using a robust engineering process, Cisco adds new products and features to the Cisco VMDC reference designs at regular intervals, using a streamlined testing and documentation process, helping ensure end-to-end quality based on real-world customer requirements. IT departments can use the well-documented results of these validation efforts as a reference for their own configurations or to plan, build, and deploy their data center infrastructure in conjunction with Cisco Advanced Services or other partner services engagements.

Table 2 lists the current available releases from the Cisco VMDC validated test bed.

Table 2. Cisco VMDC Validated Releases

Cisco VMDC Release	Description
1.0 and 1.1	• Introduces foundational architecture for deploying virtualized and multitenant data centers for cloud-based services • Supports high availability, elasticity, and resiliency of virtualized computing, networking, and storage services
2.0	• Enhances and expands Release 1.1 by adding infrastructure orchestration capability using BMC Cloud Lifecycle Management, enhanced network segmentation, and host security • Uses integrated computing stacks (ICS) as building blocks for the pod and validates two scale points: compact pod and large pod
2.1	• Provides general-purpose architecture for a multitenant virtualized data center used for private cloud • Includes these improvements: multicast support; simplified network design; jumbo frame support; improved convergence, performance, and scalability for private cloud; quality-of-service (QoS) best practices, and increased design flexibility with multitenant design options
2.2	• Builds on Releases 2.0 and 2.1, adding defense in-depth enhanced security, multimedia QoS support, and Layer 2 (Virtual Private LAN Service [VPLS])-based Cisco Data Center Interconnect (DCI)
3.0	• Introduces a Cisco VMDC design based on Cisco FabricPath for private cloud deployments, providing simple tenant containers suitable for enterprise deployment models, firewalls, and load-balancing services as well as high availability and security

Conclusion

Cisco has been a trusted advisor in helping customers rapidly and safely deploy new technologies in the network. As the data center becomes increasingly complex, the Cisco Virtualized Multiservice Data Center reference architecture can help IT departments evolve their infrastructure toward a cloud environment and take advantage of new technologies that can fundamentally shift the economics of the data center and bring innovation to the business.

For More Information

http://www.cisco.com/go/vmdc.

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 C22-714480-01 12/12