



Preface

This preface explains the objectives and intended audience of the Virtual Multi-tenant Data Center (VMDC) solution and outlines the organization of the Virtual Multi-tenant Data Center Design Guide.

Purpose

Infrastructure as a Service (IaaS) simplifies application development and implementation by virtualizing underlying hardware resources and operating systems. This allows IaaS users to significantly cut development and deployment times by cloning the environments best suited for an application without having to factor in the underlying hardware environment. Units of this infrastructure, including compute, storage, and networks, collectively form a cloud infrastructure.

This document describes a reference architecture that brings together core products and technologies from Cisco, NetApp, EMC, BMC, and VMware to deliver a comprehensive end-to-end cloud solution. Focused on IaaS cloud deployment, the Cisco VMDC solution provides customers with robust, scalable, and resilient options for cloud data center deployments.

This Cisco driven end-to-end architecture defines how to provision flexible, dynamic pools of virtualized resources that can be shared efficiently and securely among different tenants. Process automation greatly reduces resource provisioning and time to market (TTM) for IaaS-based services. Shared resource pools consist of virtualized Cisco unified compute and virtualized SAN and NAS storage platforms connected using Cisco data center switches and routers.

This solution addresses the following problems:

- **Inefficient Resource Utilization**—Traditionally, Enterprises design their data centers using dedicated resource silos. These silos include access switches, server racks, and storage pools assigned to specific applications and business units. This approach results in inefficient resource use, where resource pools are customized per application, resulting in fewer shared resources. This design cannot harness unused or idle resources, is complex to administer, and is difficult to scale, which results in longer deployment times. For the public cloud Service Provider, inefficient resource utilization translates to higher capital expense and operating expense and decreases revenue margins.

- **Security Guarantees**—In a multi-tenant environment, access to resources must be controlled to ensure isolation and security among users. This becomes more challenging when resources are shared. Tenants need to be assured that in new highly virtualized systems their data and applications are secure.
- **Resource Provisioning and TTM**—Facility consolidation coupled with increased deployment of virtualized servers results in larger, very dense data center systems. Manual provisioning often takes two to four weeks or longer. In many cases, this lengthy duration fails to meet business agility and time to market (TTM) requirements of Enterprises and Service Providers.
- **Complex and Expensive Administration**—Network, server, security, and application administrators must collaborate to bring up new resources for each new or expanding tenant. Collaboration based on manual methods no longer scales in these new highly virtualized systems, resulting in slow responses to business needs due to complex IT operations. It is complicated and time consuming to streamline manual configuration and resource provisioning tasks. It also increases capital and operating expenditures and overhead caused by resource churn.

As Enterprise IT departments evolve, they are looking for a data center solution that is efficiently shared, secured, and rapidly provisioned. Similarly, Service Providers are looking for solutions that enable them to reduce TTM for new revenue-generating services and reduce ongoing operating expense (OpEx). The VMDC infrastructure design provides a model for flexible sharing of common infrastructure, maintaining secure separation of tenant data and enabling per-tenant differentiated services. The VMDC Orchestration Design Section details how to rapidly provision these shared pools.

Audience

This document is intended for, but not limited to, system architects, network design engineers, systems engineers, field consultants, advanced services specialists, and customers who want to understand how to deploy a public or private cloud data center infrastructure.

This design guide assumes that the reader is familiar with the basic concepts of IP protocols, QoS, DiffServ and HA. This guide also assumes that the reader is aware of general system requirements and has knowledge of Enterprise or Service Provider network and Data Center architectures.

Obtaining Documents

Cisco documentation and additional literature are available on Cisco.com. This section explains the product documentation resources that Cisco offers.

Cisco.com

- For the most current Cisco documentation, go to <http://www.cisco.com/techsupport>
- To access the Cisco web site, go to <http://www.cisco.com>
- To access international Cisco web sites, go to
http://www.cisco.com/public/countries_languages.shtml

Product Documentation DVD

The Product Documentation DVD is a library of technical product documentation on a portable medium. The DVD enables you to access installation, configuration, and command guides for Cisco hardware and software products. With the DVD, you have access to the HTML documentation and some of the PDF files found on the Cisco web site at this URL: <http://www.cisco.com/univercd/home/home.htm>

The Product Documentation DVD is created and released regularly. DVDs are available singly or by subscription. Registered Cisco.com users can order a Product Documentation DVD (product number DOC-DOCDVD= or DOC-DOCDVD=SUB) from Cisco Marketplace at the Product Documentation Store at this URL: <http://www.cisco.com/go/marketplace/docstore>

Ordering Documentation

You must be a registered Cisco.com user to access Cisco Marketplace. Registered users may order Cisco documentation at the Product Documentation Store at this URL:
<http://www.cisco.com/go/marketplace/docstore>

If you do not have a user ID or password, you can register at this URL:
<http://tools.cisco.com/RPF/register/register.do>

Documentation Feedback

You can provide feedback about Cisco technical documentation on the Cisco Support site area by entering your comments in the feedback form available in every online document.

You can submit e-mail comments about technical documentation to bug-doc@cisco.com.

You can submit comments by using the response card (if present) behind the front cover of your document or by writing to the following address:

Cisco Systems
Attn: Customer Document Ordering
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments

Cisco Product Security Overview

Cisco provides a free online Security Vulnerability Policy portal at this URL:

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

From this site, you will find information about how to do the following:

- Report security vulnerabilities in Cisco products
- Obtain assistance with security incidents that involve Cisco products
- Register to receive security information from Cisco

A current list of security advisories, security notices, and security responses for Cisco products is available at this URL: <http://www.cisco.com/go/psirt>

To see security advisories, security notices, and security responses as they are updated in real time, you can subscribe to the Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed. Information about how to subscribe to the PSIRT RSS feed is found at this URL:

http://www.cisco.com/en/US/products/products_psirt_rss_feed.html

Cisco is committed to delivering secure products. We test our products internally before we release them, and we strive to correct all vulnerabilities quickly. If you think that you have identified a vulnerability in a Cisco product, contact PSIRT:

For **emergencies** only—security-alert@cisco.com

An emergency is either a condition in which a system is under active attack or a condition for which a severe and urgent security vulnerability should be reported. All other conditions are considered nonemergencies.

For **nonemergencies**—psirt@cisco.com

In an emergency, you can also reach PSIRT by telephone:

1 877 228-7302
1 408 525-6532



We encourage you to use Pretty Good Privacy (PGP) or a compatible product (for example, GnuPG) to encrypt any sensitive information that you send to Cisco. PSIRT can work with information that has been encrypted with PGP versions 2.x through 9.x.

Never use a revoked encryption key or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one linked in the Contact Summary section of the Security Vulnerability Policy page at this URL

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

The link on this page has the current PGP key ID in use.

If you do not have or use PGP, contact PSIRT to find other means of encrypting the data before sending any sensitive material.

Product Alerts and Field Notices

Modifications to or updates about Cisco products are announced in Cisco Product Alerts and Cisco Field Notices. You can receive these announcements by using the Product Alert Tool on Cisco.com. This tool enables you to create a profile and choose those products for which you want to receive information.

To access the Product Alert Tool, you must be a registered Cisco.com user. Registered users can access the tool at this URL:

<http://tools.cisco.com/Support/PAT/do/ViewMyProfiles.do?local=en>

To register as a Cisco.com user, go to this URL:

<http://tools.cisco.com/RPF/register/register.do>

Obtaining Technical Assistance

Cisco Technical Support provides 24-hour-a-day award-winning technical assistance. The Cisco Support web site on Cisco.com features extensive online support resources. In addition, if you have a valid Cisco service contract, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not have a valid Cisco service contract, contact your reseller.

Cisco Technical Support Website

The Cisco Technical Support Web site (<http://www.cisco.com/tac>) provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The Cisco Technical Support Web site is available 24 hours a day, 365 days a year.

Accessing all the tools on the Cisco Technical Support Web site requires a Cisco.com user ID and password. If you have a valid service contract but do not have a login ID or password, please register at this URL:

<http://tools.cisco.com/RPF/register/register.do>

To ensure that all cases are reported in a standard format, Cisco has established case priority definitions.

- **Priority 1 (P1)**—Your network is down or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.
- **Priority 2 (P2)**—Operation of an existing network is severely degraded, or significant aspects of your business operation are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.
- **Priority 3 (P3)**—Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.
- **Priority 4 (P4)**—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco engineer. The TAC Service Request Tool is located at this URL:

<http://www.cisco.com/techsupport/servicerequest>

For S1 or S2 service requests, or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

- Asia-Pacific: +61 2 8446 7411
- Australia: 1 800 805 227

- EMEA: +32 2 704 55 55
- USA: 1 800 553 2447

For a complete list of Cisco TAC contacts, go to this URL:

<http://www.cisco.com/techsupport/contacts>

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

- **Severity 1 (S1)**—An existing network is “down” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.
- **Severity 2 (S2)**—Operation of an existing network is severely degraded, or significant aspects of your business operations are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.
- **Severity 3 (S3)**—Operational performance of the network is impaired while most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.
- **Severity 4 (S4)**—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- The Cisco Online Subscription Center is the web site where you can sign up for a variety of Cisco e-mail newsletters and other communications. Create a profile and then select the subscriptions that you would like to receive. To visit the Cisco Online Subscription Center, go to:
<http://www.cisco.com/offer/subscribe>
- The Cisco Product Quick Reference Guide is a handy, compact reference tool that includes brief product overviews, key features, sample part numbers, and abbreviated technical specifications for many Cisco products that are sold through channel partners. It is updated twice a year and includes the latest Cisco channel product offerings. To order and find out more about the Cisco Product Quick Reference Guide, go to this URL:
<http://www.cisco.com/go/guide>
- Cisco Marketplace provides a variety of Cisco books, reference guides, documentation, and logo merchandise. Visit Cisco Marketplace, the company store at:
<http://www.cisco.com/go/marketplace/>
- Cisco Press publishes a wide range of general networking, training, and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:
<http://www.ciscopress.com>
- Internet Protocol Journal is a quarterly journal published by Cisco for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at:

<http://www.cisco.com/ij>

- Networking products offered by Cisco, as well as customer support services, can be obtained at:
<http://www.cisco.com/en/US/products/index.html>
- Networking Professionals Connection is an interactive web site where networking professionals share questions, suggestions, and information about networking products and technologies with Cisco experts and other networking professionals. Join a discussion at:
<http://www.cisco.com/discuss/networking>
- “What's New in Cisco Documentation” is an online publication that provides information about the latest documentation releases for Cisco products. Updated monthly, this online publication is organized by product category to direct you quickly to the documentation for your products. You can view the latest release of “What's New in Cisco Documentation” at:
<http://www.cisco.com/univercd/cc/td/doc/aboutnecd/136957.htm>
- World-class networking training is available from Cisco. You can view current offerings at:
<http://www.cisco.com/en/US/learning/index.html>

About Cisco Validated Designs

The Cisco Validated Design Program consists of systems and solutions designed, tested, and documented to facilitate faster, more reliable, and more predictable customer deployments. For more information visit <http://www.cisco.com/go/validateddesigns>.

