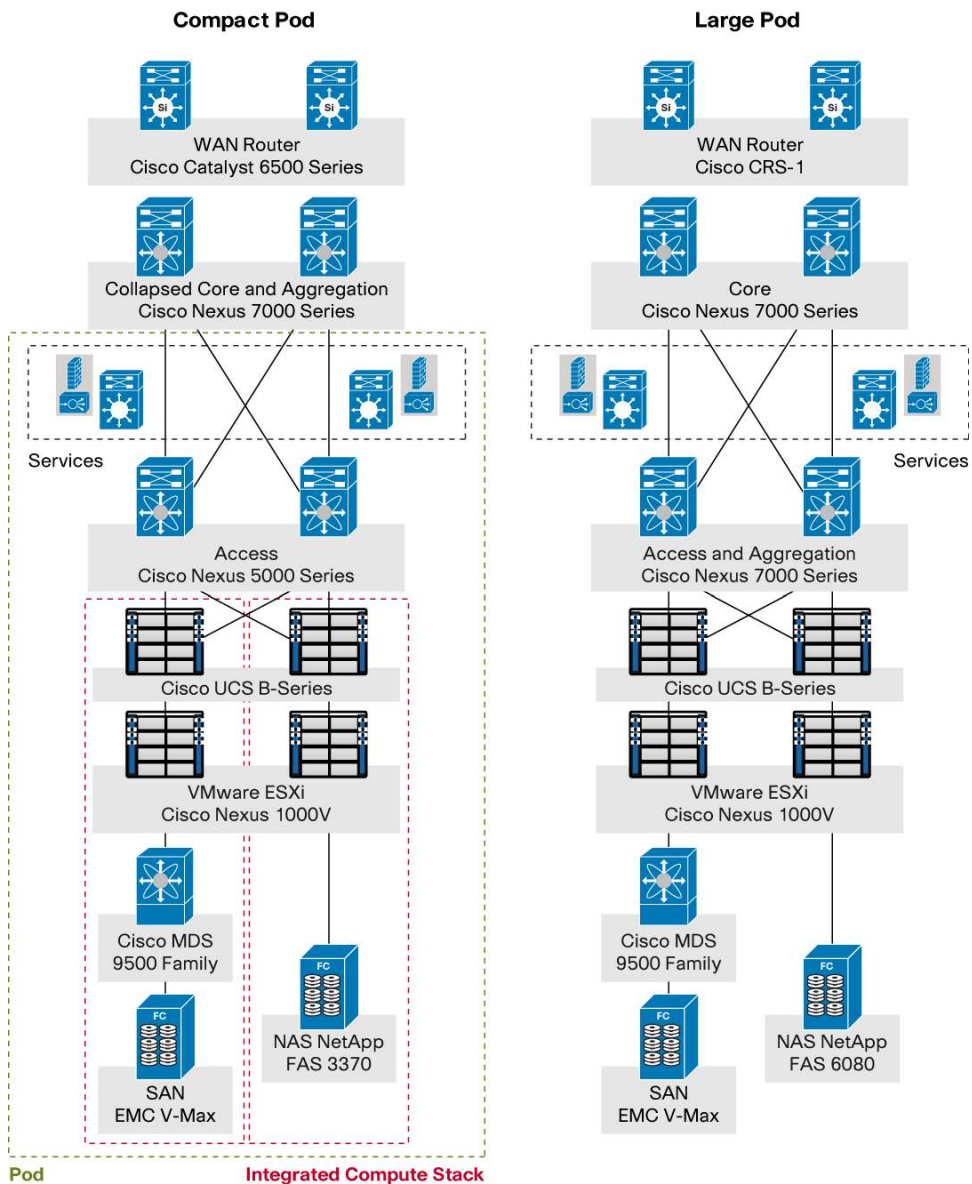


# Cisco Virtualized Multi-Tenant Data Center Solution 2.0

## Solution Overview

The Cisco® Virtualized Multi-Tenant Data Center (VMDC) 2.0 solution is designed for enterprises building cloud-capable infrastructure and service providers deploying an infrastructure-as-a-service (IaaS) model for the data center. It integrates various Cisco and third-party products that are part of the cloud computing ecosystem (Figure 1).

Figure 1. Solution Topology



## Customer Benefits

The Cisco VMDC architecture is a validated design of a virtualized multi-tenant infrastructure that confers several benefits:

- Predictable deployment time and cost: Use of a validated, scalable, modular architecture that incorporates Cisco's pod designs and integrated compute stacks
- Rapid tenant provisioning and management on a unified infrastructure: Use of a comprehensive automation framework with portal-based resource provisioning and management capabilities
- Efficient and flexible workload deployment: Use of shared resource pools and service catalogs

## Architecture Features

- Infrastructure
  - Use of two different integrated compute stacks: Vblock™ Infrastructure Packages, defined by the Virtual Computing Environment (VCE) coalition,<sup>1</sup> and a Cisco, NetApp, and VMware stack
  - Pod-based design (see Figure 1): Two baseline scale points (compact and large pods) validated
  - Workload mobility and disaster recovery capabilities: For business continuance
  - Security in each module of the architecture: Integrated compute stacks, pod, and data center interconnect
- Tenant scale and service tiers
  - End-to-end separation of tenants on top of unified infrastructure: Validated scaling of from 30 to 150 tenants
  - Service-tier-based design to allow differentiated services for tenants (see Table 1): Validation of a three-tier model
  - Support for scalable and flexible mix of typical enterprise workloads per tenant: Support for a range from a few hundred to multiple thousand virtual machines
- Tenant and workload management
  - Lifecycle management for tenants and workload using the BMC Cloud Lifecycle Management (CLM) product
  - Fully templated process to create, monitor, and delete tenants within the service-tier framework
  - Service catalog and portal capability for tenant-focused workload management

Table 1 lists the service tiers that were used to validate the multi-tenant service capability of the Cisco VMDC 2.0 solution. The chosen service tiers reflect a typical set of parameters used by customers to create a differentiated IT environment. Note that the three tiers are only an example to demonstrate the flexibility and scalability of the solution.

**Table 1.** Example Service Tiers

Service	Bronze	Silver	Gold
<b>Tenant-specific network services</b>	No additional services	Firewall services	Firewall and load-balancing services
<b>Segmentation</b>	One VLAN per client and a single virtual routing and forwarding (VRF) instance	Multiple VLANs per client and a single VRF instance	Multiple VLANs per client and a single VRF instance
<b>Data protection</b>	None	Snap: Virtual copy (local site)	Clone: Mirror copy (local site)
<b>Disaster recovery</b>	None	Remote replication (with specific recovery-point objective [RPO] or recovery-time objective [RTO])	Remote replication (any-point-in-time recovery)

<sup>1</sup> <http://www.cisco.com/en/US/partner/netsol/ns1027/index.html>

<b>Workload sizing (number of virtual machines per core)</b>	4:1, 2:1, or 1:1	4:1, 2:1, or 1:1	4:1, 2:1, or 1:1
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## Solution Components

Table 2 lists the components of the Cisco VMDC solution.

**Table 2.** Solution Components

Features	Compact Pod	Large Pod
<b>Network</b>	<ul style="list-style-type: none"> <li>• Cisco Nexus<sup>®</sup> 5020 Switch and 7000 10-Slot Switch</li> <li>• Cisco Catalyst<sup>®</sup> 6500 Series Switches and Catalyst 6509-E Switch (WAN edge)</li> <li>• Data center services node: Cisco Catalyst 6509-E Switch (with Virtual Switching System [VSS])</li> <li>• Cisco Nexus 2148T Fabric Extender</li> </ul>	<ul style="list-style-type: none"> <li>• Cisco Nexus 7000 10-Slot and 18-Slot Switches</li> <li>• Cisco Catalyst 6500 Series Switches and Cisco CRS-1 Modules (WAN edge)</li> <li>• Data center services node: Cisco Catalyst 6509-E Switch (with VSS)</li> </ul>
<b>Compute</b>	<ul style="list-style-type: none"> <li>• Cisco Unified Computing System™</li> <li>• Cisco UCS 5108 Blade Server Chassis</li> <li>• Cisco UCS B200 M1 Blade Server</li> <li>• Cisco UCS M71KR-E Emulex Converged Network Adapter (CNA)</li> <li>• Cisco UCS M81KR Virtual Interface Card (VIC)</li> <li>• Cisco UCS C200 M1 Rack-Mount Server</li> <li>• Cisco UCS 6120XP 20-Port Fabric Interconnect and Cisco UCS 6140XP 40-Port Fabric Interconnect</li> </ul>	<ul style="list-style-type: none"> <li>• Cisco Unified Computing System</li> <li>• Cisco UCS 5108 Blade Server Chassis</li> <li>• Cisco UCS B200 M1 Blade Server</li> <li>• Cisco UCS M71KR-E Emulex CNA</li> <li>• Cisco UCS M81KR VIC</li> <li>• Cisco UCS 6120XP 20-Port Fabric Interconnect and Cisco UCS 6140XP 40-Port Fabric Interconnect</li> </ul>
<b>Virtualization</b>	<ul style="list-style-type: none"> <li>• VMware vSphere</li> <li>• VMware ESXi 4.0U1 Hypervisor</li> <li>• Cisco Nexus 1000V Switch (virtual access switch)</li> </ul>	<ul style="list-style-type: none"> <li>• VMware vSphere</li> <li>• VMware ESXi 4.0U1 Hypervisor</li> <li>• Cisco Nexus 1000V Switch (virtual access switch)</li> </ul>
<b>Security</b>	<ul style="list-style-type: none"> <li>• Cisco Catalyst 6500 Series Firewall Services Module (FWSM) and Cisco Application Control Engine (ACE)</li> <li>• VMware vShield</li> <li>• NetApp vFiler and Virtual Service Domains</li> <li>• Cisco Nexus 1000V Switch</li> </ul>	<ul style="list-style-type: none"> <li>• Cisco Catalyst 6500 Series FWSM and Cisco ACE</li> <li>• VMware vShield</li> <li>• NetApp vFiler and Virtual Service Domains</li> <li>• Cisco Nexus 1000V Switch</li> </ul>
<b>Storage fabric and arrays</b>	<ul style="list-style-type: none"> <li>• Cisco MDS 9506 and MDS 9513 Multilayer Directors and Cisco MDS 9148 and 9134 Multilayer Fabric Switches</li> <li>• EMC Symmetrix V-Max with virtual provisioning</li> <li>• NetApp FAS3170 and NetApp FAS6080</li> </ul>	<ul style="list-style-type: none"> <li>• Cisco MDS 9506 and MDS 9513 Multilayer Directors</li> <li>• EMC Symmetrix V-Max with virtual provisioning</li> <li>• NetApp FAS3170 and NetApp FAS6080</li> </ul>
<b>Orchestration and management</b>	<ul style="list-style-type: none"> <li>• BMC Atrium Orchestrator</li> <li>• VMware vCenter</li> <li>• Cisco UCS Manager</li> <li>• BMC BladeLogic for server and network</li> <li>• BMC Remedy IT Service Management Suite</li> </ul>	<ul style="list-style-type: none"> <li>• BMC Atrium Orchestrator</li> <li>• VMware vCenter</li> <li>• Cisco UCS Manager</li> <li>• BMC BladeLogic for server and network</li> <li>• BMC Remedy IT Service Management Suite</li> </ul>

## Solution Scope

Table 3 summarizes the scope of Cisco VMDC 2.0 solution validation.

**Table 3.** Solution Validation Scope

Use Case	Details
<b>Validation of functions across the entire data center for SAN and network-attached storage (NAS) designs</b>	End-to-end feature integration validation, including validation of quality of service (QoS) for all data center network layers from the access layer to the WAN edge on all platforms; VMware ESX and virtual machine provisioning, bootup, and maintenance; and SAN and NAS storage design
<b>Disaster recovery scenario validation</b>	Transparent movement of data center workloads for business continuance (active-backup scenario)
<b>Automation validation</b>	Validation of service orchestration, portal, and service catalog, with element manager integration for computing and network resources
<b>Validation of data center services</b>	Validation of service-tier offerings with data center services node (firewall, load balancing, etc.)
<b>Failover scenario validation</b>	Validation of redundancy designs (with baseline steady-state traffic), including routing, virtual PortChannel (vPC) and multichassis EtherChannel (MEC), Equal-Cost Multipath (ECMP), VSS, Hot Standby Router Protocol (HSRP), active-active service modules, and clustering

<b>Security validation</b>	End-to-end security validation for various components
<b>Scalability validation</b>	Multidimensional scalability (VLANs, MAC addresses, HSRP, routes, contexts, and virtual machines) within the scope of the architecture

## Solution Scale

Table 4 summarizes Cisco VMDC 2.0 scalability validation.

**Table 4.** Validated Scalability

Feature	Compact Pod Design	Large Pod Design
<b>Tenants</b>	32	152
<b>Servers per pod</b>	64	512
<b>Virtual machines per pod</b>	1440	11,520
<b>VLANs per pod</b>	180	520
<b>Virtual firewall contexts</b>	6	8
<b>Virtual load balancers</b>	16	24
<b>Server VLANs</b>	180	200
<b>MAC addresses</b>	12,000	24,000
<b>HSRP gateway instances</b>	196	504
<b>Routing protocol scale</b>	256 Open Shortest Path First (OSPF) neighbors	480 Border Gateway Protocol (BGP) peers

## For More Information

For more information about Cisco VMDC 2.0 and other Cisco cloud computing solutions, please visit:

- [http://www.cisco.com/en/US/solutions/collateral/ns340/ns517/ns224/ns836/white\\_paper\\_c11-604559\\_ns976\\_Networking\\_Solutions\\_White\\_Paper.html](http://www.cisco.com/en/US/solutions/collateral/ns340/ns517/ns224/ns836/white_paper_c11-604559_ns976_Networking_Solutions_White_Paper.html)
- [http://www.cisco.com/en/US/netsol/ns1050/networking\\_solutions\\_sub\\_program\\_home.html](http://www.cisco.com/en/US/netsol/ns1050/networking_solutions_sub_program_home.html)
- <http://www.cisco.com/en/US/netsol/ns976/index.html>



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