

# FlexPod Datacenter with VMware vSphere 5.5 Update 1

## Overview

The IT industry today faces the challenge of transitioning to a reliable, highly available virtualized and cloud-based data center infrastructure for improved business continuity, greater efficiency, and cost-effectiveness. To enable this migration with reduced risk and cost, Cisco, in partnership with NetApp, has developed the FlexPod Datacenter solution. FlexPod Datacenter is a predesigned unified computing, storage, and network infrastructure composed of Cisco Unified Computing System™ (Cisco UCS®) servers, Cisco UCS Manager, Cisco Nexus® switches, and NetApp fabric-attached storage (FAS) arrays. FlexPod Datacenter provides a standard, flexible data center building block that can be used to build an optimized data center to support a variety of workloads and applications.

Cisco, through its Cisco® Validated Designs, offers a comprehensive suite of pretested FlexPod Datacenter solutions, developed using various system components, configurations, and hypervisor and application software. Using a solution based on the Cisco Validated Design for FlexPod Datacenter as the baseline platform, IT customers can deploy a virtualized and cloud-enabled data center quickly, with low risk and cost. This document describes the FlexPod Datacenter solution validated for running VMware vSphere 5.5 Update1 (U1) software for enabling a shared cloud infrastructure.

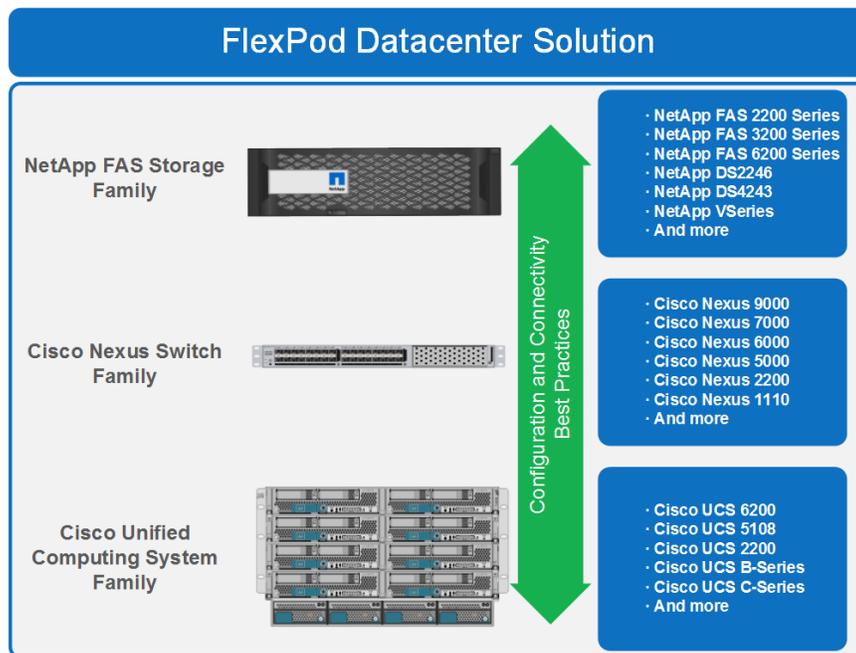
### Benefits of the Cisco Validated Design for FlexPod Datacenter

- **Resilience and reduced risk:** Prevalidated configurations help ensure proper deployment of the current applications on the new infrastructure. MetroCluster software enables multisite data centers with near zero downtime and fault tolerance.
- **Accelerated deployment:** Unified and standard architecture reduces transition.
- **Flexibility:** A wide variety of applications and workloads are supported through proven hardware and software combinations.
- **Scalability:** Modular architecture supports future expansion through scale-up and scale-out strategies.
- **Lower total cost of ownership (TCO):**
  - Workload balance and nondisruptive application mobility offer better utilization of resources.
  - Standardized architecture reduces management and training overhead.
  - Modular infrastructure enables IT to build a right-sized data center and avoid underutilization of resources.
  - Pretested solutions reduce deployment, procurement, and setup times.

## FlexPod Datacenter Design Elements

FlexPod Datacenter is a unified data center platform composed of Cisco UCS servers, Cisco Nexus network switches, and NetApp storage array elements, as shown in Figure 1. The FlexPod Datacenter modules can be configured to support a variety of applications by mixing and matching the component families and versions to achieve optimal capacity, price, and performance targets. The solution can be scaled by augmenting the elements of a single FlexPod instance and by adding multiple FlexPod Datacenter instances to build numerous solutions for virtualized and nonvirtualized data centers.

**Figure 1.** FlexPod Datacenter Design Elements



## Cisco UCS Family

Cisco UCS is a next-generation data center platform that unites computing, networking, and storage access and virtualization into a cohesive server system for superior performance and cost-effectiveness. All resources participate in a unified management domain in an integrated multichassis platform. This platform is composed of Cisco UCS B-Series Blade Servers and C-Series Rack Servers, fabric interconnects blade server chassis, and adapter connectivity. Cisco UCS supports Cisco Data Center Virtual Machine Fabric Extender (VM-FEX) technology.

Cisco UCS Manager device management software enables unified management of the entire computing environment. It provides role-based and policy-based management by using the service profiles of the resources, reducing maintenance overhead.

Cisco UCS Central Software manages global resources to enable central management of multiple Cisco UCS domains within or across data centers.

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Cisco UCS fabric interconnects are the communication and management backbone for the Cisco UCS solution, providing LAN and SAN connectivity to the server blades. The fabric interconnects connect the Cisco UCS B-Series and C-Series servers and the blade server chassis to form a unified fabric, which becomes a single management domain, providing high availability and simplicity of management.

Cisco UCS B-Series Blade Servers are an enterprise-class computing platform designed to efficiently deliver a broad range of IT workloads, from web infrastructure to distributed databases.

Cisco UCS C-Series Rack Servers extend the unified computing model to further increase scalability and business agility. The C-Series implements innovative technologies, including a standards-based unified network fabric, support for Cisco VM-FEX virtualization, and Cisco Extended Memory Technology.

For more information about Cisco UCS servers, refer to [www.cisco.com/en/US/products/ps10265/index.html](http://www.cisco.com/en/US/products/ps10265/index.html).

### Cisco Nexus Switches

The Cisco Nexus family of switches forms the networking foundation for a FlexPod Datacenter deployment. They support any transport over Ethernet, including Layer 2 and Layer 3 traffic and storage traffic, on one common data center-class platform to transform the data center network into a standards-based, multipurpose, multiprotocol, Ethernet-based fabric. They use data center-class Cisco NX-OS software for high reliability and ease of management.

Cisco Nexus 5000 Series Switches are ideal for enterprise-class data center server access and support smaller-scale midmarket data center aggregation layer deployments. The Cisco Nexus 5000 platform is a higher-density, lower-latency switching platform, which can be deployed across a diverse set of traditional, virtualized, and high-performance computing (HPC) data center environments. The 5000 Series also expands Cisco fabric extension technology into the servers and virtual machines (VMs) with Cisco Adapter FEX and Cisco VM-FEX.

For more information about the Cisco Nexus 5000 Series, refer to <http://www.cisco.com/en/US/products/ps9670/index.html>.

Cisco Nexus 1000v Series Switches provide an extensible architectural platform for VM and cloud networking. Integrated into VMware vSphere ESXi and ESX hypervisors and VMware Cloud Director, they provide policy-based VM connectivity, virtualized network services with Cisco vPath for load balancing, and firewalling.

For more information, refer to

<http://www.cisco.com/en/US/products/ps9902/index.html>

<http://www.cisco.com/en/US/products/ps10785/index.html>

**Note:** The Cisco Nexus 1000v is an optional component and was used in this validation effort. However, the standard VMware vSwitch or a VMware VDS can also be used.

Cisco VM-FEX technology collapses virtual switching and physical switching infrastructure environments into a unified environment to simplify management and improve network security and utilization.

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## NetApp FAS Storage

NetApp FAS forms the scalable storage element in a FlexPod Datacenter platform. Using the NetApp Data ONTAP operating system, this FlexPod design supports both the Data ONTAP 7-Mode and Clustered Data ONTAP Mode. Both operating system modes support SAN (Fibre Channel, Fibre Channel over Ethernet [FCoE], iSCSI) and network-attached storage (NAS) (CIFS, NFS), and enable primary and secondary storage in a single unified platform so that all virtual desktop data components can be hosted on the same storage array. Data ONTAP provides superior storage efficiency and data protection through features including SnapMirror, thin provisioning, compression, and deduplication.

This FlexPod Datacenter design uses the NetApp FAS8000 Series unified storage systems. The FAS8000 Series is optimized for scale-out storage infrastructure. It enables business-critical workloads that need massive performance and scalability. It unifies SAN and NAS infrastructures and uses high-performance NVRAM-based memory modules to maximize application throughputs. In addition, it integrates unified target adapter (UTA2) ports for 16-Gbps Fibre Channel, 10 Gigabit Ethernet, or FCoE.

For additional information about NetApp storage systems and Data ONTAP operating systems, refer to:

<http://www.netapp.com/us/products/storage-systems>

<http://www.netapp.com/us/products/platform-os/data-ontap-8/index.aspx>

### Cisco Validated Design for FlexPod Datacenter with VMware 5.5U1: New Features

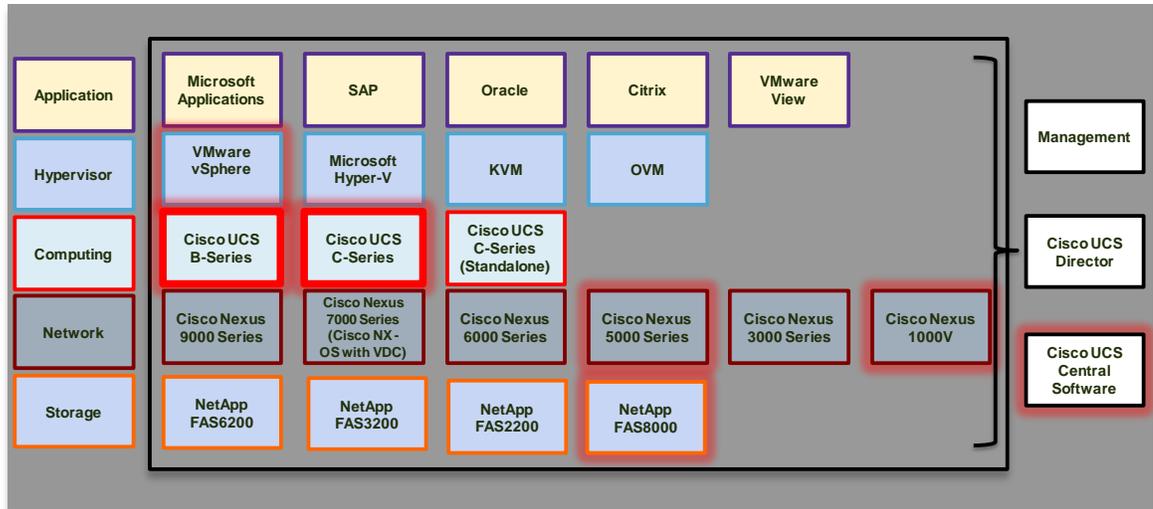
- The latest generation of Cisco UCS servers, the M4 delivers record performance, expandability, and configurability for diverse workloads ranging from web infrastructure to distributed databases.
- The Cisco UCS C-Series provides direct connection to fabric interconnects, eliminating the need for fabric extenders.
- The Cisco Nexus 5000 Series Switches implement port profiles to provide ease of management and configuration.
- NetApp FAS 8000 Series offers a high-performance, unified scale-up or scale-out storage system, which can be scaled easily to suit the workload needs.
- VMware vSphere 5.5U1 delivers high availability through vSphere Fault Domain Manager (FDM) technology and offers dynamic workload distribution through VMware Distributed Resource Scheduler (DRS).
- VMware vSphere 5.5U1 implements VMware Update Manager for patch management and vSphere Web Client for ease of management.

## Cisco Validated Design for FlexPod Datacenter

The Cisco Validated Design for FlexPod Datacenter validates the cohesive operation of industry-standard hypervisors and applications running on various FlexPod Datacenter configurations. Figure 2 provides a comprehensive list of supported hypervisors, management, and FlexPod Datacenter design elements and versions.

The highlighted components make up the Cisco Validated Design for FlexPod Datacenter described in this document. The objective of this verification is to functionally validate VMware vSphere 5.5U1 on the latest FlexPod architecture for various hardware and software combinations and provide extendable VMware vSphere-based data center infrastructure for mixed workloads and applications.

**Figure 2.** Components of the Cisco Validated Design for FlexPod Datacenter Running VMware vSphere 5.5U1



The Cisco Validated Design described in this document uses the FlexPod Distinct Uplink Design architecture for validation. This is an end-to-end Ethernet transport system supporting multiple LAN and SAN protocols, including FCoE (which is used by the Cisco Nexus switches and NetApp FAS controllers). It provides a unified 10 Gigabit Ethernet-enabled fabric with dedicated FCoE uplinks and dedicated Ethernet uplinks between the Cisco UCS fabric interconnects and the Nexus switches, and converged connectivity between the NetApp storage devices and multipurpose Nexus switch platforms.

The VMware vSphere 5.5U1 features used in this validation include:

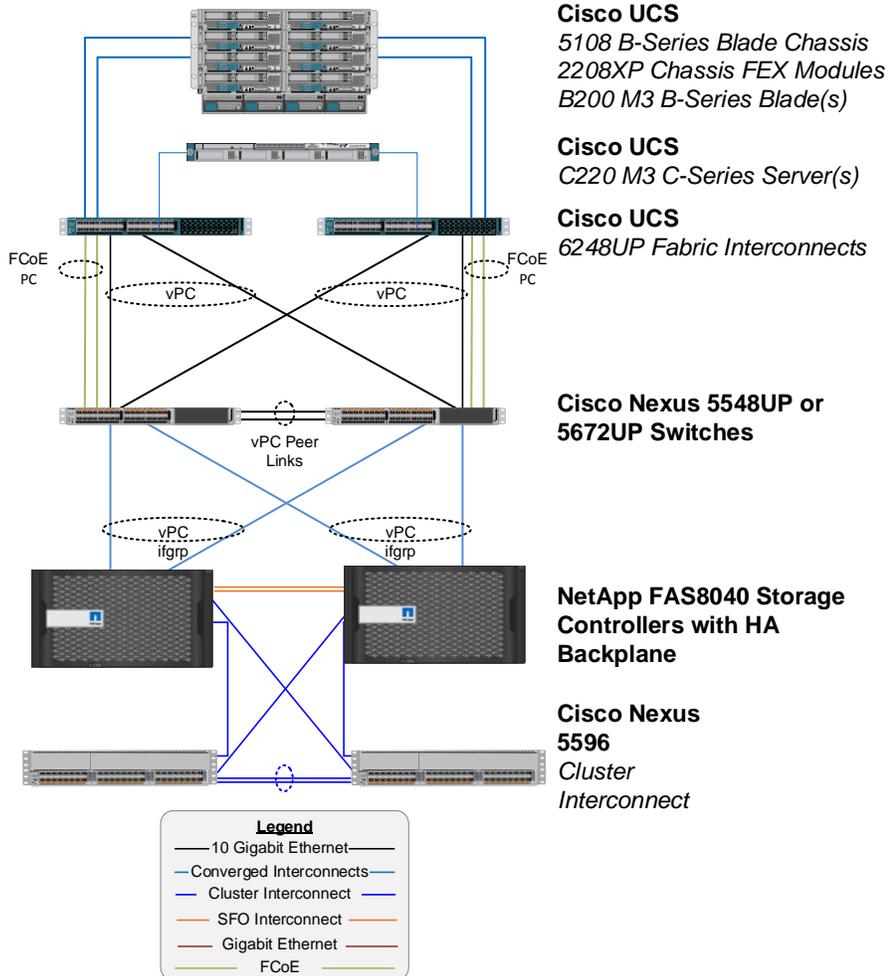
- VMware vSphere FDM technology offering VM resiliency in the event of physical server or guest operating system failures
- VMware Distributed Resource Scheduler (DRS) offering dynamic workload distribution to improve resource utilization
- VMware vSphere ESXi hypervisor providing efficient VM abstraction
- Virtual Machine File System (VMFS), which supports simultaneous memory access for multiple hosts

The FlexPod storage configurations used in this validation effort are:

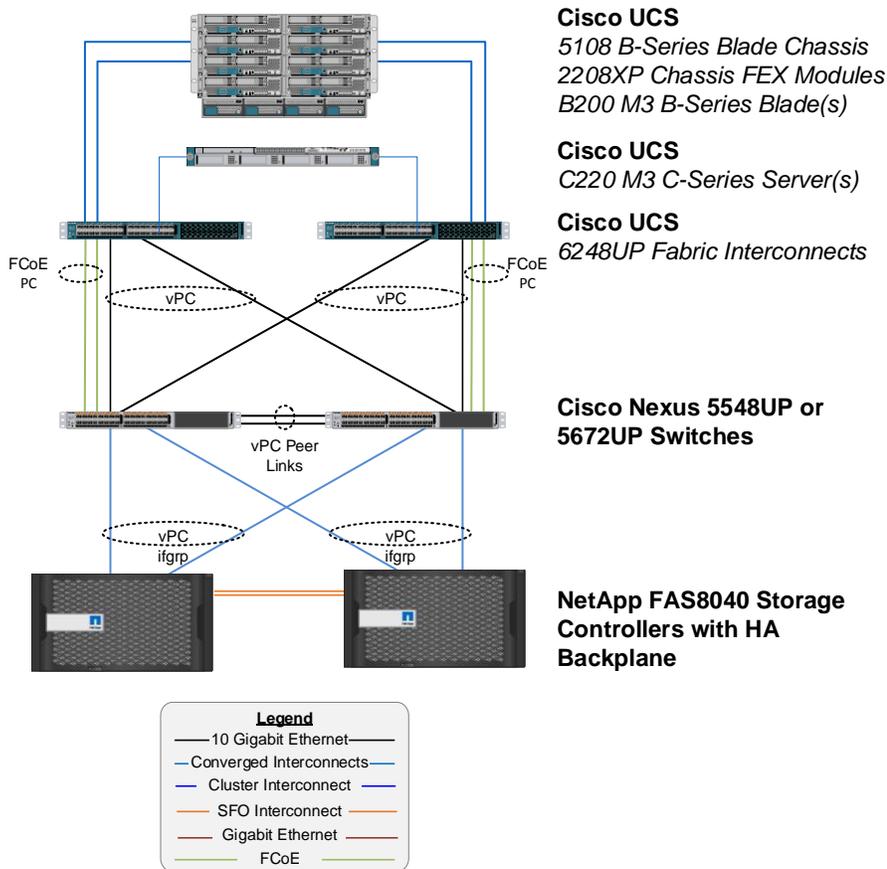
- FlexPod with NetApp Clustered Data ONTAP mode
- FlexPod with NetApp Data ONTAP 7-mode

Figures 3 and 4 illustrate the FlexPod Distinct Uplink topologies for these configurations and highlight the design elements used in each mode. Note that the configurations of the Cisco UCS and Nexus elements are identical in both topologies. The NetApp FAS controller topology is different—in Clustered Data ONTAP Mode, Cisco Nexus 5596 cluster interconnects are used to network the FAS controllers with the disk storage to create a storage pool. In Data ONTAP 7-Mode, the disk storage connects with the FAS controllers using dedicated links, as shown in Figure 4. The FlexPod design is capable of supporting C-Series rack-mount servers using single-wire management, providing further consolidation of the infrastructure and improved rack-mount server density.

**Figure 3.** FlexPod Distinct Uplink Design: Clustered Data ONTAP Mode



**Figure 4.** FlexPod Distinct Uplink Design: Data ONTAP 7-Mode



### Hardware and Software Versions Used in the Cisco Validated Design for FlexPod Datacenter Running VMware vSphere 5.5U1

Table 1 lists the FlexPod hardware and software versions tested in this validation effort.

**Table 1.** Hardware and Software Versions

Layer	Device	image	Comments
<b>Compute</b>	Cisco UCS 6200 Series Fabric Interconnects	2.2(2a)	Includes the Cisco UCS-IOM 2208XP, Cisco UCS Manager
	Cisco UCS B200 M3	2.2(2a)	Cisco UCS B200 M3 using Cisco UCS VIC 1240 and B230 M2 using Cisco UCS VIC 1240
	Cisco eNIC	2.1.2.38	
	Cisco fNIC	1.5.0.45	
	Cisco UCS C220 M3	2.2(2a)	
<b>Network</b>	Cisco Nexus 5548UP NX-OS	6.0(2)N2(2a)	
<b>Storage</b>	NetApp FAS8040	Data ONTAP 8.2.1	
<b>Software</b>	VMware vSphere ESXi	5.5.0 U1 with patch P02 (Build number: 1892794)	

Layer	Device	image	Comments
	VMware vCenter	5.5.0 U1 with patch P02 (Build number: 1892794)	
	Cisco Nexus 1000v	4.2(1)SV2(2.2)	
	OnCommand Unified Manager for Clustered Data ONTAP	6	
	OnCommand Unified Manager Core Package for Data ONTAP 7-Mode	5.2R1	
	NetApp Virtual Storage Console (VSC)	5	
	Cisco Nexus 1110-X	4.2(1)SP1(6.2)	

In addition to the configurations discussed so far, the FlexPod Datacenter architecture supports a wide range of other hardware and software versions. To verify support for a specific implementation of FlexPod Datacenter, and to identify compatible hardware and software configurations, refer to the following compatibility guides:

- NetApp Interoperability Matrix Tool: <http://support.netapp.com/matrix/>
- Cisco UCS Hardware and Software Interoperability Tool: [www.cisco.com/web/techdoc/ucs/interoperability/matrix/matrix.html](http://www.cisco.com/web/techdoc/ucs/interoperability/matrix/matrix.html)
- VMware Compatibility Guide: [www.vmware.com/resources/compatibility/search.php](http://www.vmware.com/resources/compatibility/search.php)

**Note:** The FlexPod Cooperative Support model applies to both the FlexPod Datacenter architecture component versions in this Cisco Validated Design and the individual component versions listed as supported in the interoperability matrix. Cooperative support is available for all FlexPod components and versions so long as customers have purchased the appropriate levels of support contracts. This approach allows customization of the FlexPod solution according to the organization's specific requirements.

## Conclusion

FlexPod Datacenter is an integrated, standardized, and prevalidated data center module that can be used to build a right-sized data center for a variety of IT applications. Its flexible architecture is composed of Cisco UCS servers, Cisco Nexus switches, and NetApp FAS arrays. With the appropriate versions of these design elements, the customer can deploy a flexible and scalable data center optimized for the workload requirements. The Cisco Validated Design described in this document highlights the use case for running VMware vSphere 5.5U1 on FlexPod built using the Cisco UCS M4 blade servers and NetApp FAS 8000 Series storage system. Using this Cisco Validated Design for FlexPod Datacenter as the foundation, customer IT organizations can transition toward a high-performance, highly scalable, easy-to-manage virtualized IT infrastructure with reduced cost and time.

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## References

### Design Guide

[http://www.cisco.com/c/dam/en/us/td/docs/unified\\_computing/ucs/UCS\\_CVDs/flexpod\\_esxi55u1\\_design.pdf](http://www.cisco.com/c/dam/en/us/td/docs/unified_computing/ucs/UCS_CVDs/flexpod_esxi55u1_design.pdf)

### Deployment Guides

#### C-Mode

[http://www.cisco.com/c/dam/en/us/td/docs/unified\\_computing/ucs/UCS\\_CVDs/flexpod\\_esxi55u1.pdf](http://www.cisco.com/c/dam/en/us/td/docs/unified_computing/ucs/UCS_CVDs/flexpod_esxi55u1.pdf)

#### 7-Mode

[http://www.cisco.com/c/dam/en/us/td/docs/unified\\_computing/ucs/UCS\\_CVDs/flexpod\\_esxi55u1\\_7mode.pdf](http://www.cisco.com/c/dam/en/us/td/docs/unified_computing/ucs/UCS_CVDs/flexpod_esxi55u1_7mode.pdf)



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