FlexPod Datacenter with VMware vSphere 5.1

| Benefits of Cisco Validated Design for FlexPod |
|---|
| **Reduced risk**
Pre-validated configurations help ensure proper execution of the current applications on the new infrastructure. |
| **Accelerated deployment**
Unified and standard architecture minimizes transition downtime and management overhead. |
| **Flexibility**
Supports a wide variety of applications and workloads through proven hardware and software combinations. |
| **Scalability and flexibility**
Modular architecture supports future expansion through scale-up and scale-out strategies. |
| **Lower total cost of ownership (TCO)**
◦ Standardized architecture lowers 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. |

The present-day IT industry faces the challenge of transitioning toward virtualized and cloud-based data center infrastructures for improved efficiency, agility, and cost-effectiveness. To enable this migration with reduced risk and cost, Cisco, in partnership with NetApp, has developed the FlexPod data center solution. FlexPod is a predesigned, unified computing, storage, and network infrastructure composed of Cisco Unified Computing System™ (Cisco UCS®) servers, Cisco UCS Manager, the Cisco Nexus® family of switches, and NetApp FAS storage arrays. FlexPod provides a standard, flexible data center building block that is 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 solutions, developed using various system components, configurations, and hypervisor and application software. Using a solution based on the Cisco Validated Design for FlexPod as the baseline platform, IT customers can deploy a virtualized and cloud-enabled data center quickly, with low risk and cost.

FlexPod Design Elements

FlexPod is a unified data center platform composed of Cisco UCS servers, Cisco Nexus network switches, and NetApp storage arrays. Figure 1 shows the FlexPod base configuration and design elements. The FlexPod modules can be configured to match the application requirements by mixing and matching the component versions to achieve the optimum capacity, price, and performance targets. The solution can be scaled by augmenting the elements of a single FlexPod instance and by adding multiple FlexPod instances to build numerous solutions for a virtualized and non-virtualized data center.

Figure 1.   FlexPod Design Elements
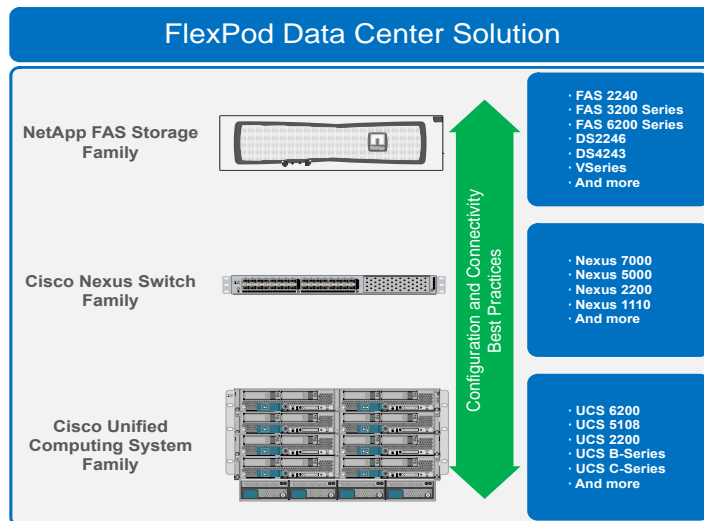
Cisco UCS Family

Cisco UCS is a next-generation data center platform that unites computing, network, 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, C-Series Rack Servers, fabric interconnects, blade server chassis, and adapter connectivity.

 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 and reduces maintenance overhead.

Cisco UCS fabric interconnects are the communication and management backbone for the UCS system, providing LAN and SAN connectivity to the server blades. They connect the UCS B-Series and C-Series (connected through Cisco Nexus 2220 Series Fabric Extenders) and the blade server chassis to form a unified fabric, which becomes a single management domain providing high availability and simplicity of management.

The Cisco UCS B-Series blade and blade server chassis is an enterprise-class computing platform designed to deliver a broad range of IT workloads, ranging from web infrastructure to distributed database, efficiently.

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 Virtual Machine Fabric Extender (VM-FEX) virtualization, and Cisco Extended Memory Technology.

For more information, refer to the following documentation: www.cisco.com/en/US/products/ps10265/index.html

Cisco Nexus Switch Family

Cisco Nexus switches form the networking foundation for a FlexPod 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. All switches in the Cisco Nexus family use the NX-OS operating system.

Cisco Nexus 5000 Series Switches are ideal for enterprise-class data center server access and support smaller-scale, midmarket data center aggregation layer deployments. These multipurpose, multilayer switches can be deployed across a diverse set of traditional, virtualized, and high-performance computing environments. The Cisco Nexus 5000 Series also expands Cisco fabric extension technology into the servers and VMs with Cisco Adapter FEX and Cisco VM-FEX.

The Cisco Nexus 7000 Series Switches offer a comprehensive, one-platform solution for the data center core network. This series provides aggregation, high density, and end-of-row and top-of-rack server connectivity. It enables innovative technologies such as Cisco Overlay Transport Virtualization (OTV), Cisco FabricPath, Fibre Channel over Ethernet (FCoE), and Cisco Locator/ID Separation Protocol (LISP).
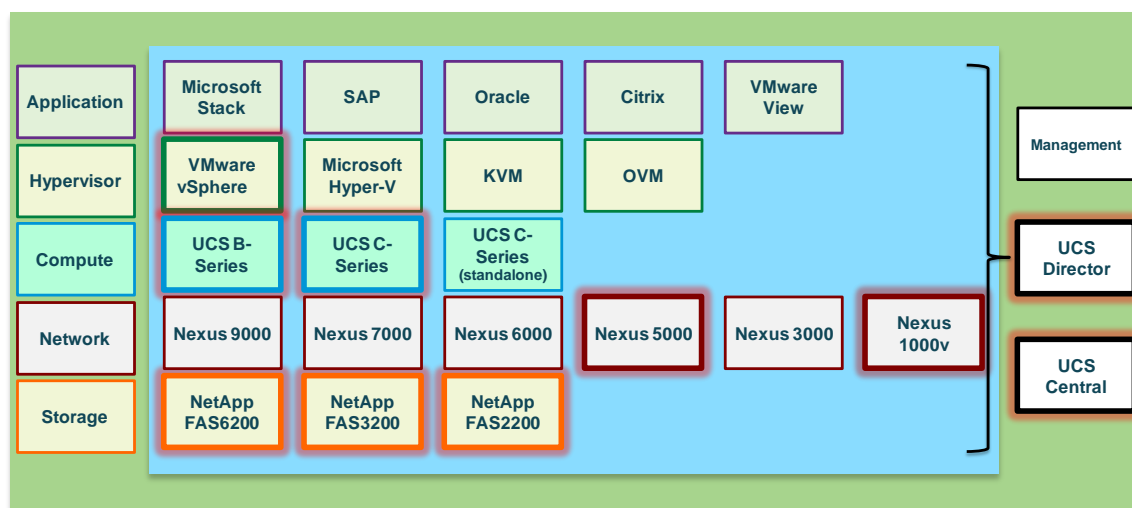
NetApp FAS Storage Family

The NetApp FAS storage system forms the scalable storage element in a FlexPod platform. It uses the NetApp Data ONTAP operating system. Both Data ONTAP 7-mode and Clustered Data ONTAP mode are supported in this FlexPod design. Both operating systems provide SAN (FCoE, FC, iSCSI), NAS (CIFS, NFS), and primary and secondary storage in a single unified platform so that all virtual desktop data components can be hosted on the same storage array.

The FAS2000 series supports midsize enterprises, while the FAS6000 series supports large enterprises. FAS provides hot-swappable redundant components with fault tolerance through clustered storage controllers that offer scalability up to several terabytes.

Cisco Validated Design for FlexPod

The Cisco Validated Design validates the cohesive operation of industry-standard hypervisors and applications running on various FlexPod configurations. The comprehensive list of supported hypervisors, management, and FlexPod design elements is illustrated in Figure 2. The highlighted components compose the Cisco Validated Design for FlexPod described in this document. The objective of this verification is to functionally validate vSphere 5.1 on the latest FlexPod architecture for various hardware and software combinations and provide extendable vSphere-based infrastructure for mixed workloads and applications.

Figure 2.   Components of the Cisco Validated Design for FlexPod

Application	**Microsoft Stack**	**SAP**	**Oracle**	**Citrix**	**VMware View**	**Management**
Hypervisor	**VMware vSphere**	**Microsoft Hyper-V**	**KVM**	**OVM**		**UCS Director**
Compute	**UCS B-Series**	**UCS C-Series**	**UCS C-Series (standalone)**			
Network	**Nexus 9000**	**Nexus 7000**	**Nexus 6000**	**Nexus 5000**	**Nexus 3000**	**Nexus 1000v**	**UCS Central**
Storage	**NetApp FAS6200**	**NetApp FAS3200**	**NetApp FAS2200**			

Cisco Validated Design for FlexPod: New Features

- Multihop FCoE uses Fibre Channel (FC) uplinks and creates a unified Ethernet fabric, eliminating the need for FC switches.
- Converged fabric: Supports multiple protocols: 10 Gigabit Ethernet, FC, and FCoE.
- Single-wire Cisco UCS Manager enables Cisco UCS Manager to manage the C-Series M3 servers using a single wire for both management and data traffic, doubling the server density and reducing cabling cost.
- Cisco VM-FEX technology unifies virtual and physical switching infrastructures to form a single virtual environment for simplicity of management and superior network utilization.
- NetApp clustered Data ONTAP 8 offers scale-out to tens of petabytes of storage.
- VMware vSphere 5.1 provides a single-sign-on server manager.

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 5.1 features used in this validation include VMware ESXi, vCenter Server, vSphere SDKs, Virtual Machine File System (VMFS), High Availability (HA), and Distributed Resource Scheduler (DRS).

The FlexPod storage configurations used in this validation effort are:

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

Figures 3 and 4 illustrate the FlexPod Distinct Uplink topologies for these respective 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
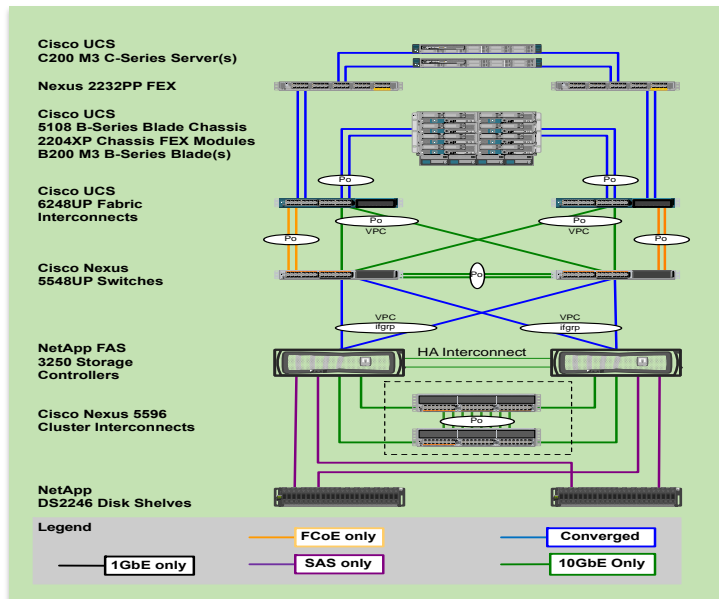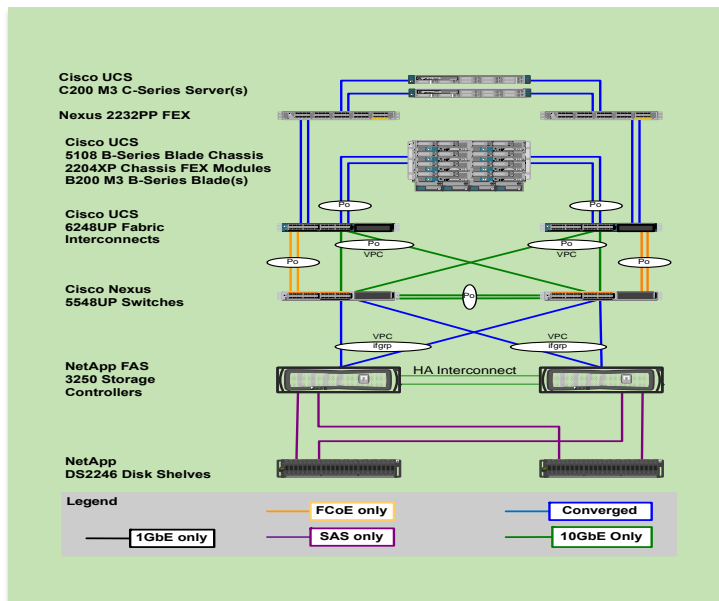

Figure 4. FlexPod Distinct Uplink Design: Data ONTAP 7-Mode

Hardware and Software Versions Used in the Cisco Validated Design for FlexPod

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

Table 1.   Validated Software and Firmware Versions

Layer	Device	Image
Computing	Cisco UCS 6200 Series Fabric Interconnects	2.1(1a)
	Cisco UCS B200 M3 Blade Servers	2.1(1a)
	Cisco eNIC	2.1.2.38
	Cisco fNIC	1.5.0.20
	Cisco UCS C220 M3 Rack Servers	2.1(1a)
Network	Cisco Nexus 5548UP NX-OS	5.2(1)N1(3)
Storage	NetApp FAS model 3250-AE	DATA ONTAP 8.1.2
Software	VMware vSphere ESXi	5.1.0, 914609
	VMware vCenter	5.1.0, 799731
	Cisco Nexus 1000V Switch	4.2(1)SV2(1.1)
	Cisco Prime™ Data Center Network Manager	6.1(2)
	NetApp OnCommand System Manager	5.1
	NetApp Virtual Storage Console (VSC)	4.1
	Cisco Nexus 1110-X Virtual Services Appliance	4.2(1)SP1(5.1a)

In addition to the above-mentioned configurations, FlexPod can be designed using a wide range of hardware and software versions. To determine support for a specific implementation of FlexPod, and to identify compatible hardware and software configurations, refer to the following compatibility guides.

- NetApps Interoperability Matrix Tool
- Cisco UCS Hardware and Software Interoperability Tool
- VMware Compatibility Guide

Conclusion

FlexPod 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 NetApps FAS storage 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 vSphere5.1 on FlexPod. Using this Cisco Validated Design for FlexPod as the foundation, customer IT organizations can transition toward a scalable, virtualized IT infrastructure with reduced cost and time.

References

Design guide: VMware vSphere on Flexpod

VMware vSphere 5.1 on FlexPod Clustered Data ONTAP Deployment Guide

VMware vSphere 5.1 on FlexPod Data ONTAP Operating in 7-Mode Deployment Guide