Gain the Value That Makes FlexPod the Number-One Integrated Infrastructure Solution

**FlexPod solutions from Cisco and NetApp simplify application infrastructure.**

Many businesses are challenged by data center sprawl and complexity: too many different servers and storage devices that are inflexible and have many different points of management. The business needs to move forward at a fast pace to remain competitive, but the data center can’t keep up. To address this problem, IT departments are moving to integrated solutions.

The goal of integrated infrastructure is to centralize and simplify application infrastructure management and to lower costs. Cisco and NetApp combine to deliver flexible, unified FlexPod® solutions. FlexPod is number one in sales in the integrated infrastructure market (according to IDC Worldwide Integrated Infrastructure and Platforms Tracker 2013Q2.)

But creating a flexible application infrastructure requires more than just putting hardware under a common management framework, as many traditional architecture vendors do. It requires innovative thinking and an entire ecosystem that is designed to be application based. With the FlexPod solution, Cisco and NetApp have worked closely with hypervisor vendors VMware, Citrix, Microsoft, and Red Hat to transparently combine the hardware with the software infrastructure to create a united solution. We have also been working in close collaboration with application vendors such as SAP, Oracle, Microsoft, VMware, and Citrix to gain a deep understanding of the application requirements within the ecosystem. Because we did our research before we designed this integrated solution, FlexPod solutions deliver the performance and quality of service (QoS) that business-critical applications need. They also provide the flexibility, ease of management, and lower operating costs that IT requires to successfully support the business.

**Extreme Flexibility in a Top-Tier Solution**

Unlike most traditional approaches, FlexPod solutions integrate all tier-one components from Cisco and NetApp, delivering a high-quality solution. The combination of Cisco Unified Computing System™ (Cisco UCS®) and NetApp® FAS Storage (Figure 1) delivers the most up-to-date ideas to the FlexPod solution. We don’t force an old design into a new form factor.

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**HIGHLIGHTS**

- **Unbeatable Combination**
  - Cisco and NetApp combine to deliver flexible, unified FlexPod® solutions that are rated number one in the integrated infrastructure market.

- **Flexibility and Scalability**
  - FlexPod brings exceptional flexibility and scalability to converged infrastructure.

- **Gain Confidence**
  - Gain confidence with all tier-one components, including the Cisco Unified Computing System™ (Cisco UCS®), Cisco® networking, and NetApp® FAS Storage.

- **Simplify and Automate**
  - Radically simplify and automate management across the entire solution with Cisco UCS Director.

- **Reduce Risk**
  - Reduce risk and accelerate deployment. Cisco and NetApp pretest all FlexPod solutions to create a recipe-like manual called a Cisco Validated Design to make deployment fast and easy.

- **Cooperative Support**
  - Cisco has a cooperative support model for FlexPod that includes Cisco, NetApp, VMware, Microsoft, and many other application vendors.

1 IDC Worldwide Integrated Infrastructure and Platforms Tracker—2013Q2
The FlexPod portfolio includes three basic configurations to simplify ordering:

- **FlexPod Express** (formerly ExpressPod) is excellent for small and medium-sized business and branch offices.
- **FlexPod Data Center** (formerly FlexPod) is for core enterprise data centers and service providers.
- **FlexPod Select** is optimized for data-intensive workloads.

Figure 1. FlexPod Solutions Integrate Tier-One Components of Cisco UCS Servers, Cisco Nexus® Networking, and NetApp FAS Storage and Can Be Combined and Scaled to Meet Your Specific Application Needs

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**Cisco UCS Is Designed for Today’s Data Center**

Cisco UCS is the first truly unified data center platform. It combines industry-standard, x86-architecture servers with industry-leading networking and storage access into a single system. The system is intelligent infrastructure that is automatically configured through integrated, model-based management—which means that every aspect of server identity, personality, and connectivity is abstracted, and when the system is ready to be deployed, this information is applied through software. This approach gives each server in the system exceptional flexibility and configurability, which is accomplished through the integrated management provided by Cisco UCS Manager. Administrators first manipulate a service profile or model of a desired system configuration. Then they associate the service profile with hardware resources, either automatically or with point-and-click ease, and the system configures itself to match the model. This automation simplifies provisioning and workload migration with accurate and rapid scalability. For the first time, IT departments have an automated, policy-based mechanism for aligning the server configuration with the workload. Servers are configured automatically, eliminating the manual, time-consuming, error-prone assembly of components into systems. This approach radically simplifies and accelerates deployment of enterprise-class applications and services running in bare-metal, virtualized, and cloud-computing environments. The result is increased IT staff productivity, improved compliance, and reduced risk of failures due to inconsistent configurations.

**Simplifying Three Networks into One**

Building on Cisco's strength in enterprise networking, Cisco UCS is integrated with a standards-based, high-bandwidth, low-latency, virtualization-aware 10-Gbps unified fabric. The system is wired once to enable zero-touch scaling. All traffic, physical
and virtual, is handled with security isolation, visibility, and control equivalent to that for physical networks. The unified network meets the bandwidth demands of today’s multicore processors, eliminating the cost of separate networks for each type of traffic while delivering exceptional performance. Reducing the complexity and number of components, compared to traditional systems, lowers the capital costs and operating costs associated with management overhead.

NetApp FAS Storage
NetApp FAS Storage and Cisco UCS are excellent complements to each other. Like Cisco UCS, NetApp FAS Storage is designed to handle today’s diverse workloads, with superior availability and proven performance. The self-managing NetApp Virtual Storage Tier uses flash-memory technology to increase performance where you need it. NetApp Data ONTAP® enables dynamic scalability of both performance and capacity to support right-sizing today and growth as business demands require. Storage-based data protection and recovery and advanced risk protection deliver continuous operations and help eliminate both planned and unplanned downtime.

Exceptional Flexibility
Traditional systems are often limited to small “islands” of servers because of the massive complexity associated with support of multiple networks and disjointed management frameworks. For example, IBM PureFlex and HP ConvergedSystem deployments both require at least one switch per seven or eight blades in the chassis in addition to top-of-rack switching. IT staff say that with these traditional systems, “After that configuration is up and running, no one will touch it.” Conversely, a single FlexPod instance can be sized from very small (two servers and several terabytes of storage) to very large (160 servers and 69 petabytes of storage) to meet business needs today. It can easily be scaled to grow or shrink with business needs in the future. The capability to right-size your solution for today’s needs saves IT staff time and initial capital expenses and ongoing operating costs. You don’t need to overprovision resources, which require configuration, power, cooling, and ongoing management, just to have them sit idle. Right-size with FlexPod to have all your resources working for you all the time.

Integrated Management
Imagine having the time to focus on strategic business initiatives. We automate infrastructure management so you that you do. A recent IDC survey states that 77 percent of IT staff time is spent on managing existing infrastructure. This is even with single-pane management of traditional systems. Traditional systems retain the added complexity of unnecessary underlying hardware for chassis management and network connectivity (Figure 2).
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Figure 2. Traditional Systems, Even with Single-Pane Management, Have Multiple Touch Points
Whereas FlexPod Has a Single Touch Point

8 IBM Flex System Fabric CN4093 10Gb Converged Scalable Switches
1 IBM FSM Multichassis Management Module
8 IBM Flex System Management Modules

Low-Cost Management
While claiming single-pane management capability, top-down management appliances such as HP OneView and IBM Flex System Manager simply consist of software that pushes down sets of scripted commands to underlying hardware while charging significant license fees for that capability (Figure 3). These rigid appliances cannot detect and react to changes in hardware configuration. In contrast, model-based Cisco UCS Manager is integrated into the system on the fabric interconnects and detects and adapts transparently to hardware changes across the entire Cisco UCS domain. Additionally, all Cisco UCS Manager functions are provided at no additional cost.

Figure 3. Three-Year Chassis Management Software Licensing Cost (US$) Comparison of Cisco UCS, IBM Flex System Manager, and HP OneView (based on pricing available from IBM and HP websites for managing two chassis as of January 15, 2014)

Comprehensive Integrated Infrastructure Management
Cisco UCS Director, has holistic management for FlexPod integrated infrastructure that delivers end-to-end automation of IT processes. It integrates the management of Cisco UCS, NetApp FAS storage, VMware vCenter, and Microsoft Windows Server Hyper-V

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to radically simplify management across the entire solution. Model-based orchestration conducts an automated infrastructure discovery process that maps the physical and logical relationships of each component layer within FlexPod. This information is used, among other purposes, to validate workflows before they go into production. It can also be used to deliver detailed status, utilization, and consumption reports. This orchestration enhances collaboration among computing, network, storage, and virtualization teams, allowing subject-matter experts to define policies and processes that are used when resources are consumed.

The Cisco UCS Director task library lets you quickly assemble, configure, and manage workflows for FlexPod. This capability delivers enhanced IT agility with a prevalidated, unified architecture that easily scales up or out to large data center environments without the need for design changes. You can dramatically reduce capital and operating expenses through end-to-end management of the FlexPod platform with real-time reporting of utilization and consumption using trends set to customer-specific time frames. You can manage workflows for FlexPod and other parts of your existing infrastructure both locally and globally, eliminating the need to self-integrate or pay for costly integration of multiproduct solutions across your business.

Network Simplicity
FlexPod has a unified fabric to radically simplify server I/O configuration, cabling, and upstream switching. The low-latency, high-bandwidth, lossless 10-Gbps Ethernet fabric supports flexible connectivity to storage using:

- IP protocols for Network File System (NFS) access to files
- Fibre Channel over Ethernet (FCoE) for block access to storage.

With FlexPod, you can wire once, walk away, and then manage features and bandwidth through software.

Zero-Touch I/O Configuration
FlexPod offers zero-touch I/O configuration that is policy based, not cable based. It converges the three networks required by traditional systems (LAN, SAN, and management) into one unified network that can match bandwidth resources to specific application needs.

Reduce Cost and Complexity
To reduce the network complexity for traditional blade servers, many data centers support many little islands of blade servers consisting of a small number of chassis. These traditional deployments cannot share bandwidth or computing power between islands. Instead, traditional approaches over provision the network infrastructure with bandwidth not needed by the applications. This approach increases cost and complexity and reduces flexibility. The latest converged system offerings from HP and IBM reflect this complexity in their use of computing resources, in contrast to FlexPod with Cisco UCS, which offers simplicity.

Complexity with the HP ConvergedSystem
Figure 4 illustrates how the HP ConvergedSystem greatly decreases flexibility while it increases management overhead. A single HP ConvergedSystem 700x can support a maximum of four chassis and 64 blade servers. Whereas FlexPod supports 160 blade servers in a single system, HP customers must purchase three HP ConvergedSystem 700x solutions and populate them with a total of 10 blade chassis. The total number of management points per system, each of which must be purchased, configured, managed, maintained, powered, and cooled, includes:

- Eight HP Virtual Connect FlexFabric switches
- Eight HP Onboard Administrator Modules
- Two top-of-rack Fibre Channel switches
- Two top-of-rack Ethernet switches for management
- Four top-of-rack Ethernet switches for production networking
To support 160 blade servers, HP’s approach requires a total of 44 switches and 62 management points (managed devices that have IP addresses).

Figure 4  HP ConvergedSystem 700x Requires 42 Switches and 62 Management Points to Support 160 Blade Servers

Complexity with IBM PureFlex System Enterprise

Similarly, Figure 5 illustrates how IBM’s approach requires a total of 48 switches to support 160 blade servers using IBM PureFlex System Enterprise. Each IBM PureFlex System Enterprise solution supports up to three chassis. Each chassis can hold 14 blade servers, for a total of 42 blades per IBM PureFlex System Enterprise solution. However, one blade is reserved for management, bringing the total number of available slots to 41. Thus, to support 160 blade servers, an enterprise must purchase four IBM PureFlex System Enterprise solutions. Each system requires 19 managed devices, including switches, chassis management modules, and management servers:

- One IBM Flex System Manager (FSM) multichassis management server
- Six IBM Flex System Fabric Converged Scalable Switches
- Six IBM Chassis Management Modules
- Two top-of-rack Fibre Channel switches
- Two top-of-rack Ethernet switches for management
- Two top-of-rack Ethernet switches for production networking

To support 160 servers, the IBM solution requires a total of 48 switches and 76 management points.
Figure 5. IBM PureFlex System Enterprise Requires 48 Switches and 76 Management Points to Support 160 Blade Servers

Figure 6. A Single FlexPod Deployment Can Support 160 Servers with Only Four Switches

Simplicity with FlexPod
In contrast to HP and IBM solutions, a single FlexPod solution can support up to 160 blade and rack servers with four switches and three management points. Cisco UCS with Cisco SingleConnect technology radically simplifies configuration, reduces capital costs through the use of fewer networking components, and greatly reduces operating costs through the use of a single point of management (Figure 6).

To summarize, FlexPod requires only three management points to support IP and storage connectivity to support up to 160 servers. HP ConvergedSystem 700x requires 62 management points and IBM PureFlex Enterprise requires 76 management points to support the same number of servers (Table 1).
Table 1. FlexPod Requires Fewer Switching Devices and Management Points to Support 160 Servers

<table>
<thead>
<tr>
<th>SOLUTION</th>
<th>NUMBER OF SYSTEMS TO SUPPORT 160 BLADE SERVERS</th>
<th>TOTAL NUMBER OF SWITCHING DEVICES</th>
<th>TOTAL NUMBER OF MANAGEMENT POINTS (MANAGED DEVICES WITH IP ADDRESSES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FlexPod 160 Servers per System</td>
<td>1</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>HP Converged-System 700x 64 Servers per System</td>
<td>3</td>
<td>44</td>
<td>62</td>
</tr>
<tr>
<td>IBM PureFlex Enterprise 41 Servers per System</td>
<td>4</td>
<td>48</td>
<td>76</td>
</tr>
</tbody>
</table>

Deterministic Network Performance

In addition, as detailed in two performance briefs, Cisco UCS Outperforms HP Blade Servers on East-West Latency and Cisco UCS Outperforms IBM Flex System Blades on East-West Network Latency, traffic between any two servers in a Cisco UCS domain traverses only one network hop, regardless of whether the servers are in the same chassis or not, yielding excellent and deterministic networking performance. In traditional systems, in contrast, traffic traverses an inconsistent number of hops, depending on whether the traffic is between blades in the same chassis or in different chassis, creating inconsistent and inferior performance.

Reduce Risk and Accelerate Deployment with Pretested Configurations

Cisco and NetApp pretest FlexPod solutions to create a recipe-like manual called a Cisco Validated Design. This pretesting reduces risk and makes deployment fast and easy while maintaining a high level of deployment flexibility. This methodology is guided by application needs and doesn't force businesses to purchase rigid configurations with unnecessary components, unlike traditional systems.

For example, FlexPod makes an excellent solution for virtual desktop deployments. There are a number of Cisco validated designs optimized for virtual desktop deployments, depending on the size of the deployment and the desktop virtualization software required. Both VMware Horizon View and Citrix XenDesktop implementations have been tested and documented. These design guides introduce the solution at a high level; define all components with appropriate sizes; list any hardware, hypervisor, or operating system adjustments required for optimization; present best practices; and list performance expectations. The administrator is guided through all interactions for physical connections and with the GUI, with every option detailed to optimize the configuration for the application environment. Images of the physical configuration or of the screen help prevent misunderstanding and misconfiguration.

FlexPod Cooperative Support Model

The FlexPod Cooperative Support Model brings together technology expertise from all members to quickly resolve problems to keep you at peak efficiency (Figure 7). With this
high level of experience, 98 percent of all calls are resolved on first contact without the need for follow-up calls. We just get it done.

Figure 7. Customers Have Direct Access to Cisco, NetApp, VMware, and Citrix Engineers Who Are Trained to Rapidly Address Concerns Encountered in FlexPod Environments

This program provides 24-hours-a-day support, every day, worldwide. We work as a cohesive global team to accurately diagnose and remediate your problem to help ensure that you’re running at peak efficiency. If you think you have a computing or network problem, you can call Cisco. If you think you have a storage problem, you can call NetApp. If you have no idea what the problem is, you can call any of the vendor’s support numbers to get service for your FlexPod environment quickly and efficiently.

You Have to Ask Yourself
Do you really want to base your business operations on 10-year-old technologies that are too complex and burdensome to scale quickly and effectively?
Do you want to continue to spend most of your time solving problems with infrastructure, or would you rather have application-centric infrastructure?
Join the customers who have made FlexPod the number-1 integrated solution in the market and gain quick response to business needs while reducing total cost of ownership (TCO) with management automation and integration.

For More Information
• For more information about Cisco UCS Director, please visit http://www.cisco.com/go/ucsdirector.