



# White Paper

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## **FlexPod: The Gateway to Your Private Cloud**

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## Introduction

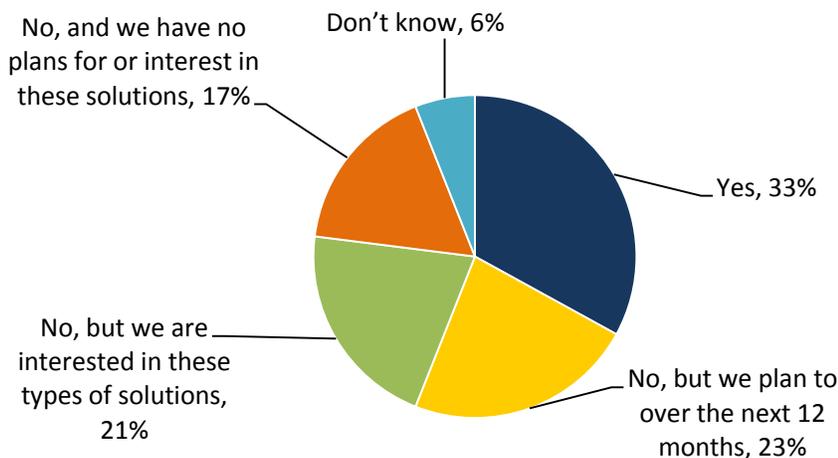
IT purchasing decisions have and will always be the result of two immutable factors: economics and operational necessity. The two are invariably linked. Over recent years, the explosion of data, compounded by the onset of complex big data and server sprawl, has brought about newfound data storage challenges that have required a new, cost-effective solution for managing data center environments. The solution came in the form of server virtualization, which allowed organizations to eliminate the one-application/one-server requirement, dynamically pool resources, and allocate them in order to scale in accordance with end-user demand. Moreover, since virtual machines add no additional footprint and cost a great deal less than physical servers, server virtualization allowed organizations to decommission or reallocate capacity based on need, creating massive savings in terms of both CAPEX and OPEX and enabling organizations to remain competitively agile.

As with most technologies, however, solutions to one problem often breed challenges that cause another problem. Server virtualization made the spinning up of virtual servers both fast and easy, which in turn led to an exponential increase in VMs, taxing legacy equipment and practices. Aging infrastructure and inflexible technologies have rendered IT unable to efficiently scale administration to meet the requirements of this growing virtual environment. In order to cut down on manual processes and administrative overhead, organizations must fundamentally change how IT infrastructure is managed.

Today’s IT systems require cross-functional, virtualization-aware management tools with automation fed by intelligent infrastructure components, which execute in harmony. These holistic management controls inherently necessitate tight integration of compute, storage, networking, and virtualization resources. ESG defines this integration of hardware and software components into a single consumable IT system as an integrated computing platform (ICP) solution. ICPs combine independent pieces of IT infrastructure that are normally operated separately through policy and common functionality to form simplified computing platforms targeted at virtualized and cloud environments. ICPs—such as FlexPod—serve as the back-end infrastructure for their organization’s virtualization/private cloud deployments and are a leading solution deployed in data centers today. Growing awareness and measurable benefits focused on time to value and improved operational economics are helping drive increased usage and interest, a trend reflected in the results of research conducted by ESG (see Figure 1).<sup>1</sup>

Figure 1. Usage of Integrated Computing Platforms

**Does your organization currently use any type of integrated computing platform?  
(Percent of respondents, N=303)**



Source: Enterprise Strategy Group, 2014.

<sup>1</sup> Source: ESG Research Report, *Trends in Private Cloud Infrastructure*, to be published in March 2014.

Delivered through value-added resellers (VARs), FlexPod is a reference architecture consisting of pre-tested designs built on shared infrastructure, including Cisco Unified Computing System (UCS) servers, Cisco Nexus switches, and NetApp unified storage systems running on Data ONTAP. Along with a modular and flexible design, the differentiating value of FlexPod resides in its management solutions. FlexPod offers three domains of management. First, open APIs for UCS Manager, Nexus OS, UCS Director, and Data ONTAP enable FlexPod infrastructure management to be integrated into existing custom or proprietary management platforms, and enable organizations to create entirely custom platforms.

In addition to the improved system performance and uptime that result from hardware compatibility, ICPs also simplify data center administration through automation and management capabilities. Rather than operate as discrete server and storage silos of compute, performance, and capacity, ICPs pool resources across systems. These resources are then automatically allocated both within and between ICP racks based on VM migration, workload demands, and performance requirements, preventing IT from having to manually provision resources for peak workloads.

Management tools provide varying degrees of consolidation, health monitoring, automation, and private cloud capabilities such as orchestration, service catalog, service lifecycle management, and multi-tenancy. The management model driven by UCS Director is rapidly evolving beyond element managers into a holistic management solution capable of high degrees of automation.

## FlexPod

FlexPod is a unified, scalable, and pre-validated reference architecture designed for both virtualized and non-virtualized environments. FlexPod supports a wide range of hypervisors, such as VMware vSphere and Microsoft Private Cloud stacks, and a variety of mixed workloads including, SAP, Oracle, Microsoft business applications, Oracle, Citrix XenDesktop, and others. Regardless of where customers are on their path to the cloud, FlexPod platform can be leveraged and scaled to deliver on numerous use cases.

### Cisco Unified Computing System (UCS) and Cisco Nexus Switches

Cisco UCS combines computing hardware, Fabric Interconnects, virtualization support, and management software into a cohesive platform that can be managed as a single unit. The computing component of UCS comes in two versions: the B-Series consisting of a powered chassis and blade servers, and a C-series for rackmount servers.

In traditional blade architectures, administrative tools interface directly to the hardware. Each chassis will have a certain number of interfaces grouped using internal switching or dedicated on a per-blade basis. These interfaces are connected to a high-speed Ethernet network, causing each chassis to exist independently within the data center and each blade to exist independently within the chassis. To perform higher level orchestration and automation, the customer must gateway to individual management components and their interfaces into the hardware itself for complete access, rendering a server environment more akin to a bank of separate servers than a bundle of pooled resources.

With UCS's stateless design, management is not tied to an individual blade chassis or rack server, but rather to Fabric Interconnect, the first level aggregation point of multiple devices. The chassis is transformed into a backplane wherein no switching occurs—the chassis is merely an extension of the UCS fabric. Cisco has further simplified the architecture to make better use of available bandwidth for improved scale, faster modification, reduced management endpoints, and highly automatable operations for both physical and virtual servers, all through a central control interface.

Cisco UCS integrates computing resources with best-in-class Cisco Nexus switches and a unified, high-speed I/O fabric for connectivity, providing an intelligent method for handling different types of network traffic.

## NetApp FAS Storage

FlexPod leverages NetApp Fabric-Attached Storage (FAS). NetApp FAS is a unified storage architecture, meaning that it consolidates file-based and block-based access in a single storage platform, which supports Fibre Channel, iSCSI, and network-attached storage (NAS). The advantage of unified storage resides in an organization's ability to support various storage needs—such as NFS, Fibre Channel, CIFS, and iSCSI—from a single device, resulting in simplified management and reduced CAPEX. NetApp FAS comes in a range of sizes and addresses a broad range of needs, from the FAS2000 for remote office and midsize enterprises, all the way to the FAS6000 for large-scale data consolidation and high-performance applications. Each storage solution leverages the scalability, reliability, and automated management of Data ONTAP, NetApp's proprietary operating system, enabling all models, from entry-level FAS2000 to high-end FAS6000, to be managed by the same tools.

One of the predominant differentiable values of NetApp FAS is its end-to-end storage management solution: NetApp OnCommand unified manager software. OnCommand is designed to manage physical, virtual, and cloud environments, making it ideally suited for data centers leveraging hybrid application and desktop delivery models. Businesses are able to aggregate and manage pools of storage using policy-based automation for provisioning and data protection. The heart of a unified system, OnCommand provides a single pane of glass for storage management, automation, and system analysis, eliminating administrative overhead and providing consistency of utilization across protocols. In addition, FlexPod and OnCommand's open APIs and SDK offer integration with various third-party orchestration management or home-grown tools so that organizations can leverage existing investments.

## Value Analysis

Integration at the hardware level is important. By minimizing interaction in terms of interoperability testing and technology integration, FlexPod helps ensure that infrastructure implementation is not an exercise of highly technical configurations posing an impediment to application deployment. But the true value in FlexPod integration is the level of intelligence seamlessly shared between its server, networking, and storage systems. The hardware components can operate well on their own, and, with relatively little labor, the three pieces of infrastructure can be cabled together and immediately recognize one another's existence. The exponential value is then realized by how well these systems communicate, share information, and automate processes in a seamless manner, which is invisible to the IT administrator.

In terms of managing the whole stack, Cisco UCS Manager plays a key role in abstracting the underlying server, networking, and storage assets into service profiles that enable organizations to create role-based management. This allows IT administrators from various domains to work with the terminology and tools with which they are most familiar. Standard roles are built in, but Cisco UCS also enables custom ones to be created. Each role has a corresponding set of privileges that control write access to server, LAN, SAN, and other UCS component configuration. The result is a complete stack that can be managed with UCS Director through a single pane of glass with enough granular capabilities to both streamline processes and appeal to server, network, and storage administrators.

IT leaders are always interested in ways they can save time and money, and become more efficient and effective at their roles within the company. Constantly managing and maintaining individual stacks of infrastructure consumes an enormous amount of time. One of the most attractive pieces of value of an integrated system is the ability for IT to focus on managing the platform as opposed to configuring it. When IT can shift its focus away from routine and mundane tasks, administrators can gain tremendous value in the following ways:

- **Headcount:** Better management tools equate to being able to do more with existing IT resources, and in some cases, with reduced overhead. The ideal situation occurs when an organization can shift valuable IT personnel away from tactical, manual tasks toward more of a strategic role in the organization by arming them with management and automation tools.

- **Streamlined process:** Management integration enables IT to streamline provisioning and proactively predict the availability of IT resources. It can also optimize capacity and performance, and automatically provision workloads on the best-suited infrastructure without manual intervention or downtime.
- **Business value:** IT can quickly change the way businesses view the IT role by leveraging management tools to quickly provision resources, add capacity, provide real-time reporting metrics, and share chargeback information to lines of business that rely on IT resources.

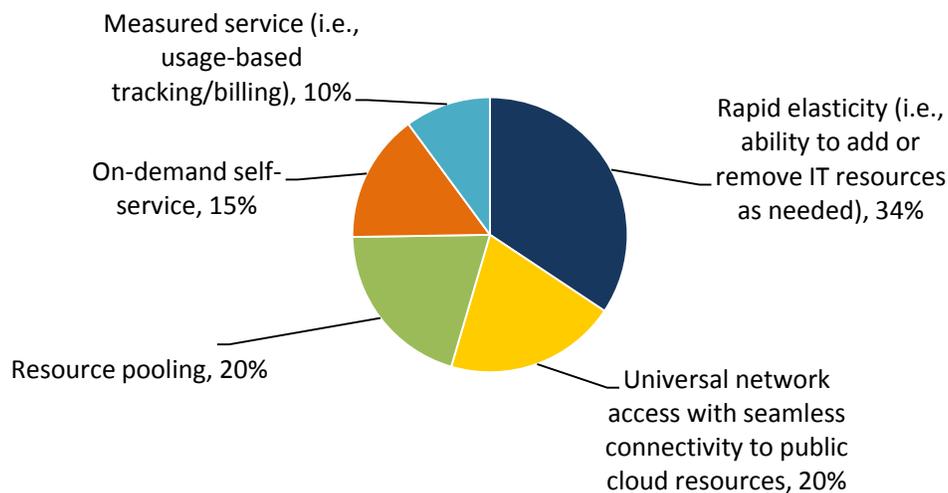
To obtain these operational benefits, IT requires integration of all infrastructure components, which can then feed intelligence to IT operations and automate system administrative tasks. IT's responsibility then becomes building, applying, and managing policy while the infrastructure reacts to change. This returns exponential value by optimizing the usage of IT infrastructure and operational efficiency.

## Gateway to the Cloud

The differentiating factors between a highly virtualized data center and a dynamic private cloud infrastructure are management and orchestration capabilities. Specifically, IT organizations that have orchestration tools in place benefit from an improved view into the availability and utilization of resources and the subsequent ability to rapidly provision them based on this enhanced level of insight. This is crucial in light of the fact that more than one-third of respondents surveyed by ESG recently identified elasticity as the most important attribute of a private cloud infrastructure (see Figure 2).<sup>2</sup>

Figure 2. Most Important Attributes of a Private Cloud Infrastructure

**Which of the five essential characteristics of cloud computing do you believe is the most important attribute of a private cloud infrastructure? (Percent of respondents, N=260)**



Source: Enterprise Strategy Group, 2014.

Orchestration tools require a higher level of system integration, making virtual computing infrastructures—and, in particular, integrated platforms—strategic investments for organizations with intentions of deploying private cloud in the future. With a FlexPod, Cisco UCS Director delivers centralized automation and management, which helps reduce the complexity of managing today's data centers. It does this by abstracting the complexity of individual devices, hypervisors, and virtual machines into a single pane of glass. As a result, IT administration and operations can deliver unified infrastructure instances across virtualization, compute, network, and storage within minutes instead of weeks.

UCS Director enables IT professionals to create workflows as individual elements such as a LAMP stack, Red Hat bare metal instance, or Microsoft IIS Server, or combine them to create a single automated workflow to stand up a

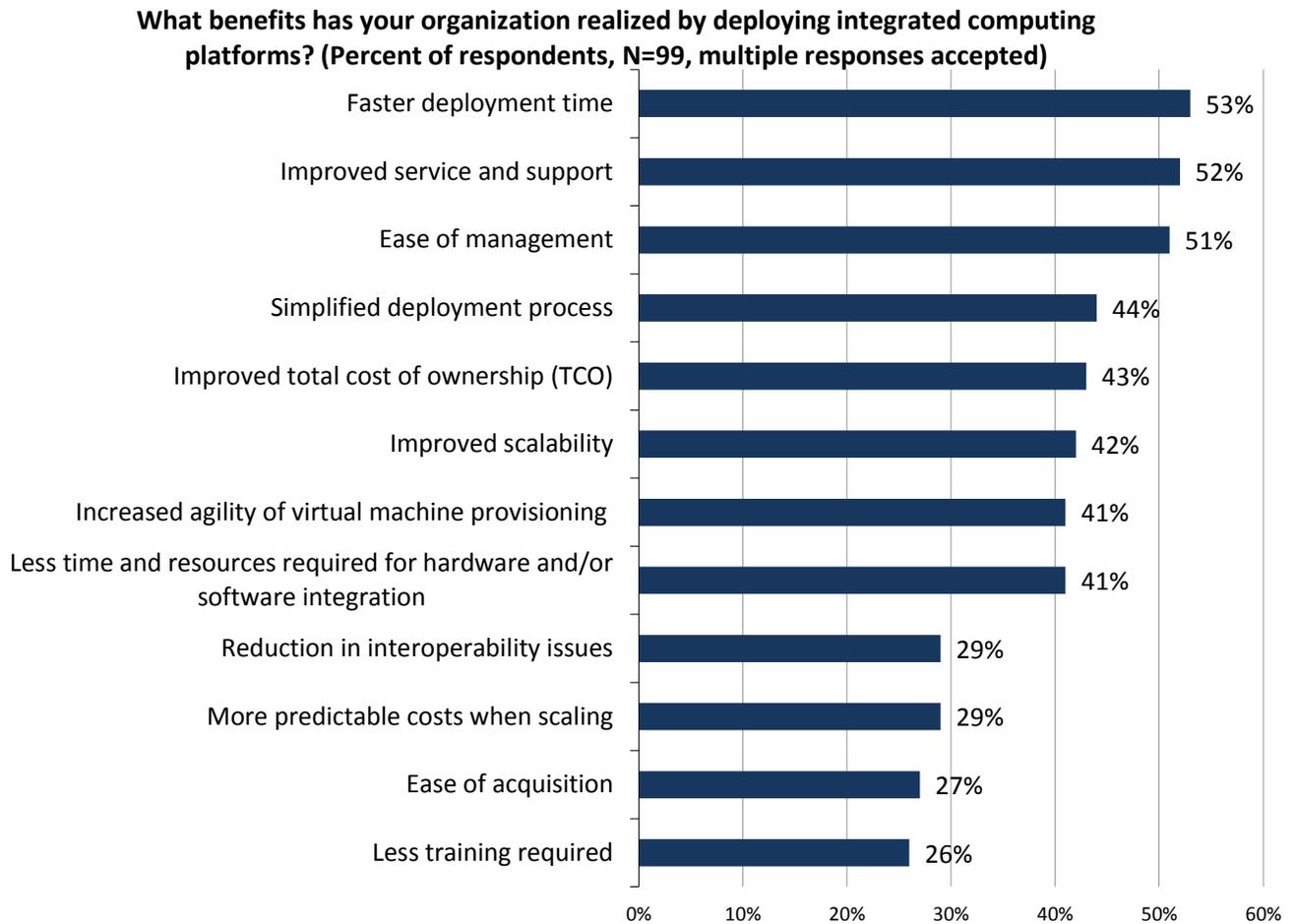
<sup>2</sup> Source: Ibid.

FlexPod instance to support a particular application such as SAP, VDI, or Oracle. In each of these cases, IT professionals can order infrastructure instances from the UCS Director self-service portal and have the service delivered within minutes.

Cisco Intelligent Automation for Cloud (IAC) extends a framework to scale to future cloud use cases. It includes a self-service portal tied to automated orchestration for rapid service delivery. This framework can adapt to new use cases such as multi-cloud and platform-as-a-service (PaaS) to simplify cloud-based service delivery within IT and development organizations. Cisco IAC delivers a comprehensive cloud management platform for capabilities ranging from converged infrastructure management to anything-as-a-service (XaaS) deployment through a robust self-service portal. Cisco IAC provides a flexible configuration solution for both private and hybrid cloud service delivery

Like Cisco UCS Manager, Cisco UCS Director brings together subject-matter experts (SMEs), who define the policies and best practices for their IT departments. The network engineer defines the VLANs and network configuration for specific groups and applications. The storage engineer defines data protection and SAN configurations. Server and virtualization administrators define allowable resource configurations and pools. Cisco UCS Director enforces these policies and automates resource delivery upon request by authorized users, which serves to streamline the entire provisioning process and simplify ongoing maintenance and management tasks, which happen to be two of the most commonly cited benefits realized by organizations that have deployed integrated computing platforms, as reported by ESG research respondents (see Figure 3).<sup>3</sup>

Figure 3. Benefits of Integrated Computing Platforms



Source: Enterprise Strategy Group, 2014.

<sup>3</sup> Source: Ibid.

Some of the specific FlexPod management capabilities that Cisco UCS Director offers include:

- **Single-purpose solution:** Cisco UCS Director was designed from the start with a single purpose: to manage FlexPod as a single entity. Designed to manage both ONTAP 7 mode and Cluster Mode, Cisco UCS Director talks natively to the NetApp storage controller as well as Cisco UCS and Nexus fabric. From the storage perspective, this means that the customer has the full range of capabilities of both ONTAP and OnCommand for the NetApp FAS storage.
- **Ease of installation and use:** Cisco UCS Director can be installed and up and running quickly. Beyond installation, Cisco UCS Director represents a different way of creating workflows for FlexPod. Customers can take advantage of the two-day deployment to begin the process of converting from siloed administrative pieces to managing a unified process.
- **Multivendor support:** Cisco UCS Director's initial focus was on managing FlexPod; however, it is also capable of managing standalone compute, network, and storage solutions from other industry leaders.
- **Task library:** Cisco UCS Director contains over 500 tasks that can be utilized by the IT administrator when constructing automated workflows. With drag-and-drop workflow creation, the API associated with each task is included as tasks are utilized to create an automated workflow. As a result, when workflows are completed, they are ready to run immediately or are published into the self-service infrastructure catalog.

## Deployment Options

Once the hardware is in place, there are several ways to implement the management software required to build a private cloud. While the final solution is typically a blend of packaged products and custom software, either developed in-house or with professional services, there are three primary methods of deployment:

- **Custom.** Custom solutions enable businesses to design software that best fits their specific needs. However, due to the substantial investment in time, resources, and capital to build them out, truly unique custom solutions have, for the most part, been relegated for specific use cases and businesses providing cloud services.
- **Semi-custom.** Semi-custom management combines turnkey and custom solutions. The balance of both speed-to-market with turnkey and flexibility with custom makes semi-custom the most common management deployment. Because FlexPod is an open platform, validated products provide businesses with the ability to easily customize their functionality as needs evolve.
- **Turnkey.** Organizations seeking to build out their private cloud faster and at a lower cost will look to packaged, turnkey solutions. This is where FlexPod leverages Cisco UCS Director and establishes market differentiation. Because these end-to-end solutions come pre-approved for common use cases by Cisco and NetApp, organizations can deploy them rapidly and with reduced interaction in terms of interoperability testing.

The FlexPod ecosystem delivers the value of partner products while also providing flexibility for the customer to choose and adopt her solution at a pace that matches the unique requirements of the IT organization.

## Customer Success Case

ESG spoke with an international travel insurance company whose existing physical server and direct-attached storage systems were nearing the end of life. Though it was still able to reliably deliver 24/7 services, daily outages and recovery costs were approaching \$3,000. Based on an environment assessment, the company determined that within six months, it could be facing business-disrupting failures. To avoid negative business impact, the organization realized it needed to refresh its systems and quickly build out and design a more reliable infrastructure model. This new model would need to allow it to reduce time to market and costs of delivering new services while improving flexibility and scalability. Moreover, the solution had to support the company's long-term strategy of implementing virtual desktop and cloud-based services.

The business entertained proposals from several service providers before ultimately selecting a FlexPod solution put forth by an IP-based integration services provider. It included a high availability (HA) NetApp FAS3140 with 14TB of capacity, four Cisco UCS B200 M2 blades, and VMware vSphere 4.1. VMware vCenter managed the virtual environment, while NetApp Virtual Storage Console and Cisco UCS Manager managed the physical environment. The VAR architected and delivered the single platform rapidly, enabling the company to achieve the speed to market that was so critical to the initiative. The customer reported that, "It worked perfectly from the moment we plugged it in, and has maintained that performance since."

The FlexPod solution immediately provided improved HA, performance, data protection, and recovery capabilities. VMs can be spun up and provisioned in a matter of seconds, and with NetApp FlexClone for creating multiple test/development environments, the organization has been able to optimize applications' performance before moving them into production. By reducing downtime and improving IT processes, the company estimates that in just eight months, conservatively factoring in only hard project costs, it received 100% return on its investment. Other soft costs not factored into the ROI include 60% less storage through NetApp's deduplication technology; reduced IT infrastructure assets leading to savings in both power and floor space; licensing and management savings through a streamlined and integrated management approach; and nearly an 80% drop in time spent in break-fix mode.

Though these economic benefits are marked, the operational drivers are equally substantial. FlexPod enabled the company to achieve the reliability, scalability, and flexibility it required to maintain service 24/7/365 to its service professionals, claims analysts, and enrollment agents, and to maintain uptime to all its websites and branded domains.

## The Bigger Truth

FlexPod is a unique integrated computing platform that meets many market demands and solves IT's top reported priorities. Its hardware integration provides built-in, seamless intelligence between the server, networking, and storage systems, reducing interoperability snares that can complicate server virtualization deployments. Server virtualization challenges surrounding capacity planning, system tuning, and orchestration demand a higher level of integration; constantly managing and maintaining individual stacks of infrastructure consumes valuable time and resources. By default, this level of integration is engineered into FlexPod. By design, these components can be rapidly cabled together, enabling the system to be brought online faster and with less effort than trying to piece together a solution from scratch, which enables faster time to market and reduced IT overhead.

Although hardware integration is an integral value proposition, the true value of FlexPod resides in its automated management and orchestration capabilities. A shared infrastructure, FlexPod's management solutions, such as NetApp OnCommand, Cisco Nexus Network management, and UCS server management, coordinate pool-based and policy-driven resources across the entire system through centralized management interfaces. In addition, Cisco UCS Director is an integral companion for FlexPod because it allows holistic management through centralized automation and orchestration from a single, unified view. These management capabilities make FlexPod an ideal platform to transform traditional data centers into highly dynamic private cloud infrastructures.

Cisco and NetApp are leaders in market innovation, focused not only on the importance of hardware, but also on the exponential value of management design and integration. This integration can help accelerate the value of IT and truly shift the economics and operational efficiency of the IT organization.



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