

White Paper

FlexPod: The Gateway to Your Private Cloud

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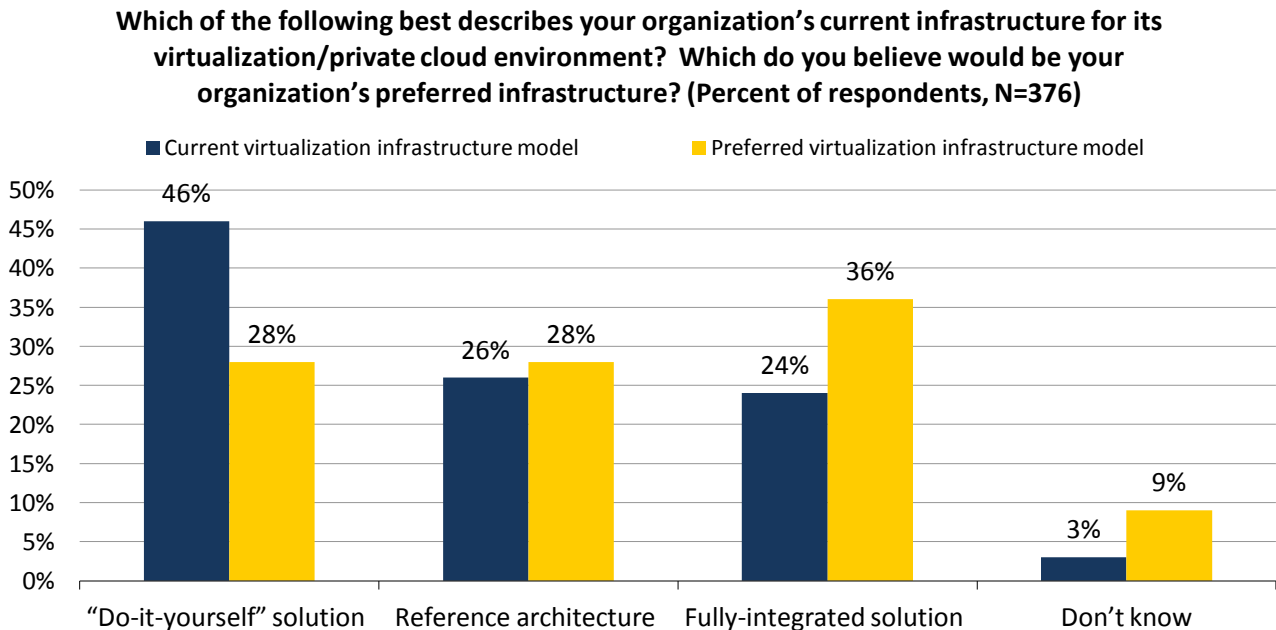
Introduction

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, brought about newfound data storage challenges that 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 which 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. As part of ESG’s *2012 IT Spending Intentions Survey*, respondents were asked about the current underlying infrastructure and deployment model for their organization’s server virtualization/private cloud environments, as well as their preferences. Figure 1 shows that nearly half (46%) of organizations currently leverage the do-it-yourself (DIY) option. This makes sense given IT’s high level of comfort and experience with traditional hardware and software implementations. However, more than one-third (36%) of respondents would prefer deploying fully-integrated, or pre-configured, computing platforms—such as FlexPod—to serve as the back-end infrastructure for their organization’s virtualization/private cloud deployment, compared to just 28% who prefer the DIY model.¹

Figure 1. Organizations’ Current vs. Preferred infrastructure for Virtualization/Private Cloud Environments



Source: Enterprise Strategy Group, 2012.

¹ Source: ESG Research Report, [2012 IT Spending Intentions Survey](#), January 2012.

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, 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. For faster time-to-market, organizations can leverage FlexPod's ecosystem of management partners, including CA Technologies, Cloupia, and Gale that deliver validated turnkey management solutions for end-to-end orchestration across all FlexPod components. These validated solutions make it possible to deploy IT services in minutes as opposed to weeks by reducing complex, multi-administrator processes to repeatable workflows that are adaptable. Finally, businesses can leverage numerous management partners such as BMC, Microsoft, VMware, and Dynamic Ops, who deliver either semi-custom or custom solutions that combine some of the time-to-market benefits of turnkey solutions with the adaptability of custom solutions. Altogether, FlexPod management solutions enable organizations to integrate in-house management tools and third-party services to deliver optimal flexibility, customization, and orchestration across virtualized environments.

FlexPod

FlexPod is a unified, scalable, and pre-validated reference architecture designed for both virtualized and non-virtualized environments. FlexPod can accommodate a variety of mixed workloads including Microsoft Private Cloud and Applications, SAP Applications, Oracle, Citrix XenDesktop, Microsoft Private Cloud, and VMware Exchange, SQL Server, SharePoint, View, 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

An integrated architecture in its own right, 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 that 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 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 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:

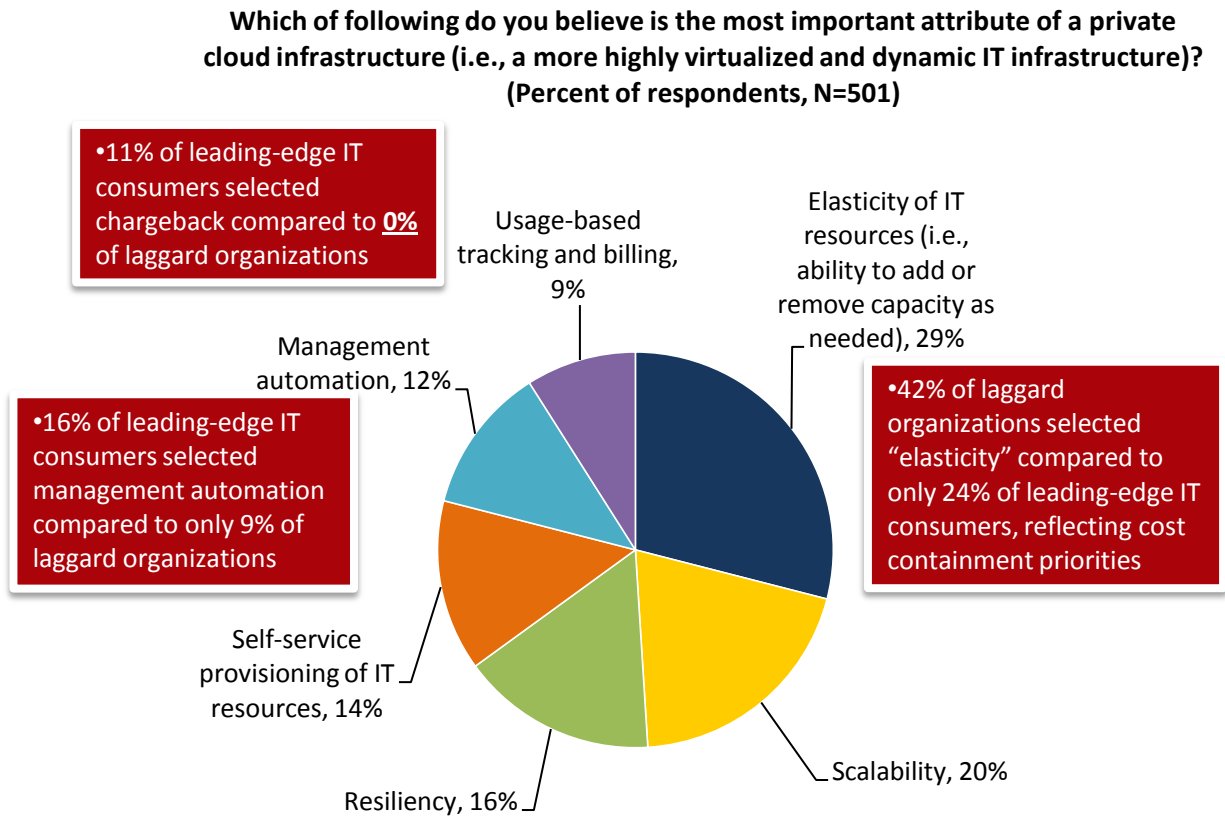
- **Headcount:** Better management tools equate to being able to do more with existing IT resources, and in some cases, with reduced overhead. The ideal situation occurs when an organization can shift valuable IT personnel away from tactical, manual tasks towards more of a strategic role in the organization 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. They enable automation, elasticity, scalability, and self-service, four of the marquee attributes of private clouds, as reported by respondents to an ESG research survey (see Figure 2).²

Figure 2. Most Important Attributes of a Private Cloud Infrastructure



Source: Enterprise Strategy Group, 2012.

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. To this end, FlexPod offers two domains of management for both granular execution at the component level and broader orchestration of the whole system: FlexPod's proprietary infrastructure management tools with open APIs and validated FlexPod management solutions.

FlexPod's management tools—including NetApp OnCommand storage manageability, Cisco Nexus network management, and UCS server management—coordinate the delivery of prescriptive, pool-based, and policy-driven resources across the entire system. FlexPod management combines the strengths of these solutions and aligns automated, service-oriented resource delivery across the entire stack, enabling each component to be managed

² Source: ESG Research Brief, [Private Cloud Usage Trends](#), August 2012.

through a pool of resources as opposed to individually. Moreover, each component of the stack has been designed with open and published APIs, enabling organizations to integrate FlexPod into existing management platforms, such as custom tools found at service providers and enterprises. This open framework fosters flexibility and speed of deployment; flexibility by enabling many solution architectures for various use cases; and speed of deployment by leveraging FlexPod partners' validated management solutions.

There are currently eight different management vendors developing turnkey solutions that fully integrate with FlexPod and provide end-to-end solutions for automation and orchestration. In order for a solution to become FlexPod-validated, NetApp and Cisco labs must verify that it meets an extensive set of functional and design requirements, including:

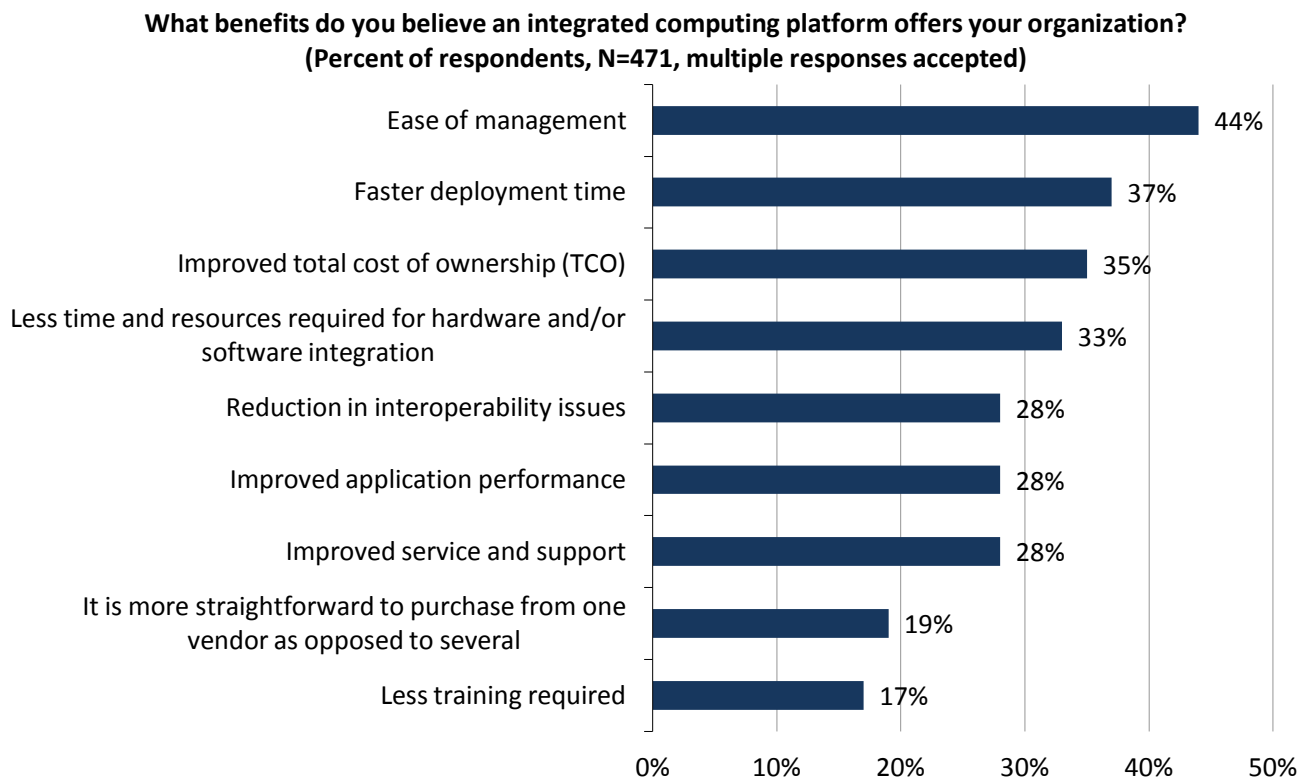
- **Unified management.** Managing various independent systems in isolation increases risks in terms of compliance and regulations, and absorbs management resources that could be otherwise used more efficiently. Through a cohesive, shared infrastructure management solution, IT can better address corporate policy with fewer resources, which can be reallocated to driving business through strategic initiatives.
- **Adaptable and extensible automation.** Automation is essential to providing a turn-key solution. A prescriptive set of automated operations to configure the physical and virtual infrastructure components of FlexPod can save IT significant time and money in manual configurations. Moreover, because the automation is adaptable and extensible, IT can reduce complex, multi-administrator processes to repeatable user-defined workflows, enabling rapid deployment of IT services and improved time-to-market.
- **Service-oriented orchestration.** Service-oriented orchestration performs two integral tasks. First, it coordinates and arranges multiple services across different applications and delivers them as higher level business services. Second, it utilizes a centralized location and takes a service-oriented, policy-driven approach to provision and configure the entire stack, reducing back-end labor for IT administrators.
- **Integration into data center management.** As an open system, FlexPod requires that solutions provide complete programmatic interfaces for integration with customer environments and complementary tools for management validation. By creating solutions that integrate into existing environments rather than require whole system refreshes, IT is able to make a smoother transition into integrated computing and private cloud.
- **Resource monitoring and metering.** Resource monitoring and metering, coupled with the right analytics, provide end-to-end visibility into utilization metrics, performance, and overall system health—insights that pinpoint degraded performance and guide resource allocation for improved system uptime.
- **Cohesive user experience.** The control interfaces of the FlexPod management solution must provide a unified set of facilities for delivering compute and storage resources within an integrated infrastructure. Managing the whole system rather than its individual components vastly reduces IT's workload, saving time that can be spent in other productive means.

As long as FlexPod partners address these requirements and pass NetApp and Cisco testing, they are free to implement additional functionality, innovate, and most importantly, compete with one another, which creates an ideal situation for end-users. Once the solutions are validated, businesses can confidently implement them knowing that they provide unified, turnkey functionality. This rapidly improves time-to-market by reducing complex processes to repeatable workflows. Of the partners developing solutions for FlexPod, three have passed solution validation testing for automation and orchestration: Clouvia, Gale Technologies, and CA.

Along with enhanced flexibility, these two domains of management combine to improve ease of management and time to market, which are the top two benefits realized by organizations deploying integrated computing platforms, as reported by ESG research respondents (see Figure 3).³

³ Source: ESG Research Brief, [Integrated Computing Trends](#), March 2011.

Figure 3. Benefits of Integrated Computing Platforms



Source: Enterprise Strategy Group, 2012.

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 its large ecosystem of management partners to deliver validated solutions that provide value to businesses and establish 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 its 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, since these tools are designed with open and published APIs, organizations can integrate FlexPod into existing platforms or into validated, turnkey solutions from one of FlexPod's management partners. Together, these solutions provide businesses with the ability to deploy a solution quickly and with the necessary customization to meet unique demands. 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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