White Paper

NetApp for the Private Cloud

Enable the Delivery of IT as a Service

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EXECUTIVE SUMMARY

Cloud computing is increasingly being adopted as a way for IT organizations to decrease costs, improve efficiency, and enhance business agility. In a recent IDC survey of IT decision makers, 44% of respondents indicated that they were considering implementing a private cloud—a cloud deployment contained within the corporate firewall to meet the needs of internal customers.

NetApp has been helping companies succeed in cloud deployment to achieve tangible results since long before the term “cloud” entered the popular lexicon. NetApp can help you build the foundation for a flexible IT infrastructure for cloud computing. We have the people, processes, and technologies in place to help you evolve your existing IT infrastructure into a service delivery model that enables you to deliver IT services to your users.

The NetApp Unified Storage Architecture integrates all the storage capabilities you’ll need into a single, easy-to-use platform. By choosing NetApp for transitioning to cloud computing, your storage infrastructure will be able to meet your business needs, now and in the future.

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1 INTRODUCTION

The traditional approach to designing IT infrastructures is evolving. While the application-based silo (in which compute and storage infrastructure is dedicated for the exclusive use of a single application) remains the standard for some IT shops, many organizations have deployed zones of virtualization to improve utilization and efficiency.

The next evolutionary step beyond virtualization is increased automation to enable the delivery of IT as a service (ITaaS). There are a variety of names for this—advanced virtualization, dynamic data center, cloud computing, cloud services, etc.—but all refer to more or less the same thing: a means of running IT that is more cost efficient and more responsive to business needs by becoming a service provider and delivering IT as a service to your end users. This is achieved through a shared, virtualized infrastructure, automated provisioning for faster resource allocation, and automated operations for more efficient management. The expected returns promise reduced overall total cost of ownership, improved efficiencies, and increased business agility.

In this paper, the term cloud is used to refer to this type of efficient, automated IT infrastructure, with a further distinction between:

- Private clouds: hosted inside an organization's firewall primarily for use by the organization's own employees; and
- Public clouds: infrastructure or applications hosted by service providers and offered as services to enterprises that have decided to outsource some applications for financial, architectural, management, or other business reasons

According to an IDC survey of IT decision makers on the forecast of private and public cloud computing through 2014[1], 44% are considering private cloud. If you are considering private cloud deployment, virtualization is a natural and necessary step. Subsequent steps may include mechanisms to implement chargeback and self-service provisioning. If you plan carefully and make the right technology choices at the start of your transition, you can build your private cloud by evolving what you have rather than ripping out and replacing infrastructure as you go.

NetApp, with its innovative data and storage management solutions, has been helping companies evolve to a private cloud infrastructure since before the term cloud became popularized. This white paper discusses the business drivers that are leading companies to a private cloud, important steps that NetApp suggests you consider when following the path to cloud deployment, and the benefits of NetApp unified storage for the path to the private cloud.

2 PRIVATE CLOUD BUSINESS DRIVERS

IT budgets in most organizations remain stubbornly flat, but demands on IT continue to rise year over year. The main forces driving organizations to implement private clouds are requirements to increase business agility, reduce costs, and improve efficiencies.

- **Business agility** results from an improved ability to elastically scale infrastructure up or down to meet dynamically changing and new business needs. Slashing the time to provision a system and activate a new application from weeks to days, hours, or even minutes can accelerate application development and test—improving quality and time to market—and can also have a dramatic effect on your business's ability to innovate.

[1] Worldwide Enterprise Server Cloud Computing 2010–2014 Forecast, IDC, April 1, 2010

- **Costs** can be reduced by leveraging a virtualized, shared IT infrastructure. This not only reduces hardware acquisition costs but also results in significant savings in IT staffing costs and data center space, power, and cooling.
- **Efficiency** improvements result from standardization, better resource allocation and utilization, simplified and automated provisioning processes, and overall operational efficiency improvements in the automation of all aspects of IT management.

To understand how a private cloud can lead to improvements in these three areas, consider a typical purchasing organization. It's not unusual to have a surge in workload at the end of each quarter. Unless the department has enough compute power to handle this surge, throughput suffers and orders don't get processed on a timely basis.

With a private cloud, the purchasing department can request and receive extra resources as needed and be charged accordingly. Because resources are shared among all departments, this is accomplished without the need to have a lot of extra computing capacity sitting idle most of the quarter, so it is more cost effective. Efficiency improves because the purchasing department simply requests the necessary resources without red tape or excessive IT intervention. Purchasing can respond to increasing or changing business needs either by scaling infrastructure for existing applications or provisioning infrastructure for new ones, and that significantly improves business agility. And naturally the same benefits apply to other departments or business units that utilize the same shared IT infrastructure.

3 EVOLVING TO A PRIVATE CLOUD

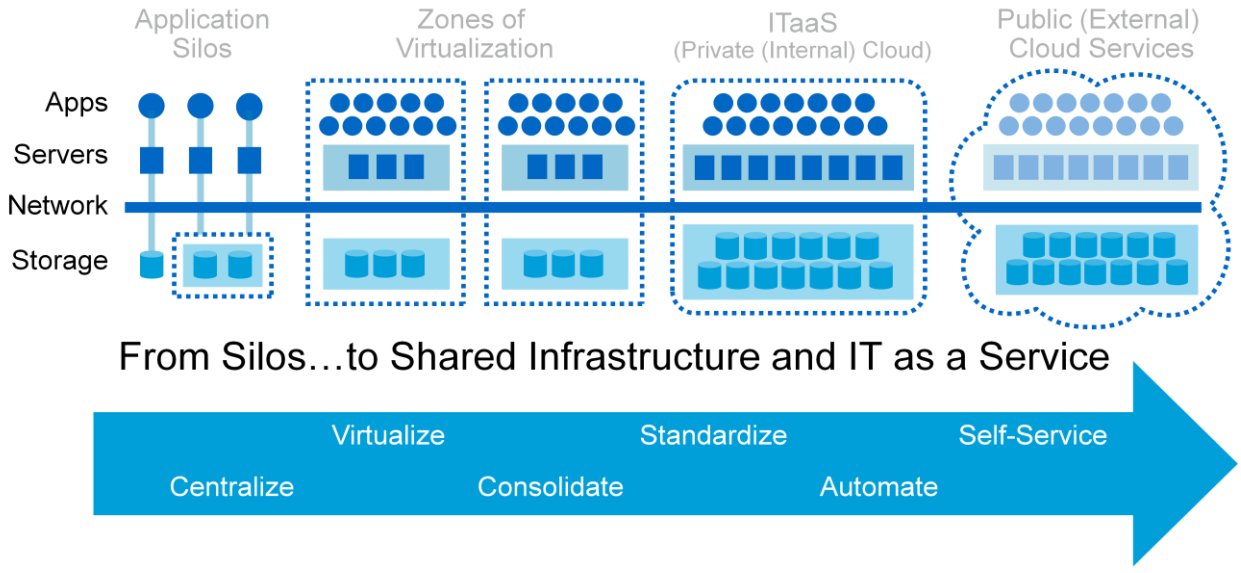
When planning to evolve your IT infrastructure to a cloud computing model there are two fundamental questions that you want to be able to answer:

- Where do I want to get to? As a starting point, you need to evaluate your applications to determine the right infrastructure for each, based on business requirements.
- How do I get there? Once you know where you want to be, making a smooth transition that addresses both business and technology requirements is essential.

WHERE DO I WANT TO GET TO?

NetApp defines four IT infrastructure models, as illustrated in Figure 1.

Figure 1) Evolving models of IT infrastructure.



- **Application Silos.** Application silos are still the standard in many IT shops. These traditional environments were built and optimized to run specific applications. This approach typically delivers poor server and storage utilization (on average, 10–15% utilization for servers and 30–40% for storage). One of the challenges in deploying applications in a silo topology is the inability to share resources to better leverage the investment in servers, networks, and storage. As an example, an application like SharePoint® can consume server and storage resources rapidly and quickly need extra capacity in order to keep scaling. Within the same environment, an Exchange application may have extra server and storage capacity and only support a small population of users, yet that extra capacity cannot be redeployed efficiently to address the SharePoint requirements because they are not managed in a shared environment.

  However, some applications are appropriate for this type of environment, and there may be a variety of reasons for maintaining them in dedicated infrastructures, such as security requirements that warrant complete isolation.
- **Zones of Virtualization.** Many organizations have virtualized some servers and storage, creating zones of virtualization. Virtualization can significantly improve utilization and efficiency. Once you have virtualized your environment, you have the foundation of a shared IT infrastructure of pooled compute, network, and storage resources to delivery capacity on demand and meet fluctuations in resource requirements.
- **Private Clouds.** With a private cloud, IT infrastructure remains internal, but applications are decoupled from servers and can be moved without disruption to address usage and performance needs. Services are offered to internal customers from a service catalog with metering and chargeback capabilities on a shared IT infrastructure that delivers greater cost savings, utilization, and efficiency. A high degree of automation makes these processes simpler to manage.
- **Public Clouds.** In the public cloud model, IT infrastructure or complete applications are hosted by outside service providers. Public clouds may be ideal for routine processes or applications as well as for organizations that don't have the in-house expertise to manage their own environment. Moving applications to public clouds has been occurring for several years, such as for e-mail and payroll.

Examining all your applications to understand how they are currently deployed and whether to move them to a private cloud is a valuable exercise. You may decide to keep business-critical applications in dedicated, application-based silos. Many of these applications will be candidates for virtualization and the cloud, but for some applications it may be too expensive or disruptive to move them in the near term.

NetApp believes that a hybrid data center model—in which organizations maintain some applications in dedicated infrastructures, embrace virtualization for the majority of applications, and evolve over time toward a private or public cloud—will be the typical pattern for many established IT organizations.

HOW DO I GET THERE FROM HERE?

Most enterprises that have already moved to private cloud computing did so by evolving their traditional IT infrastructures over time.

The path that your company will take depends on where you are starting from as well as your specific requirements and objectives. NetApp has worked with enterprises that typically follow the following steps, not necessarily in this order. In general, an enterprise will centralize IT; consolidate, virtualize, and standardize their IT environment; and then evolve to deliver IT as a service with advanced automation and self-service capabilities.

- Centralize management
- Consolidate and virtualize
- Standardize
- Automate
- Self-service

CENTRALIZE MANAGEMENT

Centralizing IT management is necessary to gain visibility of costs, take control of your IT offerings, and achieve the economies of scale you'll need to begin the transition toward a service-oriented private cloud. You can't make any meaningful progress until you have a complete picture of what resources you already have and reach a general consensus regarding the strategy and direction of IT within the company.

For example, many IT organizations can relate to the need to reduce costs while managing year-over-year storage growth. Through multiple acquisitions and/or organic growth, some companies end up with multiple IT departments, each with its own staff and infrastructure, resulting in a great deal of redundancy and wasted resources.

Through a detailed analysis of previous storage usage and expenditures and a projection of future storage usage and expenditures, this information can identify overlaps and opportunities for improvement and justify the need to centralize management of IT to the organization.

CONSOLIDATE AND VIRTUALIZE

Early adopters of the private cloud have found that virtualizing and consolidating servers and storage are necessary prerequisites to cloud implementation. Virtualization and consolidation by themselves provide a number of significant benefits:

- **Increase asset utilization**, reducing the amount of IT infrastructure needed to accommodate your existing workloads.
- **Simplify management** by reducing the number of devices you have to manage and allowing you to manage many virtual machines from a single console. Virtualization also facilitates the movement of both applications and data, making such tasks easier to perform.
- **Enhance availability** by providing simplified means for implementing high availability and disaster recovery for many applications with more rapid restart in the event of failed services.

Desktop virtualization is emerging as another area of opportunity for faster and more efficient provisioning through private cloud-based services, with the potential for reducing costs of hardware and management and reducing management complexity.

STANDARDIZE

Standardizing procedures and creating repeatable processes are key to improving quality and provisioning times, and reducing support costs and risk in a cloud computing environment. There are two aspects of standardization to consider:

- **Standardizing servers, storage systems, desktop, and network devices.** Virtualization and consolidation may not result in an environment that is completely uniform. By standardizing, however, you help enable your environment to become more uniform as you add new hardware and retire aging devices. Standardizing takes the headaches out of provisioning, transforming it from a long, drawn-out process to a simple and repeatable one.
- **Standardizing services and processes**. Creating a service catalog of storage services attached to service-level agreements that satisfy the majority of infrastructure requests from your internal customers introduces consistency, and streamlines the IT request and delivery process.

AUTOMATE

The more you can automate regular practices such as provisioning, activation, backup, and replication in a cloud computing environment, the better your environment can scale to meet the dynamic nature of delivering IT as a service. Policy-based automation maps end-user requirements to specific levels of service. Once policies are established, storage consumers (a new application, a business unit, etc.) can request and receive capacity and automatically get the appropriate level of data protection and other services without manual intervention.

One important criterion for distinguishing between a virtualized environment and cloud computing is chargeback or cost awareness. With automated, self-service capabilities, it is important to understand which resources your customer is using, how much of them, and for how long. Chargeback and cost awareness require visibility into your environment as well as mapping of resources to the services being delivered. This enables you to understand how much of a given service your users are consuming and how to appropriately charge for those services. Although many organizations may not be ready to actually initiate chargeback, the cost awareness is valuable for planning and management purposes.

SELF-SERVICE

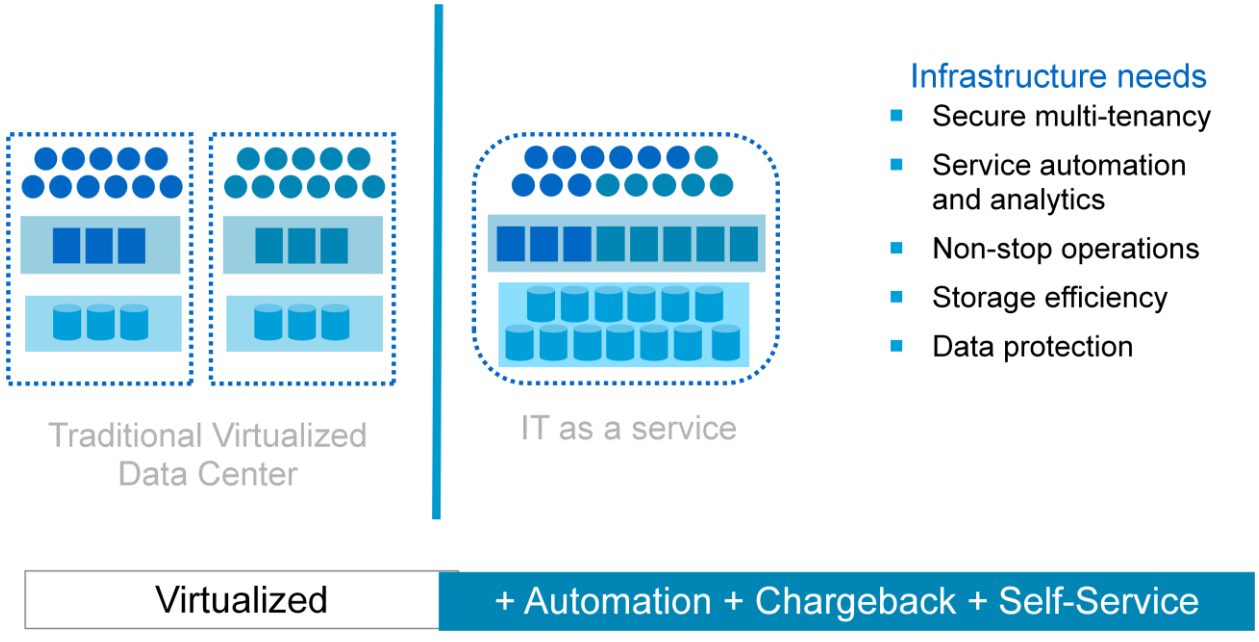
Creating a self-service environment in which your internal customers can request and receive appropriately configured IT resources with little or no IT intervention is an important step in cloud deployment. This is achieved by defining a service catalog of standard configurations with SLAs attached to services and data protection levels. Allowing administrators and users to scale resources on demand, choose different levels of performance and data protection, and automate recovery from application errors becomes possible through application integration and self-service capabilities.

4 NETAPP FOR THE PRIVATE CLOUD

NetApp private cloud solutions are built on a virtualized, shared IT environment with advanced automation capabilities.

The NetApp approach to private cloud deployment combines the right people and processes with innovative technologies to transform your IT infrastructure into a services delivery model. This approach changes the way technology resources are purchased, provisioned, and managed. It changes ownership of compute resources from the business unit to IT, where IT purchases the resources, deploys them against the services requested, and manages them as efficiently as possible through a shared IT infrastructure. With a services delivery model, IT can offer services to its internal customers from a service catalog, meter usage, create chargeback models, and deliver services for greater cost savings, utilization, and efficiencies by leveraging a shared IT infrastructure.

Figure 2) Virtualization is the foundation for the private cloud.



THE RIGHT TECHNOLOGY

NetApp private cloud solutions are based on our industry-leading data and storage management technology. Our single hardware and software platform handles any workload, providing a "future-ready" design for evolving to a private cloud.

To protect your existing hardware investments as you evolve to a private cloud computing model, NetApp V-Series controllers can be used as a front end for all major storage arrays. With V-Series solutions, you can take advantage of storage efficiency technologies for cloud computing, such as Snapshot®, thin provisioning, FlexClone®, deduplication, and more.

Our application-aware data storage works in concert with your network, server, and data management layers to deliver the capabilities that distinguish cloud computing. NetApp offers leading technology advantages for delivering private cloud-based services, including:

- Unified architecture
- Secure multi-tenancy
- Service automation and analytics
- Nonstop operations
- Storage efficiency
- Integrated data protection

UNIFIED ARCHITECTURE

NetApp storage solutions for cloud computing are built on the foundation of our unified storage architecture and Data ONTAP® operating environment. Unlike competing storage systems, every NetApp storage system provides truly unified storage—most widely used storage protocols (including SAN protocols like iSCSI, Fibre Channel, and Fibre Channel over Ethernet [FCoE] as well as NAS protocols such as NFS and CIFS) can be served from the same storage system. No matter which storage protocols you choose, all your data volumes are managed using the same set of tools for integrated data protection, enhanced storage efficiency, and other storage functions. Other vendors have separate, and often incompatible, tools for each storage protocol.

With NetApp, one system, one platform, and one investment in training can address all your storage needs, and grow with your business as you progress from application silos to virtualization to cloud computing.

SECURE MULTI-TENANCY

Secure multi-tenancy is required to cost-effectively and securely partition a single system to support multiple tenants, such as applications, business units, workgroups, and security zones. While security in private clouds may not be as high a priority as it would be in public clouds, many enterprises will require secure isolation of different business units on a shared IT infrastructure, such as for securing human resource data access from the marketing department. NetApp MultiStore® software lets you create multiple, separate, and private virtual storage controllers (vFiler® units) on a single storage system, so you can share storage with minimum impact on privacy or data security. The result is secure, multi-tenant cloud storage with increased storage utilization.

NetApp, Cisco, and VMware created the industry's first secure multi-tenancy capability that includes all the server, storage, and networking hardware and software necessary to facilitate sharing, reuse, and dynamic resource allocation in a multi-tenant cloud environment. This purpose-built capability has been carefully tested, integrated, and documented via a Cisco Validated Design.

SERVICE AUTOMATION AND ANALYTICS

One of the keys to achieving the benefits of a private cloud is automating and simplifying management. NetApp provides a suite of management products that simplify storage operations by automating all tasks

associated with storage so you can manage more capacity with fewer resources while increasing operational efficiency. Policy-based automation maps end-user requirements to specific levels of service. Once policies are established, storage consumers (a new application, a business unit, etc.) can request and receive storage and automatically get the appropriate level of data protection and other services without manual intervention.

To provide end-to-end cloud management, we're partnering with leading IT service management (ITSM) solution providers, such as BMC Software, and other vendors such as Gale Technologies, DynamicOps, and newScale, to fully integrate our storage management capabilities with their orchestration products. NetApp open APIs and SDKs make it easy to integrate NetApp storage management with ITSM solutions, enabling you to protect your investments with your preferred ITSM solution or in-house management tools while leveraging NetApp's powerful storage management capabilities.

NONSTOP OPERATIONS

The requirement to keep your IT environment running 24x7 in a cloud environment necessitates the ability to move users, applications, and data dynamically and transparently across your infrastructure while routine lifecycle management activities occur. Additionally, you need to balance performance while optimizing cost to maintain SLAs without experiencing system downtime. NetApp Data Motion™ software lets you easily and quickly migrate data across multiple storage systems while maintaining continuous user access to applications. Fully integrated with the Data ONTAP software platform, NetApp Data Motion integrates three proven NetApp software technologies—MultiStore, SnapMirror®, and Provisioning Manager—to provide live data migration for your shared storage infrastructure. The result is that you can manage your private cloud environment nondisruptively.

STORAGE EFFICIENCY

Maximizing your storage efficiency can not only significantly decrease your operational costs, it also can increase your business agility by quickly aligning computing resources with rapidly changing business and workload requirements that are inherent in a shared IT infrastructure. NetApp helps you achieve the highest levels of storage efficiency through a single unified storage architecture and unique storage software, such as deduplication, thin provisioning, and flexible cloning to boost overall efficiency, reduce costs, and increase utilization. You can use at least 50% less storage with NetApp compared to traditional storage.[2]

INTEGRATED DATA PROTECTION

Protecting a shared IT infrastructure from outages and data loss is imperative in a private cloud computing model. NetApp integrated data protection embeds services directly in the storage that deliver high availability, disaster recovery, backup, and compliance. NetApp integrated data protection allows you to offer a range of SLAs to meet varying requirements within your organization, including compliance regulations.

THE RIGHT PEOPLE AND PROCESSES

Making the transition to cloud computing requires more than technology; it requires a paradigm shift in IT that includes significant changes to IT processes and the roles and responsibilities of IT staff. NetApp understands this and can help you make the transition with as little risk and disruption to your ongoing operations as possible.

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[2] http://www.netapp.com/us/solutions/infrastructure/virtualization/guarantee.html

NetApp Professional Services and our Authorized Professional Service partners can help you with a well-documented project delivery methodology that includes everything from requirements definition to solution architecture planning to installation, testing, setup, deployment, and—once the solution is deployed—knowledge transfer. We use a well-defined work-breakdown structure and a clear project management methodology with templated delivery processes, allowing us to implement projects in a predictable and repeatable fashion.

In addition, NetApp has developed field-proven operational best practices that can help you improve the governance of your IT environment with defined processes and services that are necessary to deliver storage into an enterprise. Aligned to a globally adopted standard for IT best practices, the IT Infrastructure Library (ITIL), our operational approach helps you enable the delivery of storage services in a consistent, repeatable fashion with a high level of service quality.

NetApp offers a Fast-Start Workshop that can help you take the first steps to evolve your IT infrastructure to a private cloud. The workshop delivers an end-to-end evaluation of your data center environment from an organizational, technological, capacity, and operational viewpoint. In this workshop, we:

- Identify application and infrastructure targets for the cloud based on capacity, performance, and service-level needs.
- Assess impacts in terms of cost savings, efficiency gains, and performance improvements.
- Identify process improvements in terms of impact on cost and efficiency, agility and timeliness, and progress toward an IT-as-a-service delivery model.

The result is a summary of the top areas for near-term improvement, a project road map, and actionable next steps for solution implementation.

PARTNERSHIPS FOR YOUR SUCCESS

NetApp has cultivated a vendor-neutral approach and an extensive ecosystem of partners to help you on your path to a private cloud. Our partners include leading IT vendors such as VMware, Cisco, Microsoft, and Citrix and global system integrators such as Accenture, CSC, and Fujitsu. They work with us to deliver an integrated private cloud solution that is tailored to your specific requirements.

5 PRACTICAL APPLICATIONS OF THE PRIVATE CLOUD

INDUSTRY: HEALTHCARE

OVERVIEW

A fast-growing independent medical examination company in the United States is focused on building a national network of services through direct expansion, mergers, and acquisitions. The company provides medical assessment programs for first-party insurers, attorneys, municipalities, and third-party administrators handling automobile, short- and long-term disability, group health, liability, no-fault, and workers' compensation claims.

CHALLENGES

- Quickly deliver services via an internal cloud infrastructure to the organization.
- Scale seamlessly to support tripling revenue growth over the next three years.
- Slash IT costs.

SOLUTION

The solution is a flexible, scalable infrastructure comprised of NetApp, Cisco®, and VMware®. A NetApp FAS3140 system, populated with FC disk drives, provides storage resources via NFS to the VMware environment running on a Cisco Unified Computing System® configured with B-Series blade servers and a Cisco Nexus 5000 Series Ethernet switch. The VMware vSphere™ 4 cloud operating system and View 4 desktop virtualization solution provide full virtualization for all servers and desktops.

BENEFITS

By deploying NetApp unified storage, the Cisco UCS®, and the VMware virtualization platform together, the company streamlined deployment of data center resources, eliminated complexity, and achieved operational efficiencies. Additional benefits included:

- Highly adaptable infrastructure to deliver cloud-based services
- Avoided $1M in IT staffing costs and $500K in capital and operating expenses
- Supports over 2,000 employees with just 3 racks and 4 full-time equivalent employees (FTEs) versus 15 racks and 25 FTEs

6 NETAPP ON NETAPP WITH CISCO AND VMWARE

OVERVIEW

To enable products to stand up to the heavy 24x7 workloads of modern enterprises, NetApp rigorously tests against conditions that mirror—or exceed—the scale and extreme-performance conditions of enterprise data centers. But like any manufacturer, NetApp must balance requirements for stringent product testing with time-to-market demands and testing-infrastructure costs.

CHALLENGES

- Performance to handle extreme-workloads testing
- Seamless up and down scalability for flexibility and maximum resource utilization
- Deliver on-demand server and storage resources

SOLUTION

The solution is comprised of an engineering as-a-service infrastructure on a VMware vSphere-based private cloud running on the Cisco Unified Computing System data center platform. Twenty NetApp FAS3170 unified storage systems provide capacity (via FCoE, FC, iSCSI, NFS, and CIFS) to the shared-test environment. The solution is located in NetApp's new energy-efficient Global Dynamic Laboratory in Research Triangle Park, North Carolina.

BENEFITS

Building an engineering-as-a-service infrastructure on Cisco/VMware/NetApp enables unprecedented flexibility, responsiveness, and efficiency. Specific results include:

- Deploy 10,000 virtual clients in less than an hour
- Requests-for-services fulfillment within days or hours
- Achieve 100 times the capacity within the same cost structure

7 CONCLUSION

Unprecedented economic pressure for new models of doing business and the maturity of virtualization technology are accelerating the adoption of cloud computing. Private cloud computing is gaining traction as more and more organizations look for ways to achieve higher levels of cost reductions, improved efficiency, and increased business agility for their virtualized environment.

The move to a private cloud requires careful planning and execution, taking a holistic view of your IT environment and balancing business needs and costs. Leading companies are already delivering data and applications as a service using NetApp cloud solutions. We can help you get on the path to evolve your IT infrastructure to deliver IT as a service. Taking that next step involves building your virtualized environment into a fully automated, service-oriented infrastructure of pooled resources (server, storage, and network) that enables you to easily and efficiently deliver IT services to your internal users.

For more information about NetApp solutions and services for the private cloud, visit netapp.com/cloud. If you're ready to get started, contact your NetApp representative or consider engaging with NetApp Professional Services to attend a NetApp Fast-Start Workshop.

8 REFERENCES

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