Cloud: What an Enterprise Must Know

What You Will Learn

This document is addressed to business and technology leaders at enterprises worldwide, with the expectation that the reader has a basic understanding of cloud computing. As you work through this process within your own organizations, you can read this document to gain insights from Cisco's perspective about the benefits, barriers, and options that exist for the enterprise. This document shares Cisco's vision and strategy of cloud for the enterprise and offers guidance about how to navigate the landscape.

CLOUD MODELS

Cloud Service Models

- Infrastructure as a Service (IaaS) provides users with processing, storage, networks, and other computing infrastructure resources. The user does not manage or control the infrastructure, but has control over operating systems, applications, and programming frameworks.
- Platform as a Service (PaaS) enables users to deploy applications developed using specified programming languages or frameworks and tools on the cloud infrastructure. The user does not manage or control the underlying infrastructure, but has control over deployed applications.
- Software as a Service (SaaS) enables users to access applications running on a cloud infrastructure from various end-user devices (generally through a web browser). The user does not manage or control the underlying cloud infrastructure or individual application capabilities other than through limited user-specific application settings.

Cloud Deployment Models

- Private clouds are operated solely for one organization. They may be managed by the organization itself or by a third party, and they may exist on or off premises.
- Public clouds are open to the general public or to a large industry group and are owned and managed by a cloud service provider.
- Hybrid clouds combine two or more clouds (private or public) that remain unique entities but are bound together by technology that enables data and application portability.
- Community clouds feature infrastructure that is shared by several organizations and supports a specific community. They may be managed by the organizations or a third party and may exist on or off premises.

Source: NIST http://www.csrc.nist.gov/groups/SNS/cloud-computing/index.html.

The Power of Cloud for the Enterprise

Business and IT executives are confronted daily by conflicting and exaggerated claims of how cloud will transform their industries, but the lure of transformative efficiency and agility is hard to ignore. This document starts with some definitions and then takes a look at the real benefits of and barriers to cloud.

Defining Cloud

In the simplest terms, cloud is IT delivered as a service over the network. Going a level deeper, cloud is a model in which IT resources and services are abstracted from the underlying infrastructure and provided on demand and at scale in a multi-tenant environment.

- "On demand" means that resources can be provisioned immediately when needed, released when no longer required, and billed only when used.
- "At scale" means the service provides the experience of infinite resource availability to meet whatever demands are made on it.
- "Multi-tenant environment" means that the resources are provided to many consumers - for example, business units - from a single implementation.

Note that the physical location of resources (on or off premises) is not a part of this statement. From the perspective here, that aspect has more to do with the way the cloud is sourced than with what the cloud does.

As a framework, this document uses the National Institute of Standards and Technologies' (NIST) model for cloud, differentiating service models that define what a cloud delivers from the deployment models that define the environment those services are delivered in or from.

How the Enterprise Benefits from Cloud

Cloud computing represents a significant shift in the way that IT resources are managed, operated, and consumed. This change exposes several benefits to enterprises, promoting greater IT efficiency and agility.

Capital expenses (CapEx): Cloud promotes greater optimization and utilization of IT assets, allowing you to do more with less and achieve significant cost reduction. You can take on IT capital investments in increments of required capacity instead of building for maximum (or burst) capacity.

Nighthawk Radiology reduced its physical server count by more than 50 percent with Cisco cloud solutions.

Operating expenses (OpEx): Public cloud offerings are billed to the enterprise on a pay-per-use basis and private clouds can be treated as OpEx by consuming business units, although IT would continue to make capital investments. Through automation, cloud reduces the amount of time and effort needed to provision and scale IT resources.

iTricity decreased operating costs by 30 to 35 percent in 3 years with Cisco cloud solutions.

Simplification: Cloud promotes simplification of the underlying IT infrastructure resources to fewer standardized products, technologies, and platforms. This standardization reduces operational complexity and promotes operational consistency. Cloud also encourages IT to develop a catalog of standard services on which to build business capabilities.

Belfast Health and Social Care Trust simplified its IT infrastructure by using cloud solutions from the Cisco, EMC, and VMware partnership known as the Virtual Computing Environment (VCE) coalition.

Flexibility: Cloud provides flexibility in the way you source, deliver, and consume the IT services you need to build business capabilities.

SunGuard built a private cloud in partnership with Cisco using cloud solutions from the VCE coalition and then extended the model to its global IT services customers.

Agility: Cloud can compress the time needed to provision and deploy new applications and services from months to minutes. This increased agility allows you to experience the benefits of new applications and services and bring new capabilities to market sooner, creating a potential competitive advantage.

Seattle University reduced provisioning time from weeks to minutes with Cisco cloud solutions.

Overall, cloud offers a way for IT to create a platform for cost-effective and responsive innovation to become a partner for growth within the enterprise.

Barriers to Adoption

While most enterprises have recognized the potential benefits of cloud, practical concerns and perceived challenges have hampered the widespread adoption of cloud technologies and services.

Many of these barriers can be understood as questions of trust: Can the cloud be trusted to deliver the same capabilities at the same service levels in the same controlled way as traditional IT?

- Security: Can the same security available to applications be applied in the cloud?
- Compliance: Can applications in the cloud meet the same regulatory compliance requirements?
- Reliability and quality of service (QoS): Can the same service-level agreements (SLAs) for reliability and QoS be met in the cloud, especially given the multi-tenant use of the underlying IT infrastructure?
- Control: Can application owners still have the same amount of control over their applications and the infrastructure supporting them in the cloud?
- Fear of vendor lock-in: Will use of a particular vendor for cloud services or infrastructure prevent use of a different one in the future, or will the enterprise's data and applications be tightly locked into a particular model?

These concerns represent questions of technology and governance, but do not address any potential organizational friction that might arise from adopting cloud. For example, who will manage which part of the cloud or who will determine which applications to migrate to the cloud.

Cisco believes that all these concerns can be met with the right technology, architecture, and approach.

The Enterprise Approach to Cloud

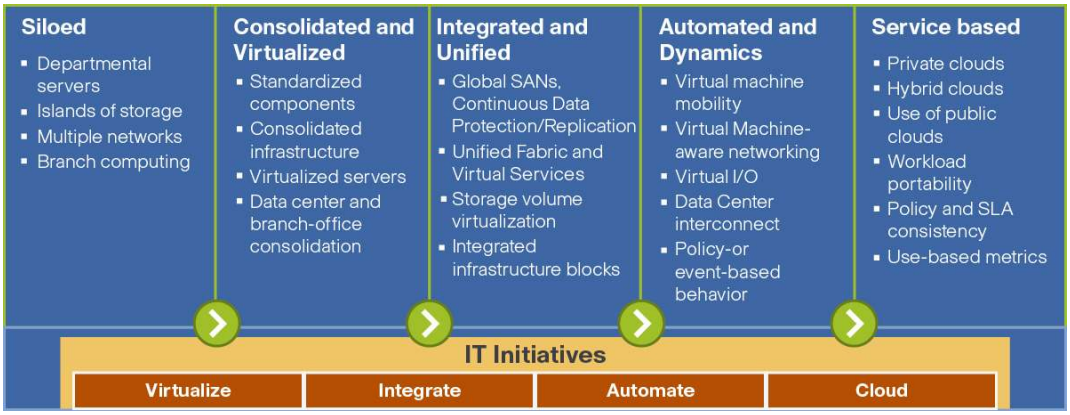
Cloud is not a "one-size-fits-all" proposition: the right approach depends on your enterprise's needs and priorities. Different service and deployment models can be adopted to match the requirements of applications across the business.

While enterprises may see tangible benefits in using public clouds, Cisco expects private and hybrid cloud models to be more common. Enterprises may use public clouds for burst or peak capacity and for selected services. However, these organizations often require a higher degree of control over their data, applications, and systems than current public clouds allow. At scale, a private cloud offers the efficiency and agility of a public cloud without the loss of control.

The capability to use multiple clouds, both internal and external to the enterprise, is part of Cisco's long-term vision of cloud, with ubiquitous, portable workloads and an environment in which many external and internal clouds coexist, federate, and share resources dynamically. This dynamic marketplace will extend enterprises to providers and providers to providers, transparently and securely. It will be based on available capacity, power cost, and proximity and will promote a new wave of innovation and investment similar to that last seen with the growth of the Internet in the mid-1990s. Cisco has partnered with many service providers and participates in major standards bodies to work toward the realization of this vision.

For enterprises seeking to start with their own private clouds, there are many entry points to the process of cloud adoption. How you move through the process, what applications and workloads you deploy to the cloud, what technologies you use, and the order in which you move services to the cloud may differ greatly from the approach of another organization. This section steps through a sample approach to building a cloud. Figure 1 summarizes the general process.

Figure 1. Sample Approach to Building a Cloud



Virtualize

Server virtualization is almost always a cloud prerequisite. While there are some interesting exceptions that bypass virtualization and still retain the essential elements of a cloud, virtualization in most cases provides sufficient immediate payback to justify starting with virtualization. Doing so also lays the foundation necessary for other initiatives. Virtualization promotes standardization of IT infrastructure assets and resources because abstracting the operating environment of applications from the hardware on which it runs demands platform consistency. The standardization may not be one-size-fits-all, however. Many enterprises are defining a small number of classes of resources, for example, different classes of servers with different memory, processor types, and storage and network connections, based on the kinds of workloads that are targeted for them. Virtualization can also be extended to storage and networks to achieve the same benefits of higher utilization, lower costs, and standardization and may be a requirement for multi-tenancy.

Integrate

With the standardization caused by virtualization as a basis, the enterprise develops an integrated and unified IT infrastructure. Individual IT infrastructure components can be integrated into a few unified platforms:

- An integrated package of server, virtualization, storage, and network access for a complete computing platform
- A single, virtualized storage platform to serve as the global storage resource pool for the computing platform
- A unified fabric for interconnecting computing and storage resources over a single, converged network platform

The enterprise may go further and package these standard platforms into basic IT infrastructure building blocks to begin scaling to meet overall business needs instead of building out on a project-by-project basis.

Automate

Virtualization and integration enable the IT infrastructure to be viewed and treated as pools of resources that can be allocated and reallocated at will to serve a given application. The enterprise can automates those operations to create rapidly deployable services.

Automation lets the enterprise systematically remove time- and labor-intensive requirements for maintenance and operation while paving the way for self-service provisioning of the virtualized IT infrastructure resources and the elasticity of those resources to meet the demands of the business.

When self-service provisioning and elasticity of IT resources becomes a reality through the implementation of greater automation and management capabilities, the enterprise is crossing the line from virtualized IT infrastructure to cloud.

Deliver Services

Ultimately, the enterprise begins to view IT capabilities in a service-oriented way: as a catalog of services delivered by IT to the rest of the organization, consumed in a self-service fashion. The IT infrastructure has essentially been abstracted away and is no longer exposed to the consumers of IT’s services.

The enterprise chooses where and how to meter and bill consumers - for example, business units - for the use of these services within the organization and begins evolving the IT service catalog as needed to meet changing business requirements.

With a service catalog interface between IT and IT service consumers, the enterprise can begin to consider the means of sourcing IT resources to fulfill requests: from the enterprise's private cloud, from a service provider's public cloud, from a virtual private cloud within a service provider's cloud, from both its own cloud and a service provider's cloud to create a hybrid cloud, or from some combination depending on the specific applications and services to be delivered.

What Cisco Brings to Enterprise Clouds

Cisco's Enterprise Cloud Strategy

To help enterprises achieve the benefits of and overcome the barriers to cloud, Cisco has a three-point strategy:

- Deliver products, solutions, and services to organizations to build secure clouds
- Enable enterprises to deliver secure cloud solutions and services to internal customers
- Advance the market for cloud by promoting technology innovation, open standards, and ecosystem development

Cisco's enterprise cloud strategy is closely integrated with what we view as the factors that are reshaping enterprise IT:

Data Center Virtualization: enabling greater utilization and operational efficiency of data center IT infrastructure and providing the foundation for building enterprise clouds

Borderless Networks: connecting anyone, anywhere, using any device, to any resource securely, reliably, and transparently, and connecting users to clouds and clouds to each other

Collaboration: bringing together people in multiple locations across multiple networks to improve and accelerate interactions among collaborators, allowing teams to form more quickly and find the information that is relevant to them faster

The network is a key to these ideas and to Cisco's cloud strategy. One of the fundamental characteristics of cloud is that the services are delivered in a location-independent fashion, making the network an essential platform for delivering cloud.

To implement our strategy to enable you to achieve the benefits of cloud, Cisco has built an innovative portfolio that provides choice and flexibility to enterprises. Cisco solutions range from architectures that detail how to design clouds, to the actual IT infrastructure needed to build and connect clouds, to services and solutions that can be consumed using any of the cloud deployment models in conjunction with service providers.

Architecture Leadership

Both on its own and with leading partners, Cisco tests and develops comprehensive IT architectures to guide the design of enterprise clouds. Some examples follow.

Cisco has developed a cloud reference architecture framework to outline, describe, and deal with questions of design, technology, processes, and operations for all aspects of a private cloud (Figure 2). This reference architecture is the result of Cisco's own experience in building, deploying, and operating its own private

ROLE OF THE NETWORK PLATFORM IN CLOUD

Access to Critical data, Services, Resources, and People

- Core fabric connects resources within the data center and data centers to each other
- Pervasive connectivity links users and devices to resources and each other
- Network provides identity- and context-based access to data, services, resources, and people

Granular Control of Risk, Performance, and Cost

- Manages and enforces policies to help ensure security, control, reliability, and compliance
- Manages and enforces SLAs and consistent QoS within and between clouds, enabling hybrid models and workload portability
- Meters resources and utilization to provide transparency for cost and performance

Robustness and Resilience

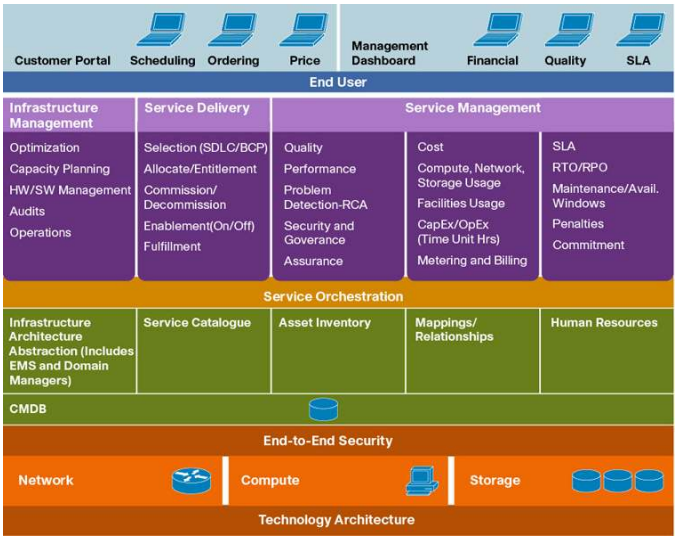
- Supports self-healing, automatic redirection of workload and transparent rollover
- Provides scalability, enabling on-demand, elastic computing power through dynamic configuration

Innovation in Cloud-Specific Services

- Context-aware services understand identity, location, proximity, presence, and device
- Resource-aware services discover, allocate, and pre-position services and resources
- Comprehensive insight accesses and reports on all data that flows in the cloud

cloud.

Figure 2. Cisco Cloud Reference Architecture Framework



Private Cloud Solutions

The Cisco Virtualized Multi-Tenant Data Center (VMDC) architecture provides an end-to-end architecture and design for a complete private cloud providing IaaS capabilities. VMDC consists of several components of a cloud design, from the IT infrastructure building blocks to all the components that complete the solution, including orchestration for automation and configuration management. The building blocks are based on stacks of integrated infrastructure components that can be combined and scaled: Vblock™ Infrastructure Packages from the VCE coalition developed in partnership with EMC and VMware and the Secure Multi-Tenancy (SMT) stack developed in partnership with NetApp and VMware. Workload management and infrastructure automation is achieved using BMC Cloud Lifecycle Management (CLM). Clouds built on VMDC can also be interconnected or connected to service provider clouds with Cisco DCI technologies. This solution is built on a service delivery framework that can be used to host other services besides IaaS on the same infrastructure: for example, a virtual desktop infrastructure VDI).

The Cisco VDI solution delivers a complete server-hosted virtual desktop IT infrastructure for the enterprise. Cisco VDI helps achieve increased administrative control and data security, provide a near-native end-user computing experience, and ease the migration to newer desktop operating systems, while helping IT control OpEx and CapEx. Cisco VDI technologies, services, and best practices are combined with partner offerings to provide an open, best-in-class approach to achieving resource efficiency and control, simplified management, security, policy, and desktop delivery optimization.

These solutions for building private clouds are also being used by service providers to build cloud infrastructures on which to provide public, hybrid, and virtual private clouds to their enterprise customers. With service providers and enterprises, Cisco is developing an ecosystem of cloud providers, builders, and consumers. This ecosystem will be able to take advantage of common approaches to cloud technology, management, interconnection, and operation.

Cloud Communications and Collaboration Solutions

Cisco offers secure, rich collaboration solutions that that can be deployed by customers, service providers, and Cisco in private clouds, public clouds, and hybrid clouds. These solutions offer flexible deployment models and interoperability for communications and collaboration that help reduce the cost of IT operations while speeding delivery of innovation.

Building on existing hosted Cisco Unified Communications offerings, Cisco Hosted Collaboration solutions provide enterprises with great flexibility in choosing how they deploy collaboration applications throughout their organizations. Cisco's solutions provide the capability to deliver integrated voice, messaging, presence, instant messaging, mobility features, web conferencing, and contact center services from a service provider's cloud, from the enterprise's own private cloud, or in a hybrid cloud model.

The Cisco WebEx™ Collaboration Cloud provides a real-time, global SaaS cloud that delivers Cisco WebEx collaboration applications with fast, reliable, and highly secure performance.

Other solutions include the Cisco Eos™ platform for media and entertainment that is delivered as a SaaS and Cisco Quad, an enterprise collaboration platform combining the power of social networking with communications, business information, and content management systems.

Cloud Security and Borderless Network Solutions

Security is traditionally applied at the network perimeter, but in cloud environments, borderless networks connect many types of users from many locations with public and private cloud-based resources. Certain kinds of use cases and applications, such as a remote worker accessing Salesforce.com, do not even pass through enterprise network or scanning systems. Cisco Borderless Network solutions address this challenge, securing cloud computing by placing intelligent control points and endpoints throughout the network.

Delivered as an on-premises appliance, in a hybrid cloud model, or as a pure SaaS solution, Cisco IronPort™ technologies provide scalable and sophisticated email protection with exclusive preventive and reactive technologies including spam protection, data loss prevention (DLP), virus defense, email authentication, encryption, tracking, and reporting tools.

Going beyond email, Cisco ScanSafe is a SaaS solution offering web security and filtering services to examine and control web traffic and content.

Other solutions include Cisco AnyConnect software, which provides secure mobile access to enterprise resources through a range of remote devices with rich, granular security and an always-on connection, and Cisco Security Intelligence Operations (SIO), which provides a cloud-based service to connect global threat information, reputation-based services, and sophisticated analysis to Cisco network security devices.

Cloud-Enablement Services

Along with technology solutions, Cisco continues to build a complete portfolio of professional services to help enterprises with all aspects of their cloud efforts.

Cisco Cloud Enablement Services help enterprises:

- Assess and develop a cloud strategy by addressing such questions as "What can cloud do for my business?" and "What will be the costs, return on investment (ROI), and business effects of implementing a private cloud in my enterprise?"
- Plan and design an enterprise cloud by addressing such issues as SLAs and final solution design
- Implement and integrate a new cloud into existing or new IT environments
- Manage and optimize the evolution of the enterprise's private cloud through activities such as architectural reviews and security audits

Cisco VDI Enablement Services help enterprises:

- Develop a strategic plan for a VDI project that helps the organization understand the value of a VDI solution and develop the metrics to validate a VDI investment

- Plan and design how to best virtualize the necessary desktop and branch-office infrastructure and create a phased roadmap for deployment

Other services include virtualization-specific services and services for Cisco Intelligent Automation Solutions for IT infrastructure automation and management.

Where to Begin Your Journey

Cisco is working with its broad ecosystem of partners to assist some of the world's leading institutions in their initial cloud deployments. Cisco will have a central role in the unique journeys of enterprises, small and medium-sized businesses (SMBs), public-sector organizations, and service providers as they move to cloud.

When the topic of cloud comes up, the conversation often focuses on the newest technologies and the latest service provider offerings. However, Cisco believes that every conversation needs to begin with an understanding of the expected business outcomes. Is the goal lower total cost of ownership (TCO) or greater agility and innovation, or some blend of the two? The journey to cloud has many paths; starting the journey without a clear understanding of the destination can lead to disappointing results.

Enterprises should start the journey to cloud by answering some basic questions:

- What is the expected impact of cloud on my business?
- Which applications can and should I move to the cloud?
- What cloud deployment model is best suited for each of my applications?
- How do I transition my existing applications to the cloud?
- How do I maintain security and policy compliance in the cloud?
- How do I transition my organization to best take advantage of cloud?

The answers to these questions will fundamentally shape your cloud strategy. For guidance through the initial process, Cisco recommends customers take advantage of the advisory services available from both our partner community and Cisco Services. Through these channels, we are helping customers define and implement a pragmatic approach to cloud. We deliver solutions that address our customer's unique business architecture and needs, align with regulatory constraints, and are optimized according to the customer's individual preferences for performance, cost, and risk.

For More Information

As you begin your own journey to the cloud, we invite you to discuss the right approach for your organization with your Cisco account manager, channel partners, and other IT advisors. For additional information about cloud, please visit http://www.cisco.com/go/cloud.

USE CASE: PRIVATE CLOUD FOR RETAIL ENTERPRISE

Situation

- Major Global Retail company
- Employee desktop costs rising dramatically as new capabilities are required to support new applications and older systems are unable to keep up to the processing demands
- The need to update and secure thousands of desktops sapping IT administrative resources
- Integrating or converting new desktop environments brought in from M&A activities require a unique process in each instance

Role for cloud and cloud-like technologies

- Flexible, rapidly provisioned, cost effective and secure desktops centrally hosted from company data centers
- The life of existing desktops extended through limiting the use of local resources to display processing
- Virtualized desktops can be centrally managed, updated, patched, secured, and backed up

Considerations

- Increased demands from both local and remote network for video and media traffic associated with VDI
- Access to virtual desktops from multiple end points such as thin clients, desktops, laptops, and mobile devices in multiple locations over local, wide area, and VPN-secured public networks

Cisco's differentiation

- Complete architecture for delivering VDI using open modular building blocks with key technology partners including storage, management software, virtualization platform, and endpoints
- Roadmap for providing integrated real-time rich media to VDI environments, with unified communications desk IP phone support already established
- VDI operations framework for desktop, server and network including
- Specialized WAN and application optimization capabilities for VDI
- Can utilize the same infrastructure used to deliver Cisco's general private cloud solutions

USE CASE: PRIVATE CLOUD FOR INSURANCE ENTERPRISE

Situation

- Major European Insurance company
- New business capability investment and delivery is limited by long provisioning times and management overhead in IT
- Significant server resources are severely underutilized across multiple data centers, adding unnecessary operational costs to the business
- Disparate technology environments for various production and non-production applications supported by IT are causing very high maintenance and management overhead

Role for cloud and cloud-like technologies

- A virtualization solution to allow consolidation of services and applications on to fewer physical resources, enabling data center consolidation
- Virtualized resources integrated with existing management systems and automated to enable agile provisioning and IT workflow automation

Considerations

- The virtualization solution should enable consolidation of x86 production workloads and "Tier 2" dev/test workloads onto a single physical platform
- Automation of provisioning and IT workflow for the virtualization solution should create the elastic resource utilization necessary for a private cloud
- The final cloud solution should provide the foundation for implementing a Virtual Desktop Infrastructure in the data center

Cisco's differentiation

- Offering a unique, pre-integrated infrastructure package with leading industry partners for the virtualization and consolidation of x86 workloads, with the ability to scale out based on overall resource utilization
- Ability to integrated with existing IT management systems through APIs
- Capabilities to engage in orchestration and automation of provisioning all virtual machines, connectivity, and storage required to create an agile, elastic virtual infrastructure for production and non-production x86 workloads
- Capability to use the same infrastructure and architecture to deliver a VDI solution
- Jointly with our partners and their expertise in strategy development, designing and implementing scalable, agile and robust solutions, we deliver increased workplace productivity and reduce total operational costs

USE CASE: PRIVATE CLOUD FOR MEDICAL SERVICES ENTERPRISE

Situation

- Major US Medical Services company
- Intense focus on systems availability, with failures measured in terms of delayed healthcare to patients and not just monetary cost
- Data center relocation project to result in a new data center to be set up in an active-active configuration with an existing data center
- Desire to move to a new computing platform that met high availability demands as well as unification of storage and data networking with Fiber Channel over Ethernet (FCoE), with the ability to support dense virtualization and automation capabilities for a private cloud

Role for cloud and cloud-like technologies

- Provide high level of availability in the form of virtual machine backups, live migration, and automatic failover in case of individual system failures
- Collapse storage and data network traffic onto a single, integrated physical network or unified fabric
- Ability to run over an active-active data center configuration

Considerations

- Being able to prove and test systems availability both within and across data centers
- Network capabilities required between data centers to support both storage and virtual machine mobility
- Impact of FCoE on infrastructure design
- Support and integration with VMware capabilities

Cisco's differentiation

- Ability to support FCoE natively on the UCS platform
- Dramatic UCS extended memory capabilities to support very dense virtualization
- Server profiles for true stateless computing
- APIs to hook into IT and automation management products
- Integration with VMware availability, backup, and recovery technologies
- Proven network extension technology for storage and virtual machine mobility between data centers

USE CASE: PRIVATE CLOUD FOR FINANCIAL SERVICES ENTERPRISE

Situation

- Major US Financial Services company
- Trying to centralize, integrate, and standardize IT systems from more than 50 acquired or subsidiary companies
- Too much management overhead to deal with high number of vendors and support touchpoints
- Unable to easily move workloads to new data centers as the data center portfolio is rationalized and consolidated

Role for cloud and cloud-like technologies

- Provide a single interaction point for both administrators and users to deploy and use approved applications
- Be able to consolidate systems and workloads without affecting application uptime
- Provide a single platform for all application development and deployment
- Support secure multi-tenancy on shared infrastructure

Considerations

- Clearly defined and well integrated physical infrastructure footprint of compute, storage, and networking required
- Ability to show secure multi-tenant access for the individual companies and subsidiaries on shared infrastructure in multiple data centers
- Support for dense virtualization to support systems and workload consolidation
- Support for high availability and live migration capabilities
- Provide a clear support model from one organization for the cloud infrastructure

Cisco's differentiation

- Providing highly integrated and discrete infrastructure packages (Vblock) with EMC and VMware, through the VCE coalition
- VCE coalition serving as single support organization
- Dramatic UCS extended memory capabilities to support very dense virtualization
- VCE architecture for secure multi-tenancy using UCS and Nexus capabilities
- Integration with VMware availability, backup, and recovery technologies

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Printed in USA C11-617239-01 01/11