



Transforming Enterprise IT Services with a Secure, Compliant Private Cloud Environment

Introduction

Today every change or transition within the enterprise requires solid business justification and thorough planning.

Cloud computing—IT resources and services that are abstracted from the underlying infrastructure and provided on demand and at scale in a multitenant and elastic environment—offers the ability to break down IT silos with their inefficiencies, high costs, and ongoing support and maintenance issues while meeting increasing user demand for cost-effective, innovative service on demand across network, computing, and storage resources.

Cloud computing is justifiably called a transformational model for the enterprise. It transforms IT and the data center as we have known it: dedicated consumption, lengthy hardware procurement, manual addition of new services, manual repair of system failure, provisioning in months, and incremental capital expenditures.

Cloud computing can provide flexibility, efficiency, and democratization around resource allocation, resulting in agile IT service delivery—provisioning in minutes and time to market reduced by more than 50 percent—and cost optimization with higher server and storage utilizations, 50 percent reduction in capital costs, and 25 to 30 percent reduction in operational costs.

And it affects the very way we do business—back office, supply chain, and governance, to name a few—and the way we engage with employees, partners, vendors, and customers and grow the business.

Cloud computing profoundly transforms the way in which information and services are provided to and consumed by enterprise users: shared, self-service, scale on demand, automated recovery, provisioning on demand, and pay per use.

Today's users truly are a new type. They want and expect a secure user experience at every point of need. Businesses must not only protect the user experience but also must deliver robust security to meet legal and regulatory requirements around governance and compliance. Enterprises must consider security based on cloud types: for example, public versus private clouds. Enterprises also must design cloud security for an internal security program, as well as security for users. Cloud security—especially policy control, visibility, testing, auditing, encryption, on-demand security controls, and automated security management for rapid provisioning—becomes increasingly important, as does end-to-end isolation of data, data transmission, and data delivery across the delivery infrastructure—network services, network, computing, storage, and management—in a multitenant cloud environment.

In evaluating clouds, enterprises might decide that some applications, data, and services should not be transitioned to any cloud. But they also might shift certain enterprise public data to an external cloud to reduce the exposure of internally sensitive data to public access. In fact, cloud computing can offer some security advantages:

- Cloud homogeneity makes security auditing/testing simpler.
- Clouds enable automated security management.
- Clouds can provide redundancy/disaster recovery services.

Given the importance of security to businesses, enterprises might want to have or have access to a dedicated security team responsible for developing, implementing, and operating the security of cloud services.

Thus, cloud computing can help enterprises to continue to lower infrastructure costs, including security infrastructures; maximize limited capital and operational spending; secure the user experience; manage a multi-tenant infrastructure; align and optimize internal processes; enable usage-based per business unit costing; define and rapidly deliver service-level agreements (SLAs) for applications; and help meet the demand for services and rapid service provisioning.

The cloud computing market, composed of infrastructure-as-a-service (IaaS), software-as-a-service (SaaS), and platform-as-a-service (PaaS) service models, is growing with estimates of approximately \$60 billion by 2012. (See Figure 1.) In fact, a number of enterprises are considering the private cloud, in which the data center operates as an infrastructure as a service.

IaaS for private cloud offers a new operational model for accelerated delivery of the new IT high-value services—at reduced cost. For example, IaaS can enable consolidation and virtualization of underutilized IT computing resources into a virtualized cloud environment with increased flexibility due to IaaS' rapid provisioning capability.

Although some 30 percent or more of enterprises are estimated to be engaged in making the transition to cloud computing, the journey away from traditional IT infrastructures toward cloud computing is no small undertaking for the enterprise and its leaders at every level. Enterprises might benefit from:

- A clear understanding of cloud benefits and limitations
- A well-defined cloud business model and architecture requirements
- Identification of needed changes to IT operations and business processes, especially security, governance, and compliance
- An assessment of risk and financial effect
- Reduced risk during a cloud transition
- The resources to make the enterprise transformation efficient; cost-effective; and, most importantly, of real continuing value to employees, partners, vendors, and customers

CEOs Are Asking...

- What is our cloud strategy?
- How do we gain the benefits promised by cloud?
- How quickly can my enterprise scale to meet business demands?
- How can we assess and track the ROI with cloud computing?
- How does cloud computing affect the security of the enterprise and my customers?

CIOs Are Asking...

- What is the role of IT in an organization and the effectiveness of IT spend?
- What are the goals of IT over the next year?
- How scalable and flexible is my data center?
- How do I control IT cost spending or cost avoidance and reduce business risk?
- What can I do about server sprawl (leading to power, cooling, space challenges, and overall cost issues)?
- What about disaster recovery of critical computing infrastructure?
- How can I meet governance and compliance requirements and deliver secure operations?
- What about adoption of virtualization or cloud technology?
- What less strategic IT services can I out-source to another provider?

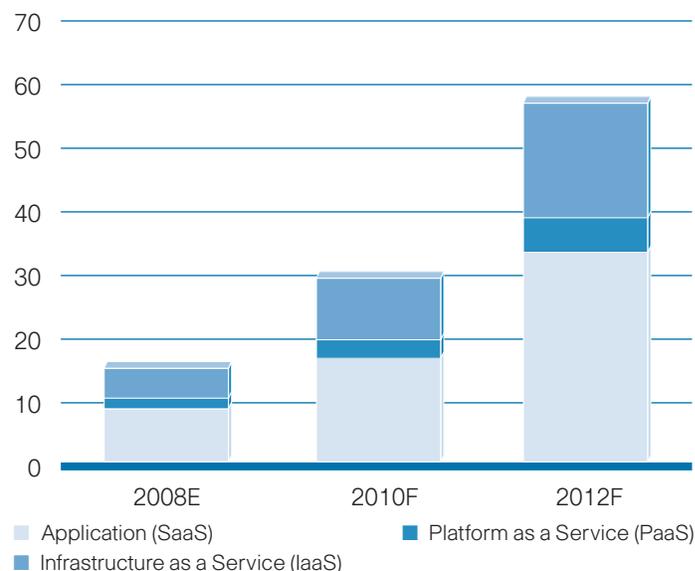
IT Directors Are Asking...

- How quickly can I deploy compute infrastructure to respond to my business needs?
- What constraints are keeping the business from fully utilizing the current compute infrastructure?
- How much would the business save if it had more robust infrastructure?
- What is the balance between rapid provisioning and secure operations for the enterprise and customers?

The journey's goal is a trusted cloud with the network as the logical platform to bring the existing assets in the data center and new cloud computing approaches together with virtualization, governance and security, and information and applications.

As in any journey, something unexpected can occur. The ease and success of the journey really depend on very good planning and expertise in delivering initiatives of this complexity and magnitude.

Figure 1. A Growing Cloud Computing Market—Estimated at ~\$60B by 2012



Source: Cisco IBSG; Saugatuck, IDC, Gartner, TripleTree, Deutsche Bank

What Enterprise Leaders Are Asking

Not surprisingly, enterprise leaders are asking sometimes difficult, though highly relevant, questions about the nature of the enterprise and the value of the cloud, often based on the role they play in the enterprise.

CEOs are seeking competitive advantage and improved time to market for their businesses any time they make an investment in the enterprise. They want to have a cloud strategy in place that makes sense for their unique business needs and customers. And they want full benefit from any cloud model, especially the ability to scale as a competitive response.

CIOs and IT managers want to maintain the relevancy and cost effectiveness of the IT organization within the larger business. They are typically struggling with the rate of growth of their IT infrastructure, the costs of managing it, low resource utilization, and the necessary flexibility to meet the rapidly changing needs of the business.

CIOs and business unit leaders might be considering what their cloud strategy should be to maximize business benefit. They are primarily concerned with costs and benefits in addition to strategic direction.

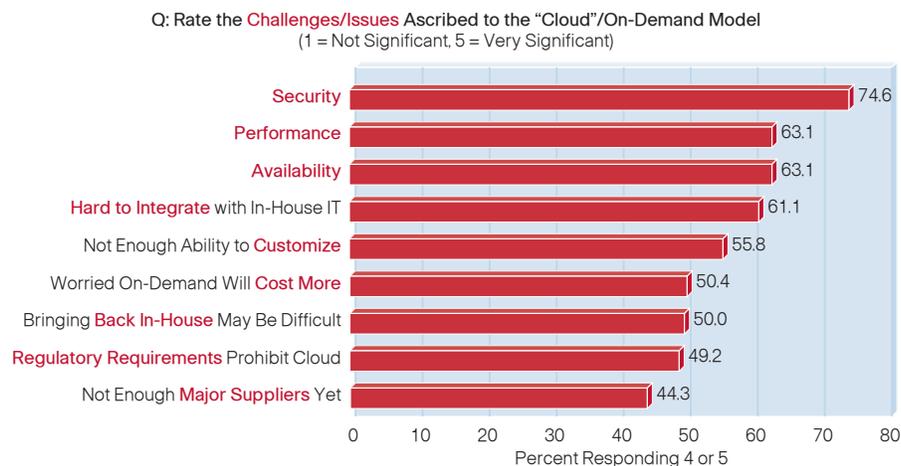
In contrast, IT and data center architects from the network, storage, and computing teams need expertise to help accelerate design and implementation of cloud-based architectures and solutions.

Since architects and solution designers are more focused on design and implementation of an existing cloud strategy, they are more interested in assistance related to the architectural implementation and operational models that cloud services can deliver.

And IT program managers are focused on maintaining existing infrastructure, not developing IT roadmaps and meeting new business needs. They also might be dealing with a myriad of vendors and partners who are involved in current environments and might be required to deliver a cloud-enabled solution.

Unfortunately, there is no one-size-fits-all cloud solution: business needs as well as network, computing, and storage quality and overall IT complexity differ from enterprise to enterprise. Based on Cisco's own research surveying 700 customers in December 2009 (16 percent service providers, 11 percent financial services, 8 percent Government organizations) and that of industry analysts, security, however, is the number one cloud concern. (See Figure 2.)

Figure 2. Security Research Results (IDC, August 2008)



Source: National Institute of Standards and Technology (NIST):
www.csrc.nist.gov/groups/SNS/cloud-computing/index.html.

Exploiting Infrastructure as a Service for Business Benefit

In many enterprises today, the infrastructure evolution toward cloud computing is under way. Over the last few years, IT has been responding to new user demands and, in the process, laying the foundation for cloud computing with:

- Consolidation of computing resources
- Virtualization of resources, with some 30 to 40 percent of businesses virtualized today
- Reprovisioning resources on demand
- The beginnings of automation with the decoupling of physical assets and services

Today virtualization and extending the virtualization architecture beyond the boundary of organization, service-oriented architectures and extending service orchestration, automated provisioning, and unified computing are making enterprise IaaS architectures technically and operationally feasible.

Cloud adoption requires an approach that covers the virtualized data center architecture and the IaaS cloud operations management architecture. These architectures must work in conjunction; through cloud service orchestration, changes and updates are made simultaneously to both. The IaaS cloud operations management includes such technologies as cloud service orchestration, which runs an end-to-end workflow; usage-based chargeback mechanisms; service level agreement (SLA) management; and a federated configuration management database (CMDB).

In essence, IaaS is a modular infrastructure solution with data services that can be turned on and off based on customer demand and available capacity. Podlike units of network, storage, and computing resources can be right sized for target applications and virtual workloads. This flexible architecture scales up or down, enabling elasticity for customers. It also provides rapid provisioning and end-to-end SLA management capabilities. The data center architecture, which can span many data centers, can provide business continuity and disaster recovery. IaaS also delivers ease of platform migration for workloads, multiuser support, and multiple application lifecycle support.

So not only are there quick deployment, migration, and scaling of enterprise applications and associated infrastructure, but the cost advantages for enterprise applications from IaaS are significant: low cost per resource; no waste from overdimensioning; and capital expense is converted to operating expense, a variable cost. Most importantly, the rapid provisioning and orchestration capabilities intrinsic to cloud and IaaS transform the user's experience of service delivery, in contrast to traditional service procurement cycles, which could take months rather than minutes.

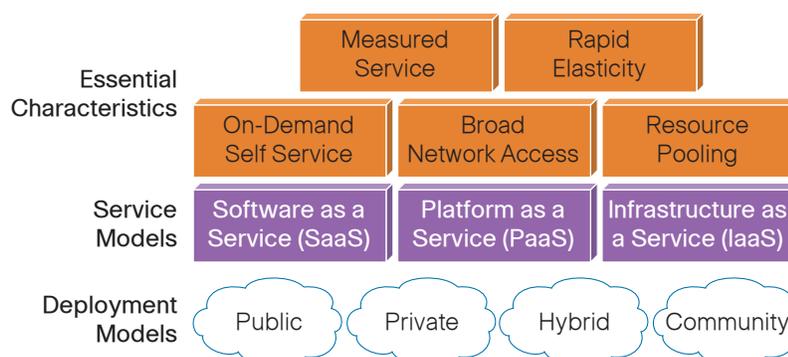
Private Clouds and Other Cloud Approaches

IaaS is one of three major service models in the cloud computing value chain. The foundation of the cloud, of course, is the IT infrastructure.

Software as a service (SaaS) provides applications services delivered over the network on a subscription basis. Cisco® WebEx® and Salesforce.com are two well-known providers of SaaS.

Platform as a service (PaaS) provides software development frameworks and components delivered over the network on a pay-as-you-go basis. Examples include Cisco WebEx Connect and Google Apps Engine. (See Figure 3.)

Figure 3. Visual Model of NIST's Working Definition of Cloud Computing



Source: National Institute of Standards and Technology (NIST):
<http://www.csrc.nist.gov/groups/SNS/cloud-computing/index.html>

There are several cloud deployment models:

- **Private clouds:** enterprise IT infrastructure services, managed by the business, with cloud computing qualities such as self-service, pay-as-you-go chargeback, on-demand provisioning, and the appearance of infinite scalability
- **Virtual private clouds:** cloud services that simulate the private cloud experience in public cloud infrastructure
- **Public or external clouds:** cloud infrastructure made available to the general public through web browsers or through APIs but offering limited customer control
- **Community clouds:** cloud infrastructures shared by several organizations and supporting a specific community; for example, several financial service banks join to form a financial community in a cloud

Compute as a Service: Use Case

Business Challenge

- Scalability issues
- Slow end user response times
- Variable capacity demand
- Lengthy provisioning times for new compute capacity
- Difficulty in allocating IT service delivery charges
- Unplanned, escalating capital/operational compute costs at peak demand periods

Solution: Compute as a Service

- Provided by an IaaS cloud
- On-demand, additional compute resources in response to variable service demand

Benefits

- Highly virtualized compute/network/storage for cost-effective capacity expansion
- Share spare capacity depending upon time of day/year
- Rapid service orchestration
 - Next-generation IT provisioning approaches using web-based portal
- Compute resource scalability and elasticity
 - No capacity planned before the need identified
 - Burst capacity easily allocated
- Fewer capital investments for periodic surges

Challenges to Realizing Solution

- Assessing the costs and benefits using financial return on investment models
- Devising the most flexible CaaS architecture with high degree of virtualization
- Extending or replacing your IT systems management tools to deliver the rapid IT services provisioning required to make CaaS effective
- Implementing a highly secure cloud architecture
- Devising departmental chargeback strategies to bill according to actual usage

- And, in the future, **hybrid clouds**: cloud infrastructures composed of two or more clouds able to interoperate or federate through networking technologies, across data center/organization boundaries

Enterprises can use IaaS architectures to offer specialized services:

- **Computing as a service (CaaS)**: A pay-as-you-go service that provides enterprise customers with rapid access to virtual servers for a wide range of applications. Enterprise decision support systems, for example, require large data sets that are expensive to manage, while seasonal variations and short-term projects stretch capacity. An IaaS solution provides capacity on demand. Potential worldwide revenue for decision support systems applications in 2013 is forecast to be \$1.2 billion.
 - **Data center as a service (DCaaS)**: On demand data center capabilities, including service burst capability to business units to meet increased demand. Enterprise customers with computing-intensive data center requirements can utilize data center as a service to provide capacity for processing and storage on the fly. Grid computing, for example, can pose massive short-term requirements, but is a non-core business for most enterprises. An IaaS-based solution provides capacity to that level. Potential worldwide revenue for grid computing applications in 2013 is forecast to be \$1.0 billion.
 - **Virtual Desktop Infrastructure (VDI)**: VDI provides the infrastructure for hosting a desktop operating system within a virtual machine on a central server. Upfront server investment can reduce VDI ROI, while variable utilization can limit potential virtualization benefits. Using IaaS to support VDI increases the security of end user environments and reduces IT service delivery costs. Potential worldwide revenue in 2013 is forecast to be \$0.4 billion.
- In CaaS, DCaaS, and VDI, enterprises can leverage their secure and virtual infrastructure and tight SLAs for economies of scale and rapid provisioning via service orchestration to provide burst capabilities.
- **High I/O Cloudburst**: By combining corporate infrastructure with cloud-based infrastructure, you can create a flexible, highly scalable application hosting environment with rapid access to additional capacity for peaks of demand. ERP financials, for example, impose seasonal resource demands and incur the sunk cost of customizing financial applications. An IaaS service increases business agility with lower costs and adjusts for changing or seasonal demand. Potential worldwide revenue for ERP financial system applications in 2013 is forecast to be \$0.8 billion.
 - **Disaster Recovery**: Today, many disaster recovery systems remain expensive, seldom used cost centers. IaaS offers the capability to consolidate multiple disparate disaster recovery systems into a single virtualized instance, shared across multiple IT applications, to increase asset utilization and reduce cost. Potential worldwide revenue in 2013 is forecast to be \$1.1 billion.

Disaster recovery represents a low-risk service for enterprises since they still own primary infrastructure. Provisioning is rapid via orchestration automation.

In order to pilot a cloud approach, some enterprises are starting with lower risk IT cloud services, for example, software development and test cloud environments. A high degree of virtualization achieves economy of scale and reduces service delivery costs.

- **Development/testing environment**: Requirements on testing environments are volatile, with frequent short-term, unplanned resource requests. An IaaS solution enables developers to reduce or eliminate underutilized capacity and equipment and supports all software development phases, including unit test, systems test, and scalability testing to increase responsiveness in responding to development and test environment requests from IT business units. Potential worldwide revenue in 2013 is forecast to be \$4.7 billion (All revenue forecasts source: Cisco IBSG, 2009).

How to Create a Cloud Approach That Works for Your Enterprise

Many enterprises are navigating infrastructure changes involving complex tradeoffs and decisions and then creating design and implementation programs around cloud transitions with only their in-house resources and expertise to guide them and without the benefit of best practices for the wide variety of technologies involved.

With an in-house approach, enterprises often experience some common cloud challenges, such as:

- Limited virtualization around the endpoint computing resources
- Failure to exploit innovative, cost-saving initiatives such as business continuity/disaster recovery into the cloud
- Security inadequately focused at the application or server layer only
- Lack of customer isolation using secure, scalable multitenant services

Since an exclusively internally focused approach to building a cloud would use already stretched in-house resources, one solution is to look to a professional services group that has built and secured data centers, infrastructures as a service, and private clouds; can work with your own in-house expertise in a collaborative fashion; and can draw upon an ecosystem of trusted best-in-class partners.

In addition, it is also possible to construct an enterprise wish list for making the transition to the cloud easier, including, for example,

- Choice
- Alignment with business strategy and goals
- A comprehensive, architectural approach
- A full service and solution offering with robust security
- Measurable benefits like return on investment (ROI)

Based on the enterprise wish list, then, **choice** would include a **vendor-independent, technology-independent, and open service and support model customized and delivered by experts.**

The service approach and process would require a deep understanding of your data center and enterprise that is **effectively aligned with your business goals and strategy.**

The service and support solution would embrace all phases of your network, computing and storage lifecycles. In short, **your approach** should be **structured and comprehensive.**

As a corollary to choice, the **products and services** utilized in delivering a cloud model should be **best in class:** provided by an **ecosystem of best-in-class partners.**

Finally, the resulting cloud model must be built upon a **development architecture that aligns with your strategy and fits your business needs.**

Business Continuity with Disaster Recovery as a Service (DRaaS): Use Case

Business Challenge

- Devising a cost-effective disaster recovery solution for server-based applications
- One-to-one server redundancy very costly
- Traditional many-to-one schemes might expose business or leave specific applications without capacity

Solution: Business Continuity with Disaster Recovery as a Service (DRaaS)

- Provided by an IaaS cloud

Benefits

- Reduce risk/costs of failure using highly virtualized computing/network/storage for cost-effective backup server provision
- Share spare capacity upon time of day/year
- Rapid service orchestration using next-generation IT provisioning approaches to adjust to necessary capacity
- Avoid additional capital investments that a one-to-one scheme would require
- Enable usage-based billing when disaster recovery needed

Challenges to Realizing Solution

- Assessing costs and benefits using financial return on investment models
- Devising the most flexible DRaaS architecture for required failover coverage
- Extending or replacing IT systems management tools for rapid IT services provisioning required to make DRaaS effective
- Devising departmental chargeback strategies to bill according to actual usage

Enterprise Wish List for Transitioning to Cloud

- Choice: technology and vendor independent, open, secure
- Alignment with your business strategy and goals
- A comprehensive, architectural approach
- A highly secure development architecture for your business needs
- Return on investment (ROI)

A Comprehensive, Architectural Approach

Let us take a closer look at this recommended approach and how that might work for transitioning your enterprise to IaaS or another cloud model. The approach has four basic phases, during which some important questions should be answered.

- **Strategic preparation:** What can cloud do for my business? How does it affect my costs? What can I expect in ROI? What will be the effect on my processes and operational structure? How does cloud computing affect our security program, security architecture, and customers? What are the gaps between the current security architecture and our targeted private cloud security architecture? What is the state of the security architecture of our existing enterprise private cloud? What applications, data, and services are suitable for migration to a public cloud? Does our strategy anticipate support for postdeployment (day 2) activities and how we evolve the cloud for greater business benefit?
- **Planning and design:** What end-to-end architectural approach is most appropriate to deliver for my chosen cloud strategy? What architecture maximizes virtualization, orchestration speed and design, and chargeback capability? How does cloud computing affect security and our overall technology architecture, including network, services, computing, and storage, as well as our customer-facing security? How can we build a security technology architecture for cloud? How do we plan and design for the evolution of our cloud infrastructure? How do we plan and design for a phased introduction of many cloud models?
- **Implementation:** How do we realize our cloud architecture on time, within budget, and in our environment? How rapidly can we implement the security technology architecture? Does our cloud implementation lay the groundwork for cloud evolution?
- **Optimization:** How do we continue our cloud evolution and ongoing cost reduction? How do we continually optimize our security capabilities?

Strategic Preparation

Experts you trust can help you navigate these phases, helping you to decide on the appropriate cloud computing strategy, ranging from questioning and evaluating whether cloud computing is an appropriate business strategy to seeking architecture and security planning and design, implementation, and optimization expertise. Expertise should be based upon extensive experience in designing complex data centers across the multiple technology areas, such as virtualization, service orchestration, and security that underpin IaaS architectures.

A strategy service should help you evaluate the most appropriate strategy for cloud adoption, including the costs and benefits and operational changes required to successfully benefit from a cloud operational model. Evaluating the current and required services management approach and analysis of how you can transition to a service-driven model occur at this stage and help align subsequent cloud architectural development, tools, and process integration and implementation with business returns.

Strategic preparation should also target security. Enterprises should evaluate their cloud security risk and architecture security risk and look at on-demand security options within a services catalog for their users.

In addition, your strategy should take into account your cloud evolution and postdeployment activities in every stage: strategy, planning and design, implementation, and optimization.

Thinking About Security in the Cloud

Security is the number-one issue, according to Cisco's own customer survey results, for business leaders evaluating cloud computing.

Here is a checklist of security issues and capabilities to consider.

- Security based on cloud types: for example, private versus public cloud security
- Security based on the need for an enterprise security program and security for users
- Refocusing your security policy for the enterprise and cloud transition
- Role of a dedicated security team to ease the security transition
- Common controls and technical security control overlap
- Policy controls across network, computing, and storage resources
- Visibility controls to address loss of control due to abstraction
- Logging controls:
 - Security dashboard with both policy control and visibility to address logging challenges
 - Secure API access integrated into management and tooling systems to address logging challenges
- Isolation of data, data transmission, and data processing for end-to-end isolation across the delivery infrastructure (including network services, network, computing, storage, and management)
- Encryption:
 - Encrypting access to the cloud resource control interface
 - Encrypting administrative access to OS instances
 - Encrypting access to applications
 - Encrypting application data at rest
- Public version control for SaaS
- Security auditing and testing for compliance
- On-demand security controls within the security catalog for users
- Automated security management to meet the rapid provisioning requirement
- Using existing virtualization as a mechanism for security monitoring and enforcement

Planning and Design

When undertaking IaaS, strategic planning and design can help reduce time to successful deployment and operation of complex IaaS solutions. Cloud planning and design require expert coordination among your team, your partners, and other vendors, as well as a detailed architecture design, data center–specific expertise, and security designed from end to end. The resulting designs and plans—including, for example, an end-to-end IaaS architecture blueprint, SLA design, dynamic billing and chargeback design, migration roadmap, facilities, mechanical, and electrical design, an enterprise common control framework, a security technology architecture, a user-facing portal design, physical safety and security, and your future cloud evolution—should link back to your strategy and lay the foundation for subsequent implementation and integration.

After the planning and design stage is completed, you are ready for implementing a cloud operational model, which should be a long-term investment opportunity.

Implementation

What is needed to reduce the risk during an IaaS implementation is experience at providing a virtualized architecture, integrated tools, a facilities plan, orchestration integration, workload migration, and staging and validation activities prior to full-scale IaaS implementation. This phase also involves implementing the security technology architecture, the security portal design, automated audit, and physical safety and security designs.

Proven methodologies, best practices, and deep knowledge of the core systems within the cloud environment can facilitate migration from your existing environment to a cloud utility computing architecture, help assure adherence to plans, and enable on-time delivery of a fully implemented IaaS. During this implementation stage, knowledge transfer also should be an ongoing process and end goal enabling operational confidence for in-house experts.

Since cloud evolution has been anticipated in your strategy, planning and design, and implementation phases, your business is poised to maximize its ROI with optimization of the cloud operational model.

Optimization

Optimization of the cloud operational model, which can accelerate adoption of IaaS, is the point where the true benefits of the private cloud—lower operating and capital expenses, increased security, business agility and responsiveness, and scalability—can be maximized through:

- Architectural reviews
- Security audits, security architecture and posture assessments, and an ongoing security operations office
- Cost reduction exercises
- Process improvements
- Tool customization
- Post deployment or day 2 support

Unfortunately, if you neglect or are unable to take a comprehensive approach to your cloud transition, then you might be at risk of losing competitive advantage through failure to realize a cloud operational model. Additionally, enterprises that embark on a cloud IaaS architecture design, without first detailing the strategic objectives and assessing the ROI, might find that their cloud project fails to deliver business benefit. And other businesses that fail to recognize that cloud is an operational model, not just a technology, are more likely to invest heavily in projects that overrun and fail to deliver measureable benefits.

What is crucial to successful realization of IaaS cloud business benefits is to take a comprehensive, architectural approach across strategy, security, ROI-driven architectural decisions, tools, people, and process changes that are required to deliver the promise of the cloud. (See Figure 4.)

Figure 4. Expertise and Services Required for Building a Cloud Operational Model

| | | | |
|---|---|---|---|
|  |  |  |  |
| Architecture | Application | Operations and Management | Data Center Optimization |
| End-to-End Architecture VDI ROI Models Business Case | Application Discovery Infrastructure Mapping Data Base Migration Application Migration Application Visibility | Organization Design ITIL and IT Process Tools Architecture Service Level Mgmt. Provisioning Chargeback | Architecture Reviews Risk Analysis Availability Performance Security |
|  |  |  |  |
| Storage Access | Compute | Networking | Green Data Center |
| Disaster Recovery SAN Migration Storage Encryption Multiprotocol SAN | Server Virtualization Migration and Transition Virtual Machine Mgmt. | L2 – L3 Design L4 – L7 Design Branch Consolidation WAN Optimization Security | Facilities Design Energy Efficiency CFD Modeling |

Five primary criteria for evaluating in-house and outside services should be their ability to deliver a cloud operational model by:

- Developing a financially justified strategy and reducing transition risk
- Aligning IT services management people and processes to your business objectives
- Accelerating the development, implementation, and optimization of a validated and secure IaaS architecture, integrated tool design, and chargeback mechanism
- Creating a phased migration plan to enable a successful adoption of the new cloud operational model and preparing in every stage for the cloud evolution and post-deployment (day 2) activities
- Increasing the time to value of the IaaS architecture for cloud services delivery

Conclusion

To obtain the very real benefits of cloud computing, enterprise leaders should consider and evaluate all significant issues and tradeoffs around making the transition to a cloud model: security, competitive advantage, operational change, cost, capital investments, operating expenses, new or evolved technical and business architectures, and business risk.

Whether beginning or in the middle of the journey to a next-generation data center and cloud computing, your enterprise will benefit from best-in-class team- and partner-based enablement services across your architectures. The experts you choose to guide you should be able to address the entire lifecycle of the environment, offer validated designs and industry best practices, and understand the capabilities and feature sets of all network, computing, and storage devices within your environment.

Enablement services also can help you exploit the full capabilities of the cloud model, including the ability to dynamically provision resources; virtualize applications and services; enhance business resiliency; build security into every layer of the virtualized infrastructure for a secure, compliant cloud environment; and, most importantly, evolve your chosen approach or add new clouds for business benefit as opportunities develop in the future.

To make the journey to and beyond your first cloud easier, your cloud approach should include:

- Choice: vendor and technology independence, open
- A development architecture that reduces risk and meets your business needs
- A comprehensive, architectural approach that anticipates your cloud evolution in every stage and into the future
- Access to industry best practices, validated designs, and an ecosystem of best-in-class partners
- Expertise in virtualized data centers and end-to-end orchestration, service provisioning, and security across network, computing, and storage resources
- Experience in strategizing for, planning and designing, implementing, and optimizing IaaS and clouds

A comprehensive, secure IaaS cloud approach with infrastructure management tools for rapid orchestration of new services, service-oriented billing and chargeback mechanisms, and IT services management around people and process alignment can help transform enterprise IT service costs, while enabling IT to better meet customer service demand and deliver greater business agility.

For More Information

For more information about cloud computing and cloud enablement services at Cisco, visit: www.cisco.com/go/cloudenablement



Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV
Amsterdam, The Netherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at www.cisco.com/go/offices.

CCDE, CCENT, CCSI, Cisco Eos, Cisco Explorer, Cisco HealthPresence, Cisco IronPort, the Cisco logo, Cisco Nurse Connect, Cisco Pulse, Cisco SensorBase, Cisco StackPower, Cisco StadiumVision, Cisco TelePresence, Cisco TrustSec, Cisco Unified Computing System, Cisco WebEx, DCE, Flip Channels, Flip for Good, Flip Mino, Flipshare (Design), Flip Ultra, Flip Video, Flip Video (Design), Instant Broadband, and Welcome to the Human Network are trademarks; Changing the Way We Work, Live, Play, and Learn, Cisco Capital, Cisco Capital (Design), Cisco-Financed (Stylized), Cisco Store, Flip Gift Card, and One Million Acts of Green are service marks; and Access Registrar, Aironet, AllTouch, AsyncOS, Bringing the Meeting To You, Catalyst, CCDA, CCDP, CCIE, CCIP, CCNA, CCNP, CCSP, CCVP, Cisco, the Cisco Certified Internetwork Expert logo, Cisco IOS, Cisco Lumin, Cisco Nexus, Cisco Press, Cisco Systems, Cisco Systems Capital, the Cisco Systems logo, Cisco Unity, Collaboration Without Limitation, Continuum, EtherFast, EtherSwitch, Event Center, Explorer, Follow Me Browsing, GainMaker, iLYNX, IOS, iPhone, IronPort, the IronPort logo, Laser Link, LightStream, Linksys, MeetingPlace, MeetingPlace Chime Sound, MGX, Networkers, Networking Academy, PCNow, PIX, PowerKEY, PowerPanels, PowerTV, PowerTV (Design), PowerVu, Prisma, ProConnect, ROSA, SenderBase, SMARTnet, Spectrum Expert, StackWise, WebEx, and the WebEx logo are registered trademarks of Cisco and/or its affiliates in the United States and certain other countries.

All other trademarks mentioned in this document or website are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (1002R)