White Paper

EMC IT'S JOURNEY TO THE CLOUD:
A PRACTITIONER'S GUIDE

Abstract

This white paper describes EMC IT's journey to cloud-based IT infrastructure. EMC IT defines the cloud as the next-generation dynamic IT infrastructure comprising both internal and external (hybrid) clouds that enables efficiency, control, and choice for the internal IT organization.

September 2011

EMC²

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EXECUTIVE SUMMARY

EMC is transforming its IT operations to improve its customer focus, create business transformation, and deliver operational efficiencies. To achieve these goals, EMC IT has embraced the hybrid cloud approach to IT infrastructure. EMC IT defines the hybrid cloud as the next-generation IT infrastructure comprising both internal (private) and external (public) clouds that enables efficiency, control, and choice for the internal IT organization.

By transitioning to a hybrid cloud-based IT infrastructure, and using the advanced capabilities that such an infrastructure provides, EMC IT's ultimate goal is to enable end-to-end, on-demand self-service provisioning of IT services to its customers, the business units at EMC.

EMC IT has been concentrating first on its internal infrastructure to prepare for the transition to the cloud—and virtualization is at the core of this effort in shaping the new infrastructure. EMC IT has defined key programs, introduced in this white paper, that are focused on the various components of the enterprise data center. Each initiative's goal is to move EMC further along on its vision to build integrated infrastructures for virtualization at scale. Separate white papers describing each initiative are available that provide more information on EMC IT's respective strategies in moving toward a cloud-based IT infrastructure.

In parallel, EMC IT is developing policies and governance mechanisms for managing the new IT services paradigm. EMC IT has also designed frameworks for preparing the organization at various levels for the transition to the private cloud.

EMC IT's structured approach helps accelerate its journey to the private cloud by enabling the organization to get started with cloud initiatives versus waiting for complete solutions to emerge. By building solutions using existing technologies—in line with global trends—EMC IT hopes to adapt them to new technologies when they become available.

INTRODUCTION

This white paper, the first in a series describing EMC IT's initiative to move toward a private cloud-based IT infrastructure, includes the following sections:

- An introduction to EMC IT
- EMC IT's cloud computing strategy: a key to realizing IT priorities
- Making the transition to the private cloud

It describes EMC IT's cloud computing strategy, how the strategy evolved, and the three steps in transitioning to the cloud. Key programs also are introduced and the use case that helped EMC move toward an integrated infrastructure for virtualization.

Audience

This white paper is intended for IT program managers, IT architects, and IT management.

AN INTRODUCTION TO EMC IT

EMC Corporation, a global leader in cloud computing technology and solutions, has a large internal IT organization that supports the business operations of its global workforce.

EMC IT supports more than 48,000 users; across 400 corporate offices; in more than 80 countries; spanning five data centers; hosting 500 applications and 8 petabytes (PB) of data.. Like all IT organizations, EMC IT faces the challenge of balancing cost, risk, and agility in its operations and has a strong focus on delighting its customers. The functionality, interoperability, and performance requirements of its internal customers must be satisfied as much as possible—without compromising the security, ease of use, and manageability of IT systems and processes.

In the past, EMC IT has had to address perceived and real objections from business units. These objections have ranged from costs to project delivery concerns around quality and speed). EMC IT has been empathetic to the business units' concerns and taken a methodical approach to transform its abilities and capabilities to resolve these by adapting the organization, its processes, and technology. EMC IT must also justify all of its investments with strong, metrics-based business cases that demonstrate return on investment (ROI) and total cost of ownership (TCO) before receiving management approvals.

Principles and priorities

EMC IT, just as any other enterprise IT organization, is impacted by a number of factors: external, internal, IT factors, and technology factors, as shown in Figure 1.
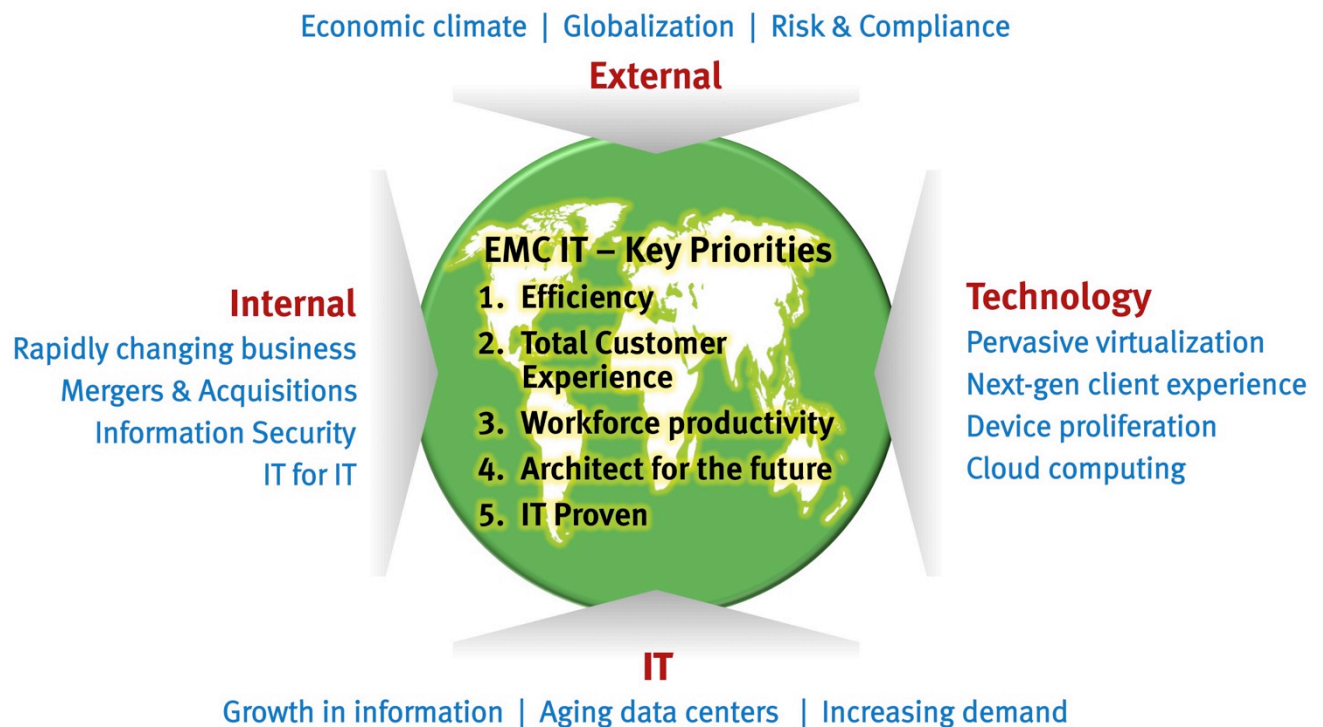
Figure 1. Factors impacting EMC IT and EMC IT's key priorities

EMC IT has defined five key priorities to address the factors described above:

- **Efficiency**—Helping business units increase their efficiencies and lower the overall cost of operations by increasing IT efficiency and reducing IT operational costs.

- **Total customer experience**—Enabling agility, automation, flexibility, and ease of use for the IT customer.

- **Workforce productivity**—Increasing global employee productivity through innovative applications, and investing in communication and collaboration technologies such as social computing and telepresence.

- **Architect for the future**—Making IT investments toward architecting the desired future state—as well as future-proofing solutions so they accommodate future requirements and changes.

- **EMC "IT Proven"**—EMC IT uses "IT Proven" solutions to drive efficiency and quality of service, increase IT agility, and prepare EMC for a dynamic future in the Cloud.

EMC IT believes the hybrid cloud is a key component of satisfying these priorities.

EMC IT's CLOUD COMPUTING STRATEGY: A KEY TO REALIZING IT PRIORITIES

EMC IT has embarked on a bold mission to move to a hybrid cloud-based infrastructure. EMC defines the hybrid cloud as the next-generation IT infrastructure that provides all of the benefits of cloud-based IT systems (for example: agility, quality of service (QoS), performance, scalability, security, and management) even as it retains complete control of the IT infrastructure. A hybrid cloud may use internal resources (private cloud), external resources (public cloud, delivered via service providers), or a combination of both, as shown in Figure 2.
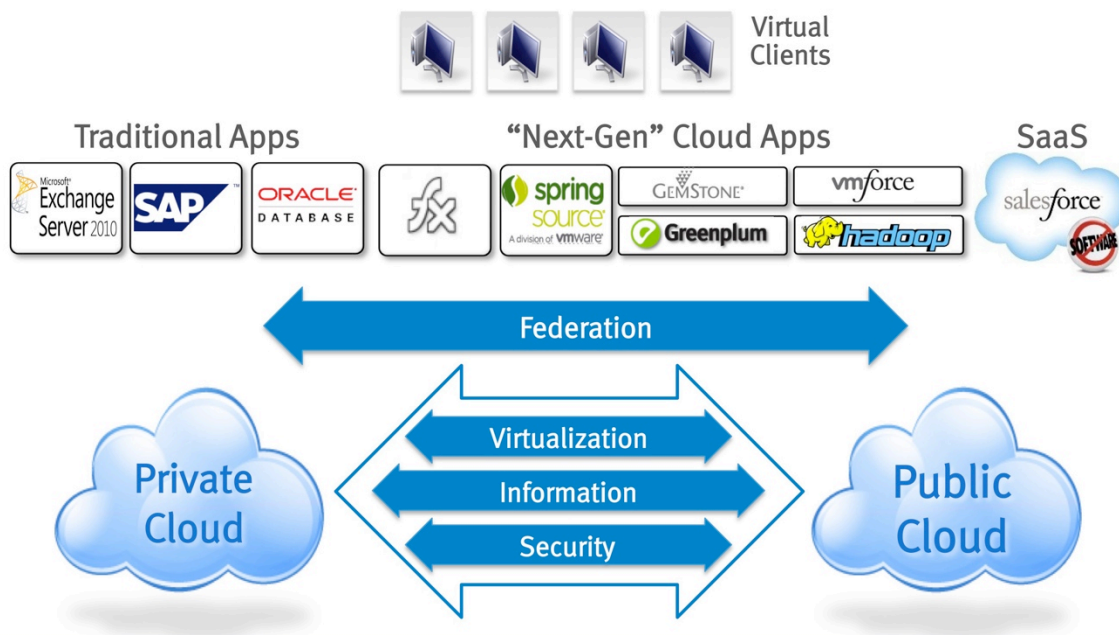

Figure 2. EMC IT's cloud strategy

Cloud computing enables EMC to create an elastic, agile environment that provides business units with the ability to scale their IT resource requirements based on actual needs. Resource utilization is improved by provisioning the infrastructure for normal, rather than peak loads, with greater agility. By using the services of external cloud service providers and third parties, cloud-based IT can transform fixed costs into variable costs. This model also offers the benefits of increased choice, self-provisioning, and utility-based chargeback models as well as the benefits of next-generation security, compliance, and service delivery management.

EMC IT believes cloud computing has a few differentiating characteristics:

- **IT is built differently** using a pooled architecture solution with defined service catalogs for each IT service and the ability to partition/move workloads to where they can best run. These solutions are integrated and predictable in their operational nature.

- **IT is run differently** by using low- and zero-touch modes for IT operations, provisioning, and management.

- **IT is consumed differently** where end consumers of IT services can benefit from on-demand provisioning of IT, based on immediate requirements, and from multiple IT service providers.

- **IT is governed differently** from QoS for services to security as new sets of rules and roles emerge.

Transitioning to a cloud-based model provides the IT organization with the benefits of flexibility, efficiency, and dynamic, on-demand resource allocation. However, the IT organization may need to divest some of the control and choice of IT components to a third-party provider of cloud services, if external service providers are involved. It is in this context that EMC's IT governance model in the cloud environment becomes more significant. Therefore, it is obvious to assume that systematic changes to personnel structure and roles, processes, and practices—along with converged advanced technology—are needed in unison for cloud computing to successfully be adopted.

EMC believes that the capabilities of the hybrid cloud will first evolve in the private cloud and then federate out into the public and partner clouds. The private cloud has to integrate with the public cloud (for example, SaaS providers such as Salesforce.com), but EMC IT's cloud strategy includes federation models where appropriate aspects of peak workloads could be deployed to service provider public clouds as well.

EMC IT's evolution to IT as a Service (ITaaS)

The EMC IT environment has continued to be transformed over many years and through many internal projects a stable infrastructure and data center architecture had successfully been established. However, it was clear that more efficiencies could be gained from the environment, and that led to the next series of transformations related to our journey to the cloud.

The internal virtual data center is at the core of EMC's vision of the private cloud. Virtualization is a key enabling technology of the private cloud. Virtualization is the ability to increase the utilization of physical resources through techniques such as pooling and multiplexing. The evolution to the cloud phase of our story begins with a process of standardization and by using virtualization effectively across all components of the data center infrastructure, namely compute systems, storage, network, security, monitoring and management, the application stack—all the way up to the desktop. To effectively pursue virtualization we were aware of the assets in our IT ecosystem and the characteristics of their use. We had also determined that our strategy simplified the environment by defining a set of standard solutions.

Figure 3 illustrates this evolution, which involves redefining the IT organization's mandate from being a provider of stand-alone components to being a provider of fully integrated, tested, validated, and ready-to-grow infrastructure and application packages that contain best-in-class components for a data center. The platform adopted by EMC IT is based on the standard x86 architecture (while moving away from traditional UNIX-based "big iron" systems), with a goal of 100 percent virtualization leveraging VMware® vSphere™.
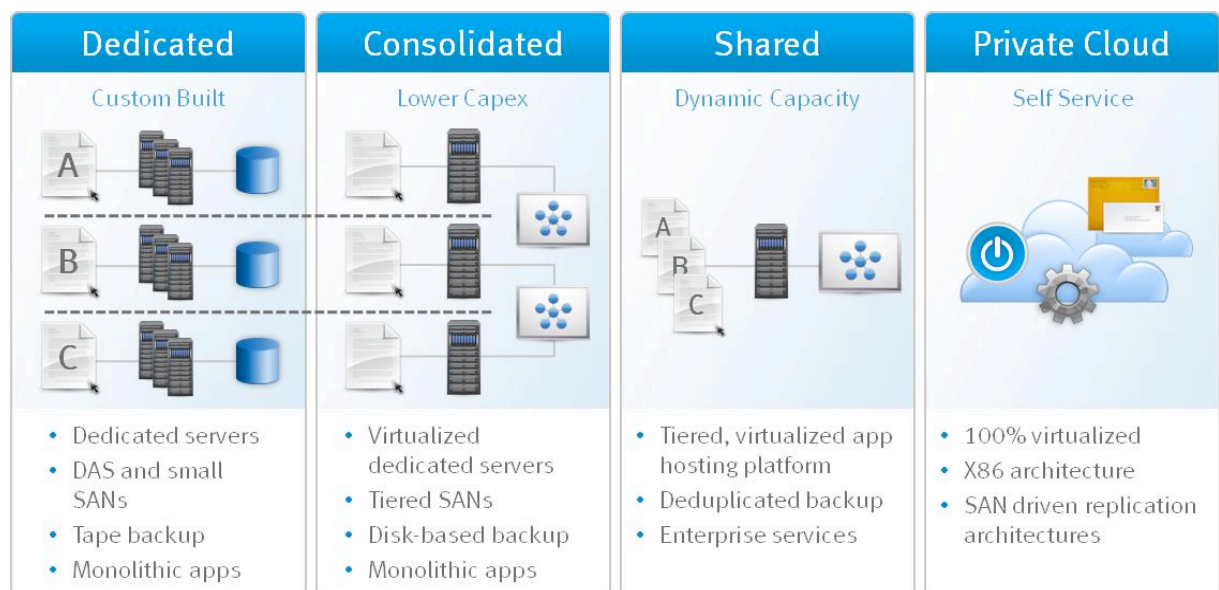
Figure 3. EMC IT's infrastructure evolution

The goal of EMC IT's transition to the private cloud is to achieve the ability to offer IT as a Service (ITaaS) to internal customers—the business units at EMC—with options for self-provisioning through a portal interface. As shown in Figure 4, EMC IT is starting to offer services at various levels, including:

- **Infrastructure as a Service (IaaS)** offers EMC business units the ability to provision infrastructure components such as network, storage, compute, and operating systems as a service.

- **Platform as a Service (PaaS)** provides the secure application and information frameworks on top of application server, web server, database, unstructured content management, and security components as a service to business units from which to develop solutions.

- **Software as a Service (SaaS)** provides applications and tools in a services model for business enablement.

- **User Interface as a Service (UIaaS)** provisions the user and the interface experience, rather than provisioning the actual device used.
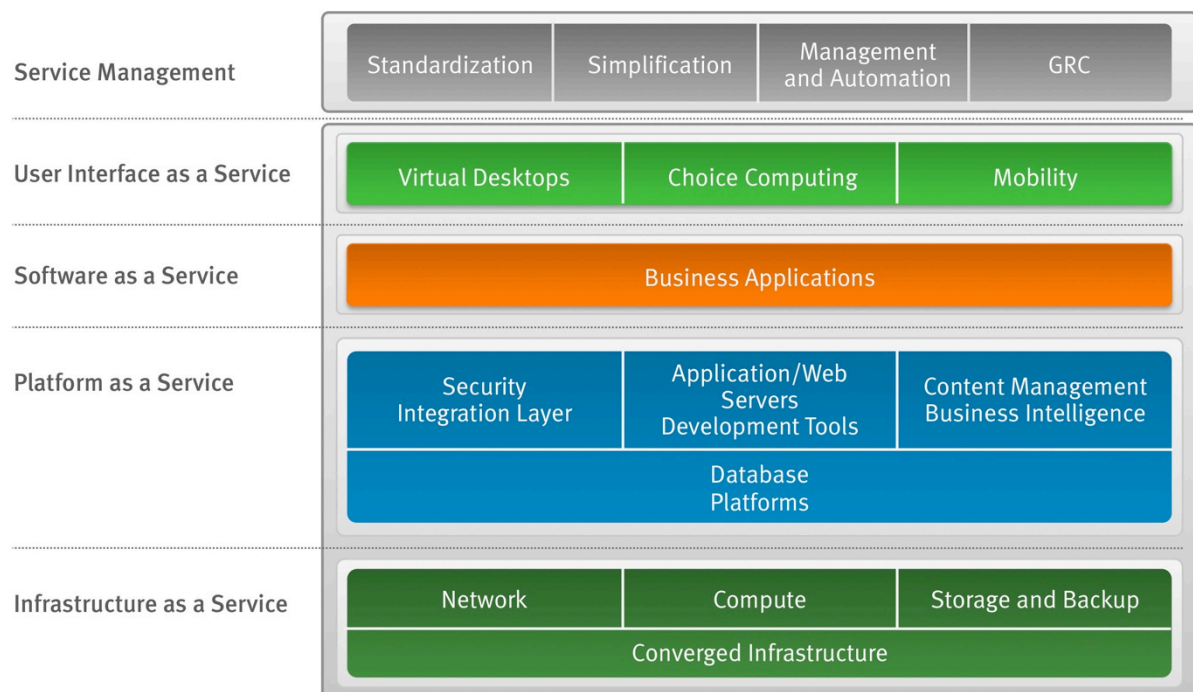
Figure 4. EMC's IT as a Service Framework

In this model, IT is more than a supplier—IT becomes a business partner—and both IT and the business benefit. With access to IT as a Service, the business benefits from the following:

- Simplicity of self-service access

- Alignment of costs with utility with a pay-for-use utility model

- Agility for faster time-to-market and the flexibility to change

- A user-centric, outcome-based approach to supporting business goals

The benefits for IT include: efficiency through automation of tasks to do more faster; elasticity to acquire, deploy, change, or release on-demand; greater visibility into costs and control over service levels for better responsiveness; and greater control over the IT environment.

The next step in the journey is the ability to achieve federation of data and resources between data centers, beginning with internal virtual data centers and going on to federation between private and public clouds. The aim is to equip the IT organization with the capabilities to move data and resources between internal and third-party data centers to achieve the real benefits of elastic IT provisioning.

EMC IT recommends that to manage the progression shown in Figure 5, it is necessary to set up a converged technology architecture roadmap that further develops the components of the ecosystem. Figure 5 shows the path EMC IT has been on over the last several years, but it also clearly depicts the forward-looking elements that we believe will be part of the cloud journey. Note how the areas of Compute systems, Storage, Networks, Backup & Recovery, and Management & Automation start out as separate towers but converge in the cloud.

Architect for the Future—2010

	2005	2007	2009	2010	Private Cloud
Client	PC		VDI	Univ. Client	**Private Cloud**
		Mobility Solutions		Mobile App Access	100% virtualized on vSphere
Applications	Monolithic Solutions	ERP, CRM	SaaS, PaaS, Next-Gen Online Experience		Self-provisioning
		App Foundation - SOA, Frameworks	Next-Gen Business Systems		Tiered services
Information Services	Monolithic Solutions and Data Islands	Business Intelligence, Global Data Warehouse			Embedded security
		Data Integration	Master Data Management, ECM		Multi-tenancy
Systems	Dedicated Servers	Dedicated Clusters	Virtualized Dedicated Servers	Tiered Shared Virtualized Clusters	Cost transparency
Storage	DAS	Dedicated SANS	Tiered Shared SANS	SAN Virtualization	Tiered Shared Virtualized Storage	Elasticity
Data Center Networks	100 M Ethernet	1 GB Ethernet	10 GB Ethernet	Data Center Ethernet	Cloud "scale"
BRS	Tape	VTL	Source Deduplication	Database Archiving	Source and Target Deduplication	
			Email Archiving	Filesystem Archiving		
Management & Automation	Point Management Solutions	Integrated Management Solutions (Physical)		Integrated Management Solutions (Virtual)	
Security	Basic Required Security Technologies	Advanced Data and Identity Protection	Enterprise Security Service Bus	Secure Technology Ecosystem	

Private Cloud:
- 100% virtualized on vSphere
- Self-provisioning
- Tiered services
- Embedded security
- Multi-tenancy
- Cost transparency
- Elasticity
- Cloud "scale"

Architect for the Future—2011

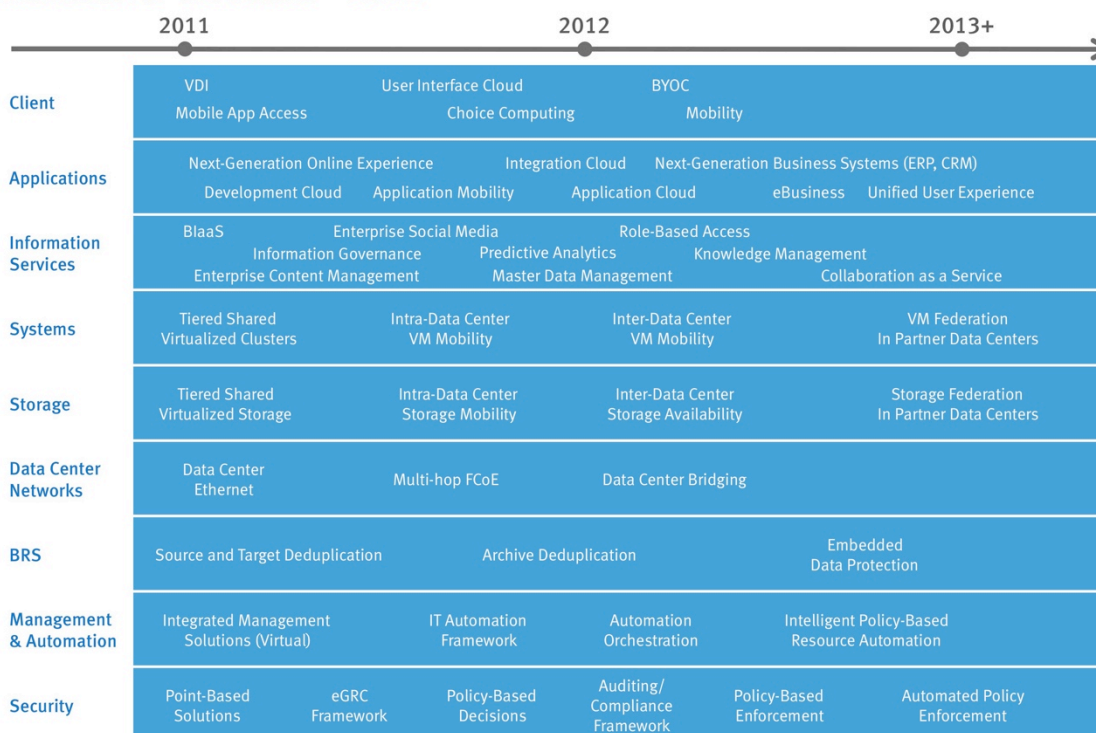|	2011	2012	2013+
Client	VDI · Mobile App Access	User Interface Cloud · Choice Computing	BYOC · Mobility
Applications	Next-Generation Online Experience · Development Cloud · Application Mobility	Integration Cloud · Application Cloud	Next-Generation Business Systems (ERP, CRM) · eBusiness · Unified User Experience
Information Services	BlaaS · Information Governance · Enterprise Content Management	Enterprise Social Media · Predictive Analytics · Master Data Management	Role-Based Access · Knowledge Management · Collaboration as a Service
Systems	Tiered Shared Virtualized Clusters	Intra-Data Center VM Mobility	Inter-Data Center VM Mobility · VM Federation In Partner Data Centers
Storage	Tiered Shared Virtualized Storage	Intra-Data Center Storage Mobility	Inter-Data Center Storage Availability · Storage Federation In Partner Data Centers
Data Center Networks	Data Center Ethernet	Multi-hop FCoE · Data Center Bridging	
BRS	Source and Target Deduplication	Archive Deduplication	Embedded Data Protection
Management & Automation	Integrated Management Solutions (Virtual)	IT Automation Framework	Automation Orchestration · Intelligent Policy-Based Resource Automation
Security	Point-Based Solutions · eGRC Framework	Policy-Based Decisions · Auditing/ Compliance Framework	Policy-Based Enforcement · Automated Policy Enforcement

Figure 5. EMC IT's roadmap of the transition to the hybrid cloud

Planning the transition to the cloud

EMC believes that in order to transform the IT organization, it isn't enough to just concentrate on changing the technology aspects. An IT transformation initiative must address five perspectives:

- Technology
- Business capabilities and user experience
- People
- Operations
- IT policies/process/governance

Moreover, it is essential not only consider these elements in isolation, but also to assess and plan for the complex interactions among them. In line with the components of an IT transformation initiative, EMC believes there are essentially three phases of adoption for organizations that are considering a private cloud strategy at the enterprise level and are at various phases. They are shown in Figure 6.

The IT Production phase, which targets dev/test/IT applications for virtualization to achieve cost efficiencies. Key capabilities leveraged include shared resource pools and elastic capacity.

The Business Production phase, which enables business applications, including mission-critical applications with an emphasis on high QoS. Key capabilities leveraged include a zero-touch infrastructure and increased control combined with service assurance.

The IT as a Service phase, which was introduced earlier and emphasizes business agility. Key capabilities include service definition, service catalog, self-service, and chargeback.
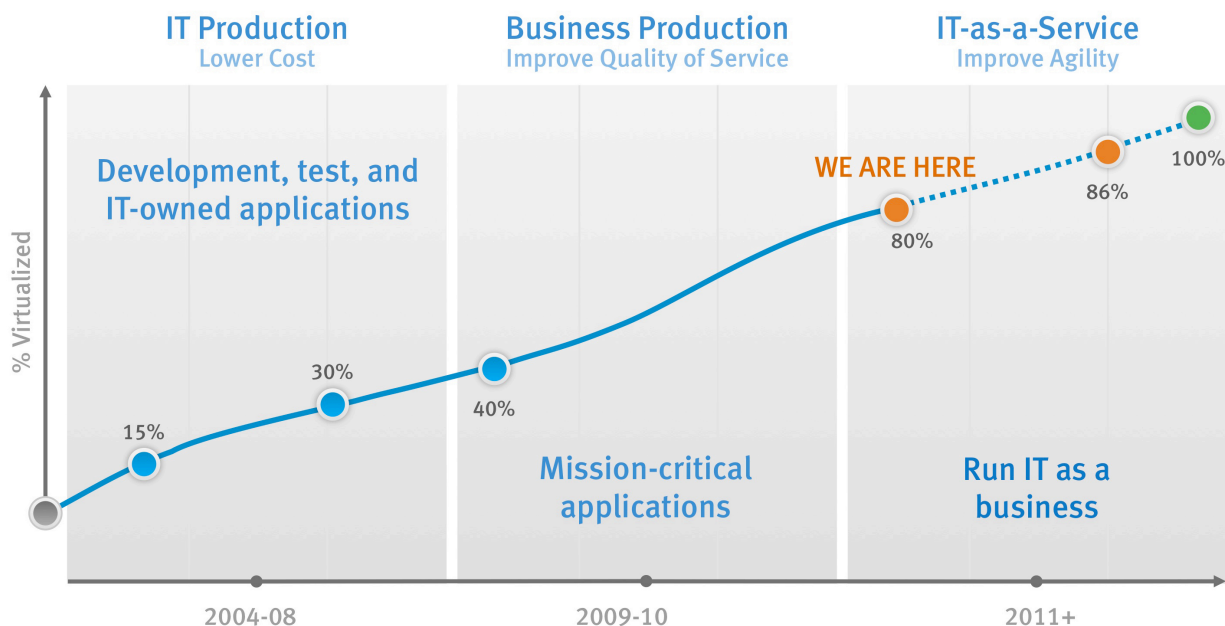
EMC IT's Journey to the Cloud

Figure 6. EMC IT's journey to the cloud

Each phase is characterized by: business drivers and triggers; level of sponsorship for virtualization; types of applications virtualized; percentage of the x86 server infrastructure virtualized; and the IT competencies acquired along the journey. Success is measured by tracking business value realized (the value path). Examples include the areas of ongoing financial and productivity results achieved along the journey to the cloud, such as CAPEX and OPEX savings and improved business agility.

When considering these three phases of adoption, it is important to plan the transition in measured steps as follows.

Step 1: Build the foundation

As a first step, EMC has been working on building the foundations at the technical level. This involves reaching out to technology practitioners in the IT organization to share information on basic cloud-enabling technologies, their operations, and their integration methodologies. Since virtualization is a key enabler of the transition to a cloud-based infrastructure, it is critical that IT practitioners learn and understand the impact of applying virtualization. Given the rapid pace of technology developments and extensions in the areas of virtualization and cloud computing, it is important that these discussions cover the current state of technology as well as trends, scenarios, and alternatives that might emerge in this dynamic segment of the IT landscape.

It is also critical to encourage technologists to look beyond individual pieces of the technology and look toward an integrated view of how the various components work together. This involves a number of domain-crossing discussions that bring together experts from different fields such as storage, network, backup, and compute among others. This requires investments in hiring and cultivating specialists who can provide an overall solution view of cloud-based IT offerings and ensure the dissemination of information, reference architectures, and product and solution documentation to the technology audience. This also means that new roles such as 'Cloud Infrastructure Architect', 'Cloud Application Architect', 'Cloud Integration Architect', and 'Cloud Information Architect' have started to emerge.

Step 2: Accelerate change

From EMC IT's experience, the next step in this process consists of bringing discussions to the operations level with the delivery audience—those people focused on delivering IT services to the business. These discussions should focus on the two clear agendas of IT operations personnel:

- Leveraging new technologies to better meet key performance indicators used to measure IT effectiveness

- Making organizational and process changes, including the policy and governance mechanisms needed, to fully leverage the capabilities of the new technologies

Changes in technology can provide only limited benefits to businesses unless accompanied by process and organizational change. Therefore, it is essential for these discussions to challenge standard operating procedures, review default assumptions around service levels and IT provisioning, and consider how IT is accounted and paid for. These conversations may also result in the development of new operational roles, metrics, and service delivery models patterned around the concept of delivering IT as a Service. However, EMC has found during discussions at this level that it is critical to recognize the close links between people and processes, and pay careful attention to the complex interplays between operations, processes, and organizational change.

Step 3: Focus on the advantages of service management

Business units may not fully understand the advantages in migrating to a private cloud-based IT infrastructure beyond IT cost reduction. Therefore, EMC IT discovered that it is critical to educate businesses leaders about the additional value that EMC IT can create for them by leveraging the benefits of the cloud infrastructure. Discussions with business units must focus on the enhanced service management benefits the new infrastructure offers, such as:

- Introducing new services that can drive value to business units (for example, truly elastic IT provisioning, choice of service providers, and utility chargeback models)

- Reducing the cycle time for businesses through self-service IT provisioning, choice of multiple providers, and service level agreement-based IT service delivery

- Providing customers, clients, and employees with better user experiences through optimized IT infrastructures

EMC IT recognizes that an important transformational initiative of this nature brings with it the need for organizational change as well as a change in behavior from its employees. Continuous education and communication are crucial to getting the organization ready for this journey.

Building EMC's private cloud infrastructure

At the heart of EMC's transition to the private cloud is EMC IT's "Virtualize Everything" strategy, which focuses on virtualizing all elements of a data center: systems, storage, network, security, monitoring and management, application stack (applications, databases, middleware), and even the desktop.

EMC IT identified several key programs along with a use case (virtual desktop), referenced in Figure 7, and described next, to make the transition to a private cloud-based IT organization. The programs had a distinct foundational infrastructure and applications focus in the IT Production and Business Production phases, and as EMC IT enters the IT as a Service phase, they have more focus on service management and service delivery.
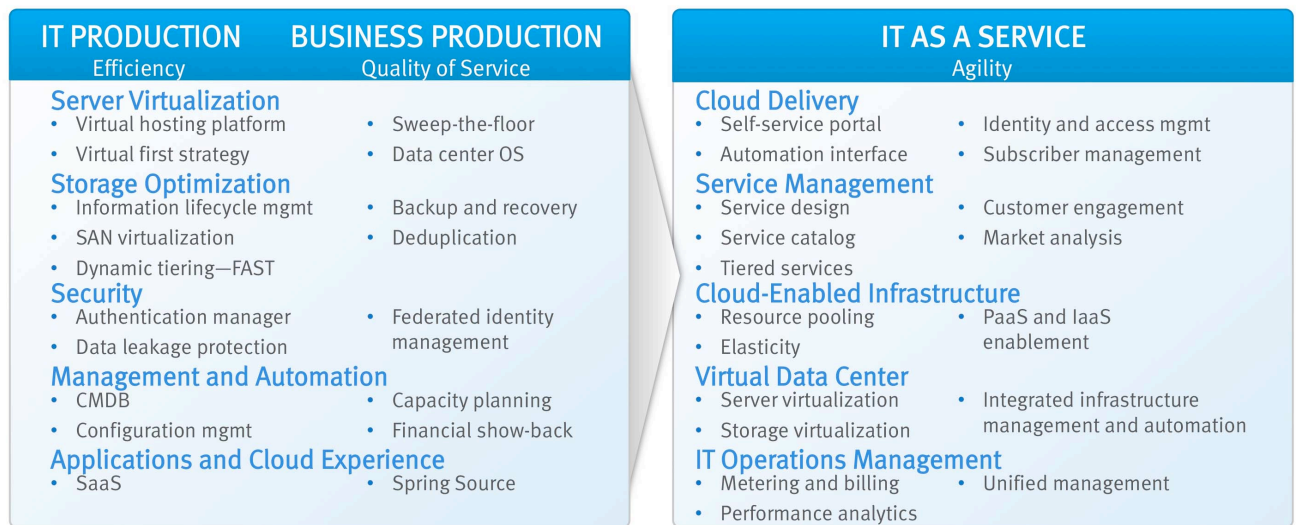
IT PRODUCTION	BUSINESS PRODUCTION	IT AS A SERVICE	
Efficiency	Quality of Service	Agility	
Server Virtualization		**Cloud Delivery**	
• Virtual hosting platform	• Sweep-the-floor	• Self-service portal	• Identity and access mgmt
• Virtual first strategy	• Data center OS	• Automation interface	• Subscriber management
Storage Optimization		**Service Management**	
• Information lifecycle mgmt	• Backup and recovery	• Service design	• Customer engagement
• SAN virtualization	• Deduplication	• Service catalog	• Market analysis
• Dynamic tiering—FAST		• Tiered services	
Security		**Cloud-Enabled Infrastructure**	
• Authentication manager	• Federated identity management	• Resource pooling	• PaaS and IaaS enablement
• Data leakage protection		• Elasticity	
Management and Automation		**Virtual Data Center**	
• CMDB	• Capacity planning	• Server virtualization	• Integrated infrastructure management and automation
• Configuration mgmt	• Financial show-back	• Storage virtualization	
Applications and Cloud Experience		**IT Operations Management**	
• SaaS	• Spring Source	• Metering and billing	• Unified management
		• Performance analytics	

Figure 7. Key programs leading to the private cloud

1. Server virtualization and consolidation

With the goals of improving the utilization of IT resources in data centers and reducing the footprint of physical machines, EMC IT embarked on a server virtualization and consolidation exercise across all of its enterprise data centers. Key to this activity was a comprehensive inventory and analysis of the servers that existed and a clear understanding of the business services supported by these servers. The IT production phase of virtualizing IT-owned applications, including development and test applications, was carried out from 2004 to 2008. By 2008, EMC had consolidated 1,250 servers into just 250 machines—a transition that reduced space requirements by 60 percent and power and cooling costs by 70 percent. By ensuring that all new solutions are VMware-compliant, and by following an aggressive plan to consolidate another 1,600 servers to 40 servers over 2009-2010, EMC saved over $13 million in costs and expects to save an additional $10 million over the next five years. EMC also expects to dramatically reduce its carbon footprint and significantly improve CPU and memory utilization rates. In addition, EMC's vision is also in line with its commitment to the Virtual Computing Environment Company's (VCE) Vblock™ vision for building integrated infrastructures for virtualization at scale, and EMC IT has deployed this solution as its standard within its new "virtual-only" data center.

2. Optimized storage and backup/recovery

EMC IT has moved from a two-tier storage model to a five-tier configuration and has also increased the utilization of its storage infrastructure by 19 percent by leveraging EMC's comprehensive product portfolio and applying the guiding principles of information lifecycle management (ILM) and operational best practices.

EMC expects to further increase its storage utilization rate from 68 percent to 80 percent, thereby avoiding the purchase of more than 1.5 petabytes of storage over five years with a goal of 100 percent virtualized storage by 2012. EMC IT is working on further optimizing information storage for a private cloud environment with technologies such as Fully Automated Storage Tiering (FAST), Virtual Provisioning, and tiering, consolidation. EMC IT classifies information based on its criticality to the business. EMC VPLEX™ is a key enabling technology that will enable EMC IT to virtualize and move workloads and associated information around data centers, and across internal and external clouds.

In terms of backup and recovery, EMC IT needed to facilitate complete and highly effective information management from a virtual cloud-based infrastructure. In addition, data deduplication capabilities were employed to increase the efficiency of EMC's growing backup-to-disk policy. Key benefits include: reducing overall backup by 50 percent; decreasing backup time by 75 percent; backing up remote users using Avamar® data deduplication capabilities; and increasing remote backup and recovery success rates from 38 percent to 98 percent. EMC IT has satisfied its storage management optimization techniques using best-in-class EMC solutions such as Data Domain®, Avamar®, and NetWorker® for replication, backup, recovery, and archiving.

3. Security

EMC's private cloud vision involves the ability for IT managers to securely federate data and resources across internal and external clouds. Therefore, it is critical to enhance security to: support multi-tenancy; data leakage protection; governance, risk, and compliance (GRC); and carrier security requirements. EMC IT collaborates with as the RSA Security division to virtualize security components and develop governance, risk, and compliance tools to monitor and manage the challenges related to transitioning IT to a private cloud-based infrastructure. Currently, identity management is enabled through RSA Access Manager and Federated Authentication Manager, and RSA SecurID® is used for two-factor authentication. Central infrastructure configuration and patch management is provided through EMC Ionix™ Server Configuration Manager (SCM). Security capabilities such as RSA enVision®—a security and information event management platform—and Archer's GRC software provide a common point of management and control to address GRC requirements.

4. Management and automation

As physical technology migrates to virtual technology, the ability to track, measure, monitor, and manage becomes more complex. As private cloud-based IT management becomes a reality, it is imperative to track IT resources and information using an integrated tool suite. EMC IT is working on solutions to accelerate self-provisioning of IT services, reduce time-to-market, and support innovative chargeback models. EMC IT has chosen toolsets from EMC's Ionix suite of IT management software that provide a single-pane-of-glass view of all of the IT resources across the virtualized data center, using the advanced integrated IT management capabilities of tools such as Ionix Unified Infrastructure Manager (UIM) and SCM, and virtualization management tools such as VMware vCenter™ and VMware vCloud™.

5. Applications and cloud experience

EMC's vision for the virtualized data center and the transition to the private cloud is to enable its IT organization to offer platforms and applications as services (for example, IaaS, SaaS, and PaaS). First and foremost, EMC IT has been on the path to providing database grids on Oracle and Microsoft SQL Server to enable virtualized functionality and provide slices of these databases with agility to business units (also known as Database as a Service). EMC Greenplum® is now being used to support an efficient scale-out data warehousing and a sandbox-based analytics service offering (also called BI as a Service).

EMC IT has also moved application servers and middleware to a virtualized platform with the goal of providing on-demand infrastructure services to business units for their development activities. The application development and middleware capabilities have been standardized on the VMWare vFabric platform, including the Spring framework, Spring Integration, Spring Batch, and Gemfire. EMC IT is also enabling an application infrastructure based on VMware's products such as vFabric App Director and Cloud Foundry to provide IT in a self-service model to its business units.

The organization also views the cloud model as an agile mechanism to support the movement of current business-supported applications into a controlled, secure, and protected IT-supported model. This will enable the business to focus more on their business priorities and IT to better enable the business.

Virtual desktop infrastructure—an implementation use case

Using the power of VMware's Virtual Desktop Infrastructure (VDI), EMC is working on desktop virtualization approaches to simplify and lower the cost of IT management, increase IT security, optimize information storage, and provision IT resources based on the needs, requirements, and profiles of its workers. EMC IT's goal is to provision the user and not the device, hence the implementation of VDI will provide the ability for IT to enable different devices used by the end user. This would include the usual company-issued desktop or laptop but extend to a bring-your-own-technology (BYOT but better known as BYOPC or BYOD) model in addition to thin clients and mobile devices.

EMC plans to have 100 percent virtualized desktops by 2012, resulting in improved and simplified security, lower client TCO, rapid deployment, reduced support costs, and user-based provisioning.

MAKING THE TRANSITION TO THE PRIVATE CLOUD

Before transitioning existing IT resources to a private cloud-based infrastructure, EMC IT performs the following key activities.

Ensure basic enabling technologies work

The first activity is to ensure that the basic enabling technologies work, as advertised, in EMC's own IT environment. This requires rigorous testing of all infrastructure components within the virtualized data center—compute, storage, network, and orchestration—to ensure that their performance is in line with requirements and established benchmarks. Next, EMC IT configures and tests all software components for the required performance levels. During this phase, it is critical to focus on security requirements and issues relating to federation between locations.

Create use cases and assess capabilities across requirements

The second general activity involves creating a high-level framework of use cases within the business and assessing the current capabilities across those requirements. The objective of identifying the use cases is to match the business needs to the appropriate cloud model for providing IT services. The high-level use cases are based on parameters such as time-to-market, demand predictability and IT elasticity, integration needs, network bandwidth and latency, security, risk and compliance, and business impact. The requirements across each of these parameters are dynamic and vary significantly across applications, affecting the choice of internal and external cloud resources required.

Define policy and governance mechanisms

The third activity is to define policy and governance mechanisms to manage and operate the private cloud-enabled IT organization. It is essential to define robust mechanisms to handle critical issues around technical characteristics such as security, bandwidth, and integration, followed by performance, which encompasses service delivery aspects such as IT management.

EMC IT's private cloud policy and governance framework

The transition of IT to the private cloud directly impacts the profits, operational and business costs, and risks faced by the organization, as follows:

- **Impact to revenue**—The transition to the private cloud helps IT organizations provide improved services to business units. These IT services help business units find new customers, enhance quality while lowering the cost of goods and services delivered, and sell more successfully to existing customers.

- **Impact to costs**—Transitioning the entire IT infrastructure to the private cloud calls for large organizational investments upfront, resulting in significant savings at the end of the transition. Therefore, it is essential to make adequate budgetary provisions initially to reap rewards later.

- **Impact to risks**—A private cloud infrastructure uses both internal and external cloud infrastructures. This calls for new approaches to manage the business and information risks for the organization.

Therefore, it is essential to establish a governance body (involving people from business, finance, legal, and IT disciplines from within the company) for evaluating the migration of IT to a private cloud-based infrastructure.

EMC IT has developed a high-level policy and governance framework to move applications, platforms, and infrastructures to the external and public cloud. EMC has defined criteria that decide the policies and governance frameworks for an application:

- **Application classification**—Classifying applications as mission-critical (directly affecting customer service delivery, or affecting EMC's revenue or its reputation), business-critical (critical to the operations of a business unit), or business supporting (a supporting application)

- **Security**—The information security requirements necessary for the application

- **Risk and compliance**—A profile of the risks of incidents, from outages to information leaks, and the required compliance requirements

- **Connectivity**—Bandwidth and performance requirements for globally distributed applications and users

- **Integration**—The requirements to ensure that tightly coupled applications can work together

- **Performance**—Service delivery requirements such as availability, service level agreements, and IT service management

- **Time-to-market**—Rapid provisioning requirements

- **Demand elasticity**—Ability to deal with changes in the requirements of business units, as well as scale-up and scale-down needs

EMC IT has created a set of business use cases, such as those in Figure 8 for various profiles of services requested by business units with policies and small-scale governance functions for each use case.

The transition to the hybrid cloud will enable EMC IT with a transparent method for tracking the usage of IT resources by business unit. This empowers EMC IT with the capability of constructing new chargeback models.

Use Cases for Public Cloud	Example of Required IT Services							Policy	Governance Mechanism
	Security[1]	Risk and Compliance Assessment	Connectivity[2]	Integration	Incident Response	Management and Monitoring	Application Classification[3]	Confidential data, etc.	Joint Review Board, etc.
Engineering labs	✓	✓	✓					• Confidential data • Connectivity requirements	Risk and Compliance assessment by IT security and network teams
Large non-production workloads	✓	✓	✓						
Backup, archive, content management collaboration-latency tolerant applications	✓	✓	✓	✓	✓	✓	✓		
Other production BU applications	✓	✓	✓	✓	✓	✓	✓	• Non-mission-critical • Non-business-critical	IT Solution Desk process

[1] Perimeter security, identity management, authentication

[2] Bandwidth, latency

[3] Mission-critical, business-critical, business-supporting

Figure 8. A high-level abstraction of EMC IT's policy and governance model for public cloud usage

The Enterprise Strategy Group has published a white paper called ESG IT Audit: EMC's Journey to the Private Cloud, which examines EMC IT's journey to date. Looking forward, EMC expects to increase the storage utilization rate from 68 percent to 80 percent and avoid the purchase of more than 1.5 petabytes of storage over five years.

All told, EMC's journey from 2004 through 2009 resulted in savings of $104.5 million, including an estimated $88.3 million in capital equipment cost avoidance and $16.2 million of operating cost reduction due to increased data center power, cooling, and space efficiency. These savings have since gone past $125 million, when including 2009 and 2010

CONCLUSION

EMC's cloud computing strategy is designed to completely transform its IT organization and operations. Such a transformation means getting ready and making changes in the way IT is *built, run, consumed*, and *governed* at the company. The goal of this strategic initiative is to make EMC IT a customer-centric provider of end-to-end IT solutions to meet the business needs of EMC business units.

Leveraging the power of the private cloud, EMC IT is introducing innovative services such as on-demand IT infrastructure provisioning and self-service options for IT service enablement. To facilitate this transition, EMC IT has concentrated its efforts on the definition of a clear strategy for internal cloud and programs that focus on transitioning its IT infrastructure to the virtualized data center model. This initiative is in line with EMC's vision for a virtualized computing environment, which it shares with its partners VMware and Cisco.

To prepare the organization for a new paradigm of IT operations, EMC IT is also educating stakeholders at various levels on the new IT service paradigms, as well as developing a strong policy and governance framework for managing the new IT infrastructure. Working closely with partners and product divisions, EMC IT is concentrating on maximizing the business benefits of technology that can move its existing IT infrastructure to the private cloud.

EMC's structured approach helps accelerate its journey to the private cloud. It provides the company with the opportunity to start realizing the benefits of cloud practices now without waiting for complete solutions to emerge even as it moves from the Business Production phase to the IT as a Service phase. This enables EMC IT to more easily leverage these solutions as technologies evolve.

By having "risk versus reward" conversations with stakeholders at each level, EMC IT has been successful in accelerating the adoption of private cloud-based technologies within the company. This approach enables EMC to better structure discussions with partners and external IT cloud service providers. EMC IT can also provide vendors with the granular details of candidate workloads and the solution requirements they seek. Overall, EMC IT has been able to put together and leverage a better, more efficient *and more agile ecosystem based on its cloud computing strategy.*

References

Read the following for more information:

www.emc.com/EMCITProven

EMC IT's Journey to the Private Cloud blog at http://www.EMC.com/EMCit

EMT IT's Journey to the Private Cloud white paper series. Topics include:

Backup and Recovery

Applications and Cloud Experience

Virtual Desktop

Server Virtualization

ESG IT Audit: EMC's Journey to the Private Cloud ESG white paper

The following can be found on Chuck's Blog, an EMC insider's perspective on information, technology, and customer challenges:

"Not All Clouds Are Private Clouds"

"Private Clouds and the Fixed Vs. Variable Discussion"

"Private Cloud – The TOS Model"

"Private Cloud Adoption Models"

"Good Governance Equals Good IT?"

Announcement of the VCE coalition

Vblock Infrastructure Packages

EMC IT, A Blueprint for Data Center Efficiency white paper

Learn more about these EMC offerings on EMC.com:

EMC Atmos

EMC Symmetrix Virtual Provisioning

EMC FAST

EMC Ionix

VCE Cloud Computing Strategy Service

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EMC Corporation

Hopkinton, Mass. 01748-9103

1-508-435-1000 (in North America 1-866-464-7381)