

EMC IT'S JOURNEY TO THE PRIVATE CLOUD: VIRTUAL DESKTOP

A series exploring how EMC IT is architecting for the future and our progress toward offering IT as a Service to the business

Abstract

This white paper outlines EMC IT's journey in implementing virtual desktops to empower users and automate desktop management. EMC IT adopted a phased rollout of virtual desktops that is addressing user requirements and mitigating the risk of migration. This paper highlights the processes, challenges, and organizational changes needed to ensure a smooth transition to *virtual desktops*.

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Executive summary

New technologies continually redefine the work environment. As demonstrated by EMC IT, cloud computing is transforming businesses, delivering operational efficiencies, and enhancing customer focus. As part of its private cloud strategy, EMC IT is moving toward a virtual desktop infrastructure utilizing VMware View™ 4.5.

EMC IT's vision for a robust and scalable virtualized desktop infrastructure has four key goals: empower the user with an enhanced personalized desktop experience and the choice of device and platform to work on; simplify administration; improve the economics of management and operations; and strengthen data security.

To help ensure success at every stage, EMC IT is embracing a three-step approach for the virtual desktop implementation that encompasses comprehensive pilot, proof-of-concept, and production phases.

A virtual desktop rollout in a full-scale production environment also needs to be based on a solid governance structure and support model. To that end, EMC IT has defined governance policies and profiles developed with solution and adoption complexity in mind. EMC IT is also building a roadmap to plan for a growing number of applications that will be offered on virtual desktop.

By leveraging EMC's world-class IT infrastructure solutions, along with other leading technologies and solutions such as VMware® View and VMware ThinApp™, EMC IT is well positioned to maximize the benefits from its virtual desktop environment. As virtual desktop technology evolves, EMC IT will work closely with its partners, users, and product divisions to ensure that its goal of a secure, virtualized desktop environment is achieved.

This white paper is part of a series describing EMC IT's initiative to move toward a private cloud-based IT infrastructure. To learn more on the background of this initiative, read the white paper [EMC IT's Journey to the Private Cloud: A Practitioner's Guide](#).

Introduction

The objective of this white paper is to elaborate on EMC IT's journey in implementing virtual desktop and to illustrate the process, challenges, and benefits of virtual desktop to other organizations that are considering a virtual desktop environment. It includes the following sections:

- [Background](#)—Provides insight into the technical and business factors that influenced EMC IT's decision to implement virtual desktop.
- [EMC's virtual desktop vision](#)—Outlines the key objectives that EMC IT aspires to achieve: empower the user and EMC IT, improve the economics of desktop management and operations, and ensure security.

- [EMC's virtual desktop strategy](#)—Chronicles the steps EMC IT is following in implementing virtual desktop from an initial pilot, to POC, to production.
- [Governance](#)—Covers the dependencies on organizational change, governance, policies, and support models needed to ensure virtual desktop is successful.
- [Use cases](#)—Includes various categories of users with different needs.
- [Adoption process: best practices](#)—Details the six-step process to identify the use cases and teams that are ideal for a virtual desktop implementation.

Audience

This white paper is intended for IT program managers, IT architects, and IT management, as well as relevant stakeholders and leaders involved in decisions related to implementing virtual desktop in their organizations. This white paper is also intended for individuals who bear responsibility for internal IT departments.

Terminology

- **eDiscovery**—Software that is the first enterprise-grade platform for eDiscovery and litigation support for the demanding and complex needs of corporations, legal service providers, law firms, and consultants.
- **EMC Celerra®**—A network-attached storage (NAS) device, available as an integrated unit or as a NAS header, which can be added to an independent EMC storage array.
- **EMC Centera®**—The world's first magnetic hard-disk-based WORM data storage device, providing “write once, read many” functionality to applications that require data to be stored on a non-rewriteable, non-erasable storage medium.
- **EMC SourceOne™ eDiscovery—Kazeon**—Includes two types of assessment services—a sensitive data assessment service aimed at identifying non-public information, and a data assessment service that provides insight into data usage, quality, and value.
- **RSA® Data Loss Prevention (DLP)** —Integrated with the RSA enVision® platform, DLP helps EMC to uncover business risk associated with the loss of data and dynamically lower that risk through policy-based remediation and enforcement of controls.
- **VCE Vblock™ Infrastructure Packages**—Includes integrated IT offerings from EMC, VMware, and Cisco that combine best-in-class networking, storage, security, and management. These packages are jointly tested and supported to deliver optimal performance and reduce operational expenses.
- **VMware ThinApp**—With VMware ThinApp, applications are packaged into single executables that run completely isolated from each other and the operating system for conflict-free execution on endpoint devices.
- **VMware View**—Facilitates the delivery of virtual desktops as a managed service to lower costs and improve reliability, efficiency, and security. Support for the

software version of the Teradici PCoIP protocol by VMware View provides end users with a dramatic improvement in user experience across a wide variety of tasks and endpoint locations.

Background

EMC IT's business goals

EMC Corporation is a large global enterprise with more than 47,000 employees working across 150 locations in 49 countries. As with any organization of this scale, EMC's internal IT processes play an important role in ensuring business continuity and data security—and more importantly, increasing the productivity of the workforce by providing them with adequate infrastructure, tools, and support. EMC IT strives to ensure the workforce is constantly equipped to fulfill their objectives, and as part of that effort supports a large number of widely dispersed desktops and laptops.

Challenges faced by EMC IT

Keeping a large and distributed desktop infrastructure running smoothly 24x7, while at the same time effectively managing costs, can be a daunting task. In many organizations, the capital expenses make up as much as 45 percent of the total cost of owning a physical desktop, and the high cost of day-to-day management of the desktop infrastructure is approximately 41 percent.

In managing its own expansive network of desktops and laptops, EMC IT faces a number of challenges:

- **Administration/support**—Business continuity, desktop backup, application deployment, and compatibility are critical. However, they are complicated by decentralized business role profiles and non-standard desktop images and patches.
- **Data security**—Securing physical machines is always challenging, but with remote workers it is an even more complex proposition. Additionally, companies must also comply with data security policies and take into consideration the high cost and sheer complexity of eDiscovery.
- **Performance**—As increasing numbers of employees access applications remotely, performance challenges become an issue. This issue is compounded if employees are unable to access applications as needed to complete their work. In addition, aging physical machines cannot always accommodate sophisticated computing and storage needs or the heavy bandwidth requirements necessary to provide rich media to end users over the virtual desktop using PCoIP.
- **User convenience**—The workforce needs to be empowered to work from anywhere, use their own machines, and choose their preferred platform. In addition to addressing those needs, EMC IT must also resolve deployment delays for patches and next-generation applications on these machines to provide users secure access to EMC network resources.

- **Energy footprint**—EMC IT must balance the need for high-end computing capabilities with the increase in power consumption to satisfy the company’s environmental commitments.

EMC IT’s solution

On its journey to the private cloud, EMC IT has been encouraged by the success of virtualization in its server and storage areas. Creating a virtual desktop environment was seen as a natural step in its ability to deliver services from a cloud environment that would enable EMC IT to better address workforce challenges, improve operational and cost efficiencies, and transform the business.

EMC’s virtual desktop vision

New technologies have removed the limitations of physical office buildings and personal computers. Users no longer need to be in the office to contribute to the company’s bottom line. Internet connectivity, smart phones, tablets, and other thin computing devices have made the remote worker a reality.

For large organizations, such as EMC, embracing these technologies offers many advantages, including reduced capital expenditures, increased savings, and the ability to harness employees’ potential, while offering them balance in their work and personal lives.

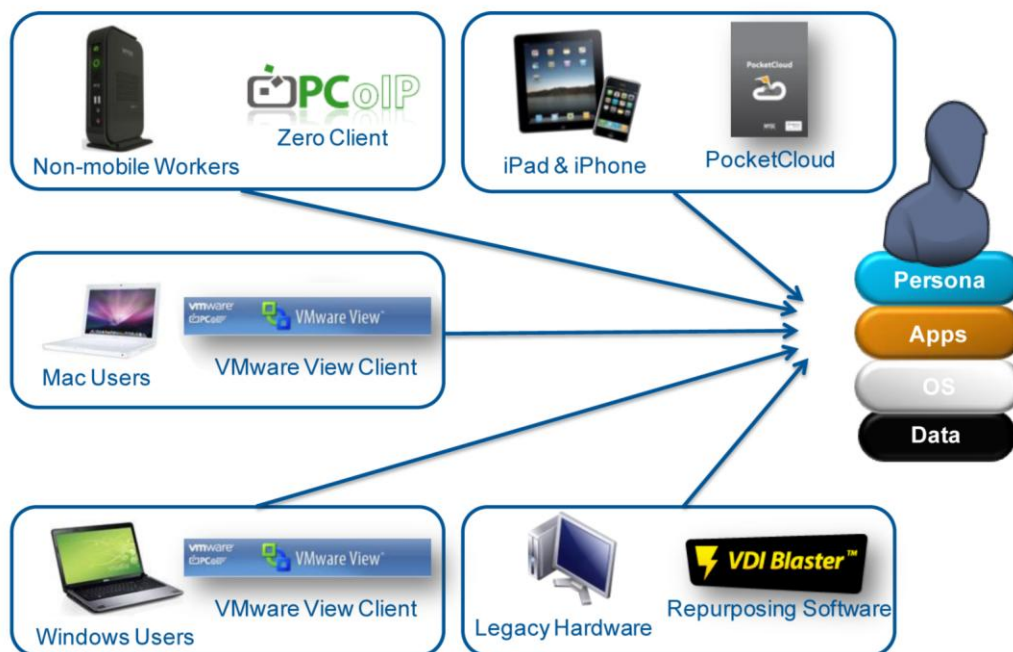


Figure 1. Virtual desktop offers end users the ability to access work-related data and applications from anywhere, at any time

Goals of EMC IT'S virtual desktop implementation

EMC IT has four goals for its virtualized desktop infrastructure:

- **Empower the user**—By provisioning users, not devices, EMC employees will access an enhanced, personalized desktop experience irrespective of their geographical location or time of day. This will provide faster and easier access to their work and any applications or resources needed through a device of their choice.
- **Empower EMC IT**—A virtual desktop will simplify the management of desktop images, applications, and user data for EMC IT, while reducing the amount of IT investment in desktop hardware management.
- **Improve the economics of desktop management and operations**—A virtual desktop can reduce total cost of ownership (TCO), increase user productivity, and drive revenue through faster provisioning and a quicker time-to-effectiveness for users.
- **Ensure data security**—A virtualized desktop environment will allow EMC IT to actively manage 100 percent of user desktop images, improving the protection of user data and intellectual property.

EMC's virtual desktop strategy

A virtualized desktop environment will enable full IT mobility by providing data and application access to the entire workforce on heterogeneous platforms. By decoupling the desktop from the underlying hardware and operating system, EMC IT will be better able to provide users choice and control of the client device used (independent of the hardware and operating system).

For an enterprise like EMC, this initiative requires a robust and scalable infrastructure. EMC IT is currently using EMC and VMware technologies to build a virtual desktop that will:

- **Reduce costs**—A lower TCO will be achieved through less upfront costs and longer client machine life. By standardizing desktop images and centralizing the management and support of desktops, EMC IT will also reduce administration costs; ensure RPO, RTO, availability and patching; and benefit from easier application deployment and migration.
- **Increase security**—Standardized desktop images and centralized data storage will support easier data protection against leakage and facilitate stronger compliance as needed by regulatory and client demands.
- **Enhance user experience**—Standardized desktop images also enable a consistent, yet personalized user experience.
- **Ensure reliable backup**—Virtual desktop allows for reliable and robust end-user data backup and restore capabilities for enhanced business continuity.

EMC IT is engaging in a strategic step-by-step process for its implementation to reduce the risk of migration to virtual desktop. It includes the following phases:

- **Pilot**—An initial pilot phase focused on a limited audience and use cases that addressed basic requirements. This promoted an understanding of early issues and challenges.
- **Proof of Concept (POC)**—In this phase, which is currently in progress, EMC IT is rolling out virtual desktops to a larger audience and extending support for a greater number of use cases. This phase is also addressing production rollout challenges such as security, desktop management processes, and support.
- **Production**—Drawing from experiences in the Pilot and POC phases, EMC IT is in the process of defining the target end state for a production virtual desktop deployment.

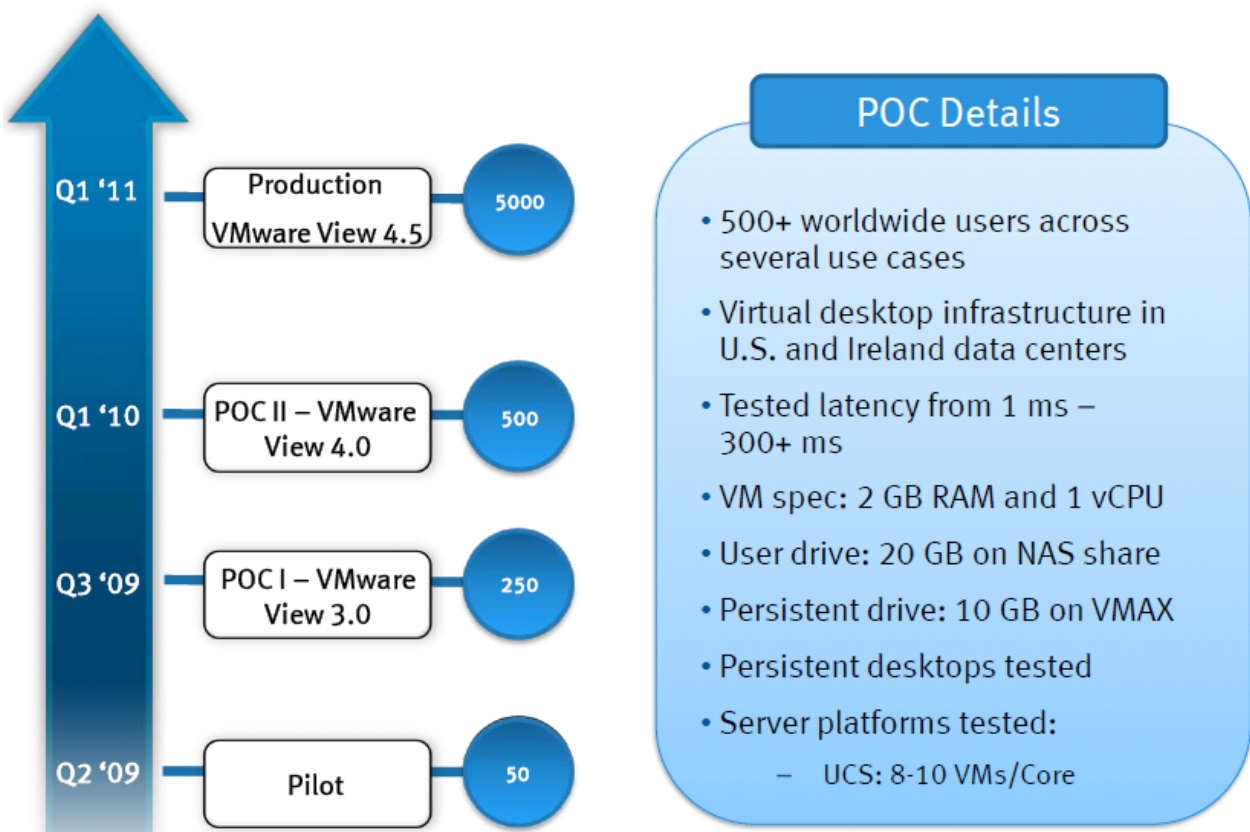


Figure 2. EMC IT Virtual Desktop POC roadmap

Pilot phase

EMC IT embarked on the pilot phase to identify use cases for virtual desktop; understand and circumvent the challenges of offering virtual desktop; and experiment on how it could achieve the greatest benefit from its efforts. This included whether virtual desktop could enhance desktop security, reduce client hardware costs, and improve the efficiency of IT operations.

EMC IT's approach

Virtual desktop was initially rolled out to 200 users using existing infrastructure and no new investment. The pilot progressed using test and development environments, and simple use cases were tested with virtual desktop to note the ability of users to log in from home. This pilot was successful, and enabled the testing of a number of important use cases including the ability to secure client and third-party devices. User experiences revealed that:

- The majority of users reported improved performance and stability with VMware View compared to the Citrix Desktop Broker.
- While most local users reported a performance similar to or better than a physical PC, remote users found the replacement slower than a physical desktop for certain applications. For the remote user, latencies of 150 milliseconds or higher were considered to be a performance issue, even though with VMware View 4.5 latencies up to 200 milliseconds are supported.
- Performance of email and video streaming was much better with a virtual desktop, but there were printing challenges using the initial version of VMware ThinApp, which was still in development at that time.

Key findings

The pilot phase enabled EMC IT to determine the minimum specifications that virtual machines would need to be successful, including a minimum of 1 GB RAM for remote desktop access and a 2 GB RAM for PCoIP technology implementations. Another key finding for EMC IT was that user data disk size requirements needed to be set based on actual usage.

POC phase

Following the pilot phase, EMC IT comprehensively tested an increased number of use cases to find the best fit for a production virtual desktop. These use cases included a wider range of user profiles and the migration of enterprise applications for these users. They also addressed related data security challenges.

EMC IT's approach

The sample was extended to more than 500 users worldwide and spanned a much larger range of use cases including securing home PCs, using multiple devices, integrating mergers and acquisitions, e-learning, and training. To test virtual desktops across larger distances, a virtual desktop infrastructure was set up both in Cork, Ireland, and in Massachusetts, U.S.

In addition to its planning and execution, EMC IT invested more than \$195,000 in hardware and approximately \$100,000 for VMware professional services, and tested Dell and Cisco Unified Computing System (UCS) server platforms for performance latency from less than 1 ms to over 300 ms.

The POC architecture included additional security firewalls to ensure data security within its networks. EMC also tested numerous complex use cases including secure PCoIP for remote users and contractors.

To prepare for a full-fledged rollout of virtual desktop in the production environment, EMC worked closely with its partners: Liquidware Labs for virtual desktop assessment and VMware for enterprise applications available on ThinApp.

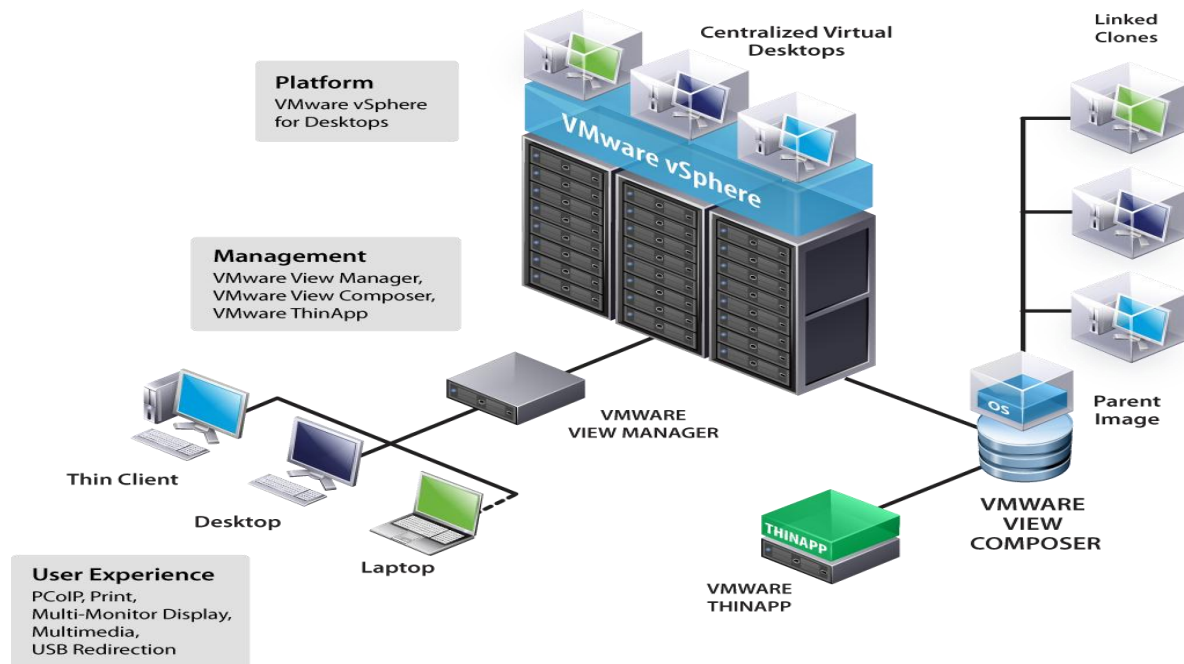


Figure 3. High-level architecture for the POC phase

Key findings

The POC phase helped EMC IT with the process of identifying and resolving important business and technical challenges to facilitate a successful virtual desktop implementation. These included:

- The ability to provide different back-end storage options (Flash drives, SATA, or Fibre Channel) and deduplication, and strategizing on how a return on these investments could be best realized.
- Allowing employees to bring their own PCs to work once virtual desktop is implemented and rolled out company-wide. EMC is working on network access-related security requirements to address these IT security challenges.
- Recognizing that moving to virtual desktop means a drastic change in the support model for desktop management as well as the roles and responsibilities of desktop support personnel. New support skills needed to be cultivated and discussions conducted across domains such as server and storage management, network support, and remote desktop management. EMC IT is putting support systems in place within the organization that will address all these concerns.

Production phase

Based on the work done and the knowledge gained from the pilot and POC phases, EMC IT is defining the target end states for a production virtual desktop deployment; the areas of business to implement virtual desktop; and how to proceed.

EMC IT and VMware are also leveraging the results of these efforts to further enhance features and products that will support more use cases and improve the virtual desktop experience.

EMC IT's objectives in the production phase of the virtual desktop include:

- **Centralized management**—This will provide increased control of desktop patching and security updates for EMC's Global IT Service Desk and support services.
- **Secure desktop environment**—This will reduce the number of security holes, and lower the risk to the EMC network from unmanaged clients that are external to the environment.
- **Rapid deployment**—The Global IT Service Desk and support services will require less time and effort to provision desktops.
- **Extended desktop lifecycle**—The increased lifespan of existing hardware will lead to a reduced spend on replacement devices.
- **ROI and cost avoidance**—By moving from physical desktops to a virtual desktop, there can be increased ROI and cost avoidance.

EMC IT has developed a comprehensive architecture based on best-in-class EMC and partner technologies for the implementation. The production virtual desktop will use a scalable and easy-to-configure VCE Vblock-based architecture, making it easy to replicate the successes of virtual desktop from one site to another.

This architecture will allow EMC IT to customize and modify per region based on their unique requirements, and facilitate virtual desktop rollout to other regions in quick succession. EMC will also use RSA SecurBook for data loss protection and authentication, EMC Avamar® for backup, and the EMC Ionix™ suite as the management toolset.

In addition, EMC IT will leverage deduplication and compression technology to significantly reduce TCO in the areas of primary storage and backup.

VDI at enterprise-scale must support thousands of concurrent users

VDI Platform	VMware
Authentication and DLP	RSA
Backup	EMC Avamar
Management	EMC Ionix
Network/SAN Switching	Cisco
Storage	EMC
Network Access Control	Cisco
Mobile Device Mgmt.	Zenprise

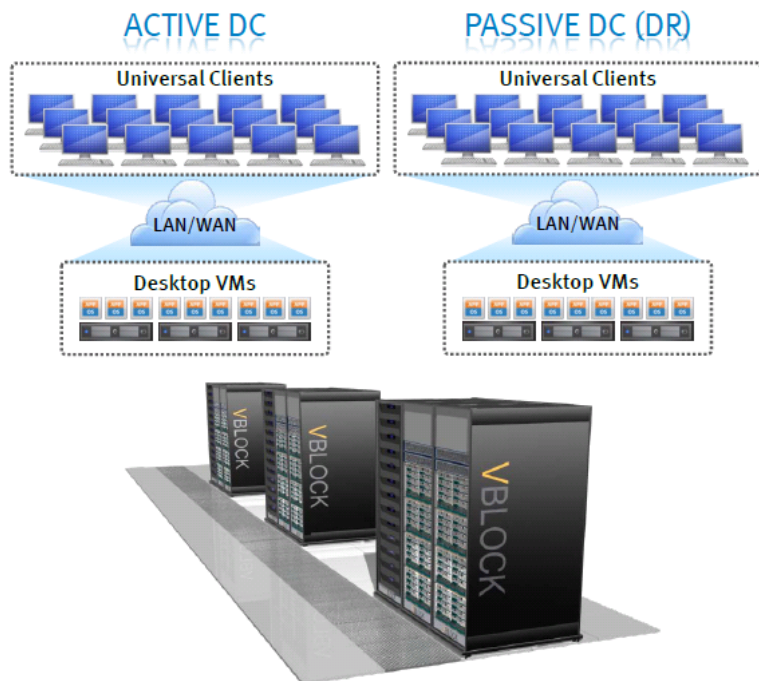


Figure 4. High-level architecture for the production phase

Designed for scalability, high availability, superior performance, and optimal storage utilization, EMC IT's virtual desktop architecture includes:

- **Vblock 2 infrastructure architecture to facilitate a repeatable and scalable platform**—Vblock 2 consists of the Cisco UCS, EMC Symmetrix VMAX™ storage, and VMware vSphere™ 4. EMC IT has employed a highly scalable Vblock 2 architecture in its initial production rollout of up to 5,000 task workers. It expects to support another 40,000 users in the coming years.
- **EMC Celerra Home Directory features for ease of management**—EMC IT has provided users with a universally accessible home drive, regardless of whether they are logging in from a virtual desktop or a standard laptop. The Home Directory feature also enables compression on user data, so it saves space. This has enabled EMC IT to reduce total storage consumption by almost 50 percent, as well as significantly reduce administrative overhead by eliminating manual provisioning and configuration of user profiles.
- **VMware View with PCoIP to provide the best possible end-user experience**—By efficiently adjusting the balance of the workload between the server and client, the PCoIP protocol enables EMC IT to enhance the end-user experience dynamically in response to available bandwidth and communication channel latency.
- **EMC Centera online archiving with EMC File Management Appliance (FMA)**—EMC IT implemented archiving functionality, using EMC FMA to enable users to store a virtually unlimited number of documents.

- **EMC Avamar for online backup of end-user data with a user-initiated restore capability**—Installing Avamar agents on a client image provides end users with the ability to restore missing files themselves, which reduces the number of support calls. To capture the initial snap, EMC IT is using Avamar NDMP accelerators to back up data directly from the Celerra Data Mover. In the case of a full restore, NDMP provides the end user with fast restore capabilities (with the help of a backup administrator). This also reduces the Avamar agent’s task of pushing initial backup data to the grid.
- **Kazeon eDiscovery for data classification and archiving rules**—EMC built a robust infrastructure to ensure that data is securely stored and archived so that it can be easily retrieved and accessed at a later date.
- **RSA technologies such as RSA DLP and RSA SecurBook**—These technologies ensure that information remains secure within the organization’s boundaries.
- **EMC Celerra and EMC SRDF®/A for business continuance**—EMC IT uses best-in-class business continuity and disaster recovery capabilities to ensure undisturbed desktop access to users.
- **EMC Virtual Provisioning™**—This technology reduces primary storage costs.

Challenges and benefits of a production rollout of virtual desktop

Some critical challenges that must be addressed before a full rollout of virtual desktop is possible include finding ways to support collaboration tools and configuring desktop management and performance monitoring tools in a virtual desktop environment. Additionally, EMC IT continues to: quantify ROI from the virtual desktop rollout; prepare a number of applications for ThinApp; and work to resolve PCoIP bandwidth requirements. There is also the task of educating and preparing the organization for the transition to a virtual desktop infrastructure.

However, the benefits from virtual desktop far outweigh the challenges. Advantages include:

- **Improved virtual desktop economics**—Virtual desktop offers several cost advantages. It helps reduce costs by leveraging cost-optimized storage solutions such as Fully Automated Storage Tiering (FAST), thin provisioning, and deduplication. Savings can also be driven through single instancing for desktop user data across multiple file systems.

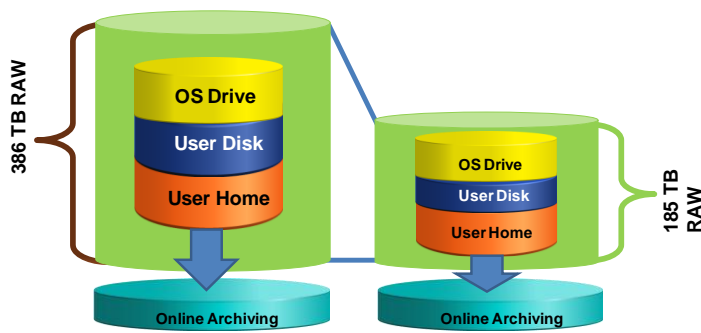


Figure 5. EMC tiered storage technologies minimize the cost of ownership

- Improved management and security**—EMC FMA, EMC Centera, and Avamar are optimized for virtual desktops and offer superior backup, archiving, and recovery, which keeps primary storage small and eliminates the need for massive backup. These optimized capabilities result in easier desktop management. Additionally, secure two-factor authentication can be implemented on a virtual desktop as needed using RSA’s technology, and desktops can be kept current by enforcing automatic updates through ThinApp.

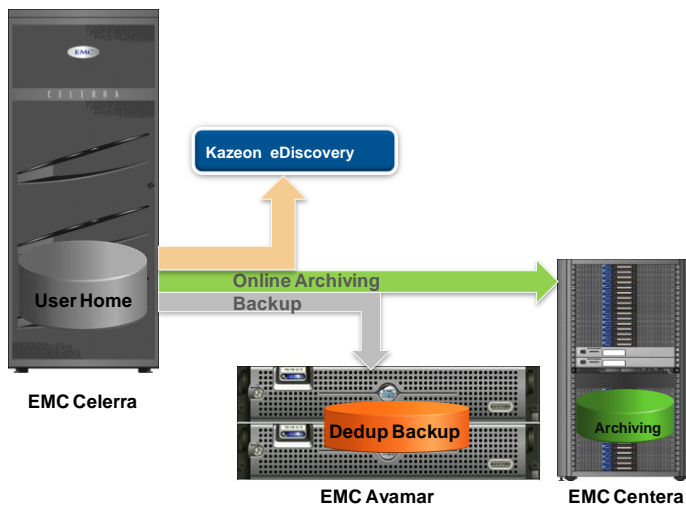


Figure 6. An EMC Avamar-based solution minimizes the cost and complexity of backup and management

Governance

Because a sound governance structure and support model are vital to the success of a virtual desktop rollout in a full-scale production environment, EMC IT has worked to comprehensively and strategically define governance policies and profiles. These policies and profiles concentrate both on task workers such as administrative, clerical, and manufacturing workers, as well as on knowledge workers and power users for a virtual desktop implementation.

Use cases

Each user has unique needs and EMC IT has developed different hardware and application profiles based on these specific requirements. This includes thin clients for task workers, and a combination of thick and thin clients for knowledge workers.

EMC IT is also working on a roadmap to offer applications on virtual desktop, starting with office applications and moving toward applications that require administrator access. This roadmap will soon expand use cases to cover business roles or functions at EMC such as business process outsourcing, remote/branch office, mobile users, and contractors. It will also encompass business continuity and disaster recovery.

- **Business process outsourcing**—Users in business process outsourcing require a virtual desktop environment tailored to the unique needs of outsourced service providers, with emphasis on centrally controlling sensitive data, better access to key applications, and central administration of all desktop images for consistent high performance.
- **Microsoft Windows 7 migration**—To extend the life of existing desktop software, EMC IT's approach considers Windows 7 migration challenges, including the cost of migration and potential difficulties caused by incompatible applications.
- **Business continuity/disaster recovery**—Business continuity and disaster recovery cannot be compromised. To ensure uptime and accessibility, desktops must be rapidly provisioned and available 24x7. Support also needs to be accessible to remote users.
- **Remote/branch office**—A remote/branch office requires an environment tailored to distributed working, with an emphasis on centralized management of desktops. Therefore, a common standardized desktop image must be maintained across the entire enterprise.
- **Mobile users**—To extend the virtual desktop to mobile users, desktop images should be available to them irrespective of the extent of connectivity to the network. This design leverages local device resources while extending much greater security and control to offline users.
- **Contractors/EOIT/BYOPC**—It is necessary to have the ability to separate the enterprise desktop from contractors' personal desktops on their devices, while ensuring enterprise data security and centrally controlling and managing access to enterprise assets and data.

Adoption process: Best practices

Even as the rollout continues, to simplify the transition to virtual desktop, EMC IT has developed a six-step process to identify use cases and teams that are ideal for an implementation of this nature.

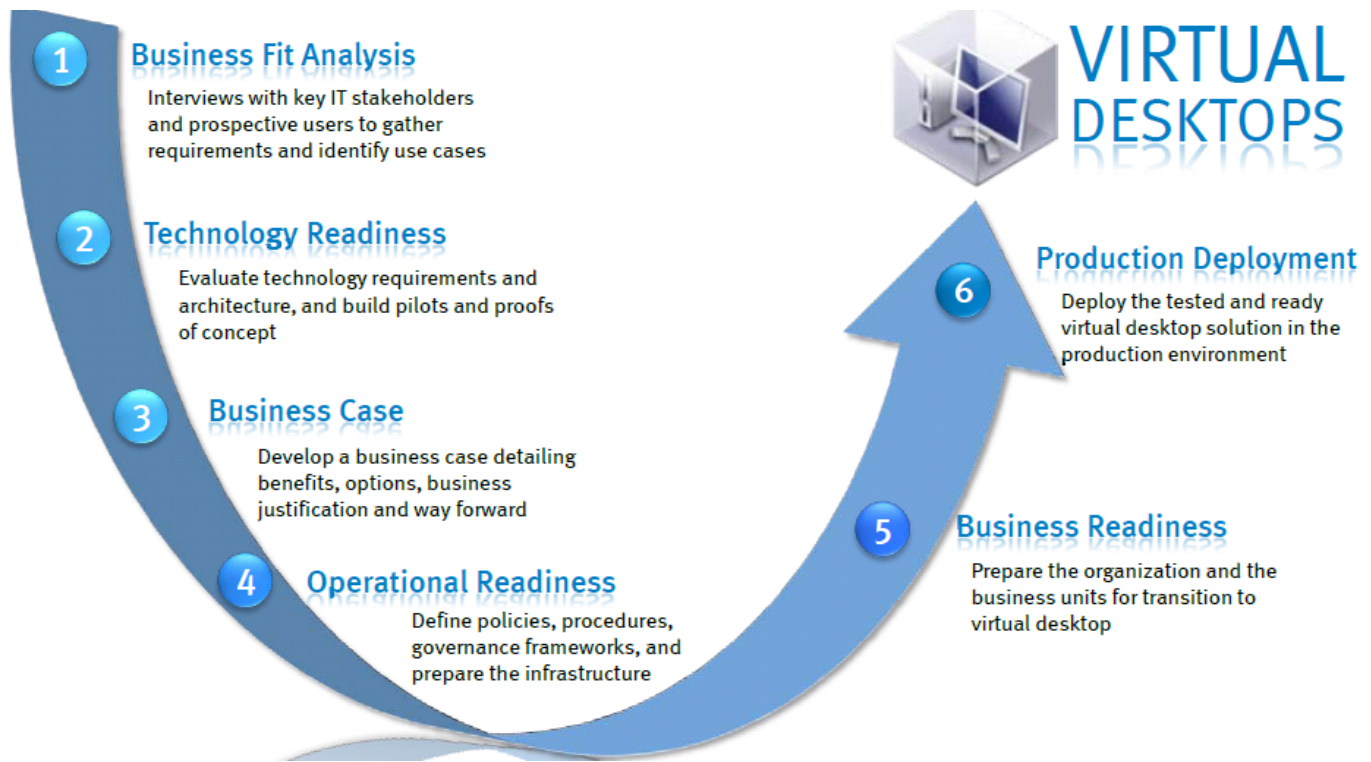


Figure 7. Process to identify use cases

Conclusion

EMC IT's virtual desktop initiative promises to liberate users and IT from the constraints of using and managing desktop technology. Users will have the freedom of choice and the ability to access their desktop at any time from an array of approved devices from any geographic location. This enables EMC IT to administer, support, and manage desktops in a simpler, more efficient, and cost-effective way.

EMC IT's systematic, phased approach to adopting virtual desktop has had several advantages in providing a better understanding of the key factors influencing its success, as well as greater insight into supporting optimal user experience through consistency, more choice, and improved performance.

Virtual desktop offers many benefits including a lower TCO than traditional physical desktop environments; easier application deployment, migration, and upgrades; improved backup and recovery; better security and stronger compliance; and an empowered and more productive end user. In addition, virtual desktops enable EMC IT to offer flexible new operational models such as "bring your own PC" and mobile desktop access and usage.

Through the use of EMC's comprehensive portfolio of innovative information infrastructure solutions, along with advanced technologies from VMware and RSA Security, EMC IT is well equipped to realize its vision for desktop virtualization.

References

The following resources provide additional, relevant information. You can access these documents and sites at www.EMC.com or by contacting an EMC representative:

- [EMC IT's Journey to the Private Cloud: A Practitioner's Guide](#)
- EMC IT web page at <http://www.EMC.com/EMCIT>
- [Deploying Authenticated VMware Virtual Desktop Infrastructure \(VDI\) Solutions using EMC Celerra Storage and RSA Secure ID](#)
- [Enterprise Virtual Desktop Infrastructure: Design for Performance and Reliability](#)