

Desktop Delivery: Making Desktop Virtualization Work

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Summary

This whitepaper discusses Desktop Virtualization and the impact on desktop management challenges. We consider:

1. The challenges for desktop management in a pre-Desktop Virtualization world.
2. How these challenges are addressed by Desktop Virtualization
3. Issues that are not well addressed by Desktop Virtualization
4. Our view of how to best address these remaining issues.

While Desktop Virtualization puts the desktop into the data center, it is not a panacea for desktop delivery. Desktop Virtualization works best as part of a comprehensive Desktop Delivery approach which focuses on the most efficient way to get applications to the end user and meet business and IT needs, not just a PC equivalent. Desktop Delivery proposes the dynamic assembly of a 'new and pristine' high performing desktop with personalized set of applications and settings every time a user logs on.

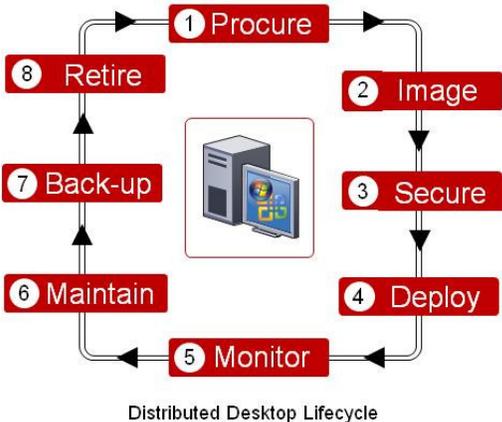
In our view, the following are imperatives for Desktop Delivery:

- Simply moving desktops into the datacenter using a Desktop Virtualization approach is not sufficient. An optimal desktop delivery strategy includes centralizing and separating both applications and desktops.
- The initial acquisition cost of a Desktop Virtualization solution is small compared to the ongoing savings that are possible using centralized desktops. Hidden costs can creep in that may impact ROI. A complete Desktop Delivery solution must deliver desktops quickly in a scalable fashion and enable very simple updates. Furthermore, it is necessary to anticipate and resolve potential severe support and storage cost impacts before they occur.
- It is not enough to simply offer users a familiar desktop experience. The Virtual Desktop must deliver a superior desktop experience to ensure user acceptance.
- An open architecture is necessary to ensure that the Desktop Virtualization solution can easily leverage and adapt to new technologies and standards as they emerge.

Challenges with Traditional Desktops

The PC is the workhorse of the enterprise and the main corporate interface and productivity tool for most employees. At the same time, the architecture of many individual complex end-user devices has led to a significant headache for IT departments only exacerbated by increased desktop diversity, growing application density, and a growing PC user base. For example, Gartner reports that “TCO for PCs can range between \$4,000 and \$9,000 (or more) per user per year.”¹

Managing the traditional PC lifecycle illustrated below drives this TCO investment.



Procuring the desktop PC is actually the smallest portion of desktop TCO. It is just the beginning of the lifecycle.

Images are painstakingly crafted to meet the needs of the user community and the enterprise IT department. However, over time, desktops are modified to a point where they are unique to each end user and no longer bear much similarity to the original corporate image, impacting performance and supportability. The latest virus definitions, firewalls, password managers and other security software is installed to the new PC but is up to a combination of the end user

and IT administrators to ensure that definitions are up to date, security patches are in place, and passwords meet requirements and are changed on a regular basis. Physical security of the endpoint cannot be assured so regular instances of stolen or lost PC hard drives and resultant lost data cost are well documented.

Once deployed, PC's are monitored to the best of the ability of the support staff, assuming that installed software tools are not modified or removed by the end users. Data that resides on centralized data store is backed up but the OS and applications installed are much less likely to be backed up on a regular basis by either end user or IT support, resulting in significant effort to recover failed, destroyed, or stolen PC's. Finally the PC is retired if it can no longer support latest OS and app images.

End users are left to fend for themselves once the PC arrives with the “corporate image”. Where they are not provided with administrator rights, users will inundate the help desk with requests to personalize the PC, add applications and so on. Help desk response time suffers and user productivity is impacted by this lack of flexibility. The more technical users will re-image the machine and fall off the grid altogether with untold impact on desktop data security.

The solution for breaking the desktop TCO cost spiral starts with centralizing desktop resources through Desktop Virtualization but it doesn't –end there. Moving to Desktop Virtualization opens up a host of other issues related to managing individual resources centrally, protecting against intrusion into the host servers, and scaling up maintenance procedures as virtual desktops roll out in volume.

Desktop Virtualization Overview

Desktop Virtualization architecture employs virtual machine technology to house user desktop images in the data center. Each desktop image has an operating system with applications and the end user accesses their desktop via a virtual display protocol. The goal is that the user experience be similar to having a PC next to their desk. Via third-party profile management software, personalization is supported and any settings are retained when user shuts down.

Several organizations are offering Desktop Virtualization products, most notably Citrix, VMware and a range of smaller organizations. This is an emerging market with a very high level of market interest. It is also a market that is still not well understood, so it is important that Citrix provide guidance on how we believe that the market will evolve and prosper.

Amongst other items, Desktop Virtualization promises to improve the following:

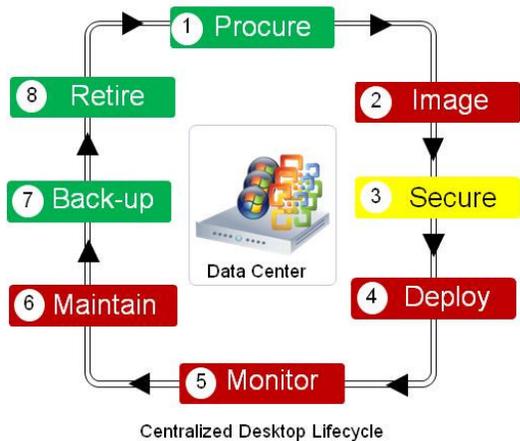
1. Desktop Refresh and Growth – On a yearly basis, most medium to large size enterprises replace a significant percentage of their desktop hardware, driving costs for new hardware acquisition and updates. With Desktop Virtualization, desktop hardware rarely needs to be updated as new OS's and Applications can be delivered instantly
2. Compliance and Data Security – by providing remote access to data from the data center, no data is ever located on the user's machine and cannot be lost even when a PC hard drive or laptop is stolen.
3. Low Cost of Desktop Ownership – by maximizing hardware utilization and bringing the complexity of the client into the data center where it can be better managed.
4. Anytime, Anywhere Access – by allowing deployment of new desktops on demand to any user anywhere in the world, by allowing new desktop images to be instantly deployed
5. Business continuity – by allowing end-users access to desktop images regardless of location or device

"Virtualization technologies have matured to the point where they can now be applied to the corporate desktop environment to improve performance, increase flexibility, provide personalization, remove application compatibility issues, and reduce operating and capital expenses."

- Credit Suisse, "Desktop Virtualization Comes of Age," Nov. 26, 2007.



Desktop Virtualization alone is an incomplete solution



Use of a centralized desktop model via Desktop Virtualization provides many strategic advantages. PC procurement is no longer an issue since any endpoint will serve to display the desktop session. Desktop backup is handled as part of the data center back up services and endpoints may be retired as needed without any changes to the user’s virtual desktop. However centralization does not intrinsically address all weaknesses of the traditional desktop: image management, application management, security, mass deployment, maintenance and performance monitoring. Indeed Desktop Virtualization can introduce

new challenges by just moving much of the existing PC maintenance challenges to the datacenter and virtual machines. At the same time, it can add network storage costs and degrade overall user experience.

Meeting User Experience Expectations

At first blush in a lab trial, VM-based delivered desktops may seem to be perfectly functional but, to be accepted as a company-wide solution, Desktop Virtualization must perform at slower WAN speeds with varying degrees of latency. Many Desktop Virtualization products produce poor quality graphics rendition and slow mouse/keyboard response when faced with less than switched LAN bandwidth and latent (>75ms) connections.

A virtual desktop will not be accepted by user community if it does not work as well or better than existing PC. Then, it is very important to find the right delivery protocol that can manage any reasonable network connection.

Centralized Desktop Management

Provisioning a centralized desktop model would seem to address many support concerns, potentially eliminating “sneakernet” support. However the migration of desktop OS and applications (along with anti-virus, patches, updates, etc.) to the data center only serves to centralize the problems and result in potentially thousands of monolithic desktop OS/Application images on expensive SAN storage.

A typical enterprise will manage 1 or 2 Windows versions on the desktop. Depending on how closely managed individual PCs are, Windows service packs and patches will over time create dozens of variations of Windows environments. These configurations confound the ability to fix desktop problems since environment discovery, diagnosis, and repair methods will be hugely variable on each service call.

Centralized desktop solutions need also to address migrating Electronic Software Delivery (ESD) solutions to deal with provisioning applications and updates to VM-based desktops. Dealing with multiple timezones for software update windows and ensuring that suspended or shutdown VM’s are updated are just two scenarios that will change the way ESD is managed.

Desktop Image Management

A variety of methods have been attempted for management of the traditional desktop image, ranging from end-user configuration to fully automated remote management. In all cases, the traditional desktop is fragile and can be damaged by end-user error or by failure of remote automated update. Managing the complexity of the traditional desktop is a key reason for the high TCO of these solutions.

Patching and updating is a particular issue. One reason for this is that there is no sure way to deliver patches to all users instantaneously, nor to assure that all patches and updates succeed. Because of this, devices can be left in unusable, or in untested configurations, where one patch succeeds but another does not.

This leads to issues with application support, as a combination of a variety of patch levels for OS and applications can make it very difficult to discover the source of poor performing or crashing applications.

Clearly an application delivery solution is required to address these issues.

Summary

Existing Desktop Virtualization solutions suffer from poor end user experience, especially on WAN connections, complex deployment due to lack of focus on application delivery, and challenging economics due to non-scalable image management strategies.

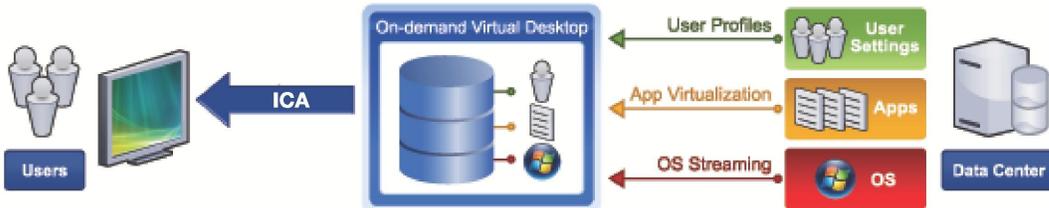
Technology Imperatives for a Successful Desktop Delivery Solution

Desktop Virtualization is just a component of an overall desktop delivery solution. By looking at desktop delivery simply as a means to deliver the Windows desktop and corresponding applications to the end users in the most efficient way possible, we find the following set of imperatives.

Keep OS and Applications Separate

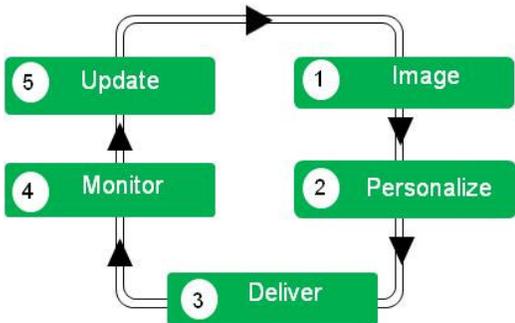
While it can make sense to bring the existing SOE into the Desktop Virtualization system for rapid deployment, this should be considered only a first step. Once the existing SOE is in the datacenter, we must consider the how to best manage that image.

As we know, system virtualization operates by decoupling the operating system from the hardware. The same notion can also be used to decouple operating system from user personalization, applications and data. In this way, desktops can be “dynamically assembled” which greatly simplifies image and application management.



Citrix proposes to address SOE proliferation and desktop image management with the following unique approach:

1. Take the core operating system and separate it from applications and user preferences. By doing so, we achieve a ubiquitous, easily managed operating system image that can be used as a base image for all users.
2. Provide that single OS image via Desktop Virtualization.
3. On delivery of the core operating system to the user, dynamically apply user personalization to the image.
4. Deliver applications, only as needed and in the most appropriate way as isolated, de-coupled, elements on top of the standard core operating system.



In this scenario depicted on the left, we completely replace the traditional PC lifecycle with a virtual desktop support structure. Once we decouple the OS and applications from the individual user desktop, we are free to update, replace, or patch the base image without impacting ongoing desktop operations.

De-coupling applications also allows the system to choose the best delivery mechanism. For example, some applications are best delivered through client-side application

virtualization technologies, others by server side virtualization, while a few applications closely coupled to the OS (Email, Browser) can reside full-time on the image.

All Windows applications can thus be delivered via centralized datacenters, where applications and data are less costly to manage and support, best secured, and easier to back up and restore.

Operational Scalability for Rapid Rollout

To be fully effective and exploit the full value of the infrastructure investment, Desktop Virtualization should be driven to all office-based knowledge workers which implies scalability to 1000's of users. The incremental cost of adding a new user in this scenario needs to be very low and the process needs to be consistent and repeatable.

This can be achieved by integration with an orchestration engine to automate new user setup as well as intelligent provisioning of the datacenter infrastructure to handle the desktop computing workloads.

Using the desktop provisioning approach described above, when we add these new users, we are able to maintain the same OS and application infrastructure, capturing personalization settings as the new users modify their environment. This same approach simplifies rollbacks, where there may have been a decision to remove a patch or update. So there is now a methodology in place to rapidly grow virtual desktop user base **and** easily support them once delivered.

User experience must be *better*

End users are used to having an experience supported by local computing resources. They are used to fast CPU response, to multi-media and to use of peripherals. It is important that the end-user not feel that they are losing out by moving to a Desktop Virtualization solution, lest they build up resistance to the solution.

Via VM technology, leading edge desktop delivery (brokering) solutions, and an advanced remote display protocol such as ICA, we see several immediate wins in user experience, including:

1. **Instant On:** Today, many end users complain that their computers take a long time (2-3 minutes or more) to boot up. Virtual desktops can be configured to be significantly faster to startup and provide users with an "Instant On" experience. Once users are connected to the virtual desktop, the virtual display technology can adapt dynamically to the available bandwidth and network latency to provide a superior user experience.
2. **Remote Access for Business Travelers:** Many business travelers are concerned about the inconvenience and potential theft of laptops they carry with them on business trips. Virtual desktops accessed remotely from any heterogeneous device can address both these concerns while enabling the corporate employee to remain productive.
3. **Simplifying Branch Office and Work-from-Home Desktops:** Given the ability of ICA to manage low bandwidth and high latency WAN connections, branch office and work at home employees can access the full corporate desktop using any endpoint available to them. Updates and new applications will be available to every corporate employee immediately, wherever they may be.

4. Proactive Support: Desktop Virtualization can be combined with technologies to maintain and improve the user experience. Good examples are monitoring performance, compliance with minimum service levels and efficient tools to quickly diagnose and resolve user issues.

Avoid infrastructure lock-in

With the sheer number of users dependent upon the Desktop Virtualization solution, vendor lock-in should be avoided where possible. Key areas to consider:

- Hypervisor – It is important to choose a hypervisor technology that supports the Microsoft VHD file format. VHD specifies a virtual machine hard disk that can reside on a native host file system encapsulated within a single file. This format will be used by a future version of Microsoft Windows Server that includes hypervisor-based virtualization technology.
- Virtual storage – many organizations will have a mix of storage types and sources. A solution that allows for flexibility around storage virtualization and that fully leverages virtual storage vendors is most appropriate.
- Desktop Appliances – Some Desktop Virtualization solutions specify a limited number of end points, such as Windows-based PCs. To maximize the scope of the Desktop Delivery solution, it is important that it supports all manner of user-side OS's (Windows, Linux, Mac,...) and hardware (PC, Thin Client).
- Blade PCs – Most Desktop Virtualization solutions do not take into account the requirement that some applications and users have for customized or dedicated PC hardware. The solution chosen must be able to address those users with the same infrastructure as those who can be served by virtual machine technology.

The ultimate goal is that as the market develops and customer needs change, infrastructure can be adapted as needed, without recourse to 'rip and replace' type of approaches.

Conclusion

Desktop Virtualization is a dramatic new development for application and desktop delivery. It offers many advantages and Citrix recommends that customers take a strategic view of the opportunity presented by this technology, considering it as a key enabling component for application delivery overall, and to apply it to the broader context so that end users and IT administrators gain significant advantages over the traditional desktop environment.

Citrix proposes the following imperatives for building out a Desktop Delivery infrastructure:

- Centralize and separate applications and desktops.
- Choose a solution that dynamically assembles a 'new and pristine' desktop with personalized applications for each user at each logon.
- Build an infrastructure that provides the quickest way to deliver, scale, and update desktops.
- Deliver a superior desktop experience to ensure user acceptance.
- Demand a solution with an open infrastructure to allow choice and flexibility.