Desktop Transformation: Start Right, to End Right

A FOCUS White Paper



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Executive Summary

The definition of a "desktop" has changed, with a plethora of new devices, Bring Your Own Device (BYOD) strategies, desktop and application virtualization architectures, Windows upgrades, and consumerization of IT all driving a major transformation. Desktop and application virtualization solutions and best practices have matured and are now gaining traction, with many projects succeeding where past efforts had failed. However, IT continues to struggle with time-consuming, costly support and upgrade issues, and now faces BYOD challenges, while users clamor for increased mobility, new device support, and an increasing range of requirements. Knowing your user base and their range of requirements is the first step towards successful transformation.

In order to meet the wide range of user requirements, most organizations will require a combination of technologies and vendors. Successful transformation will involve more than VDI, with combinations of VDI and hosted/published desktops and applications, and layering of application virtualization, and personalization as part of the mix. In addition, most organizations will likely be a hybrid environment in terms of vendors, combining solutions from VMware, Citrix, Microsoft and others.

With many of the barriers of the past eliminated, re-evaluating desktop strategies today can bring huge benefits. If done well, centralizing and modernizing desktops and applications can dramatically reduce desktop management and support costs AND improve user satisfaction. The caveat is that if done badly, it can drive up the cost per desktop AND make for very unhappy users. However, by carefully planning, implementing and managing a well-thought-out desktop transformation strategy, you can provide cost-effective, secure desktop and application access from any device, anywhere. Leveraging the best of today's technologies, learning from mistakes of the past, and paying attention to the considerations and recommendations described in this white paper can help ensure your successful desktop transformation, and help you start right to end right.

Introduction: Defining the New "Desktop"

The definition of a "desktop" has changed over the last ten years from a Personal Computer sitting on a desk to a virtual computing "workspace" where tasks are accomplished, regardless of the device, operating system, location, or connection. This workspace still includes traditional desktop and laptop PCs but has now evolved to include myriad new devices from thin/zero clients to smartphones to the ever-growing world of tablet devices.

In addition, desktop and application virtualization technologies have matured, enabling the abstraction of virtual desktops and applications away from the underlying devices. This allows centrally managed virtual desktops and applications to run remotely on a variety of devices, delivering a broad set of options for integrating corporate and web-based applications across the growing range of devices. IT organizations are working to leverage virtualization to better integrate these new devices, support Bring your own Device (BYOD) initiatives, and implement/integrate Enterprise App Stores to allow users to connect from the device of their choice, and download approved, appropriate apps for their devices. All of these technologies are still evolving, with new approaches continually emerging, such as client and mobile hypervisors, applications running within the browser itself, data/file sharing and synchronization in the cloud, and more.

Overall, this transformation involves a shift from the traditional focus on desktops with applications, to focusing on applications that run on desktops, laptops, tablets, smartphones, kiosks, and whatever

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devices come next. The term "desktop" has become a metaphor for the collective devices, applications, technologies, services and content to which users subscribe both within the enterprise and in the cloud.

Desktop & Application Trends

There are a number of key trends relative to desktop and application delivery that are working together to shape this desktop transformation.

Consumerization of IT

The term "consumerization of IT" often is used to describe this new onslaught of consumer devices – iPads, iPhones, Android tablets and phones, etc. Although these devices are clearly a part of this consumerization, there is much more to it. All the cool new devices also tend to offer a wide range of user preferences, along with instant-on, immediate access to applications and data, with real-time information and fast response time. Users looking for a new application have only to go to the app store of choice, search, click and download that app, and they are off and running.

In fact, a recent survey showed that a majority of employees under 30 feel they have better technology at home than at work. The new generation of workers has never lived without computers, and many have never lived without a smartphone – they are "born digital" vs. the previous generation who were "taught digital." This trend brings with it something much more important than new devices; that is, the expectation of immediacy – of finding and loading new applications, accessing real-time information, changing user settings and more. The risk here is that if corporate IT cannot deliver solutions that match their level of expectations, users will simply circumvent IT and go directly to the public cloud for their solutions.

Endpoint device choices

Over the past decade, the number and types of endpoint device choices has skyrocketed, and consequently, the number of user devices within corporations has as well. As users began connecting from various computers at home or on the road, corporate IT began experimenting with Bring Your Own PC (BYOPC) initiatives, allowing users to connect from their own PCs. This grew into Bring Your Own Computer (BYOC), and eventually with the plethora of new mobile devices to Bring Your Own Device (BYOD). The advent of the iPad and its popularity amongst corporate executives in particular, has increased the urgency for IT to support the emerging BYO trend.

In addition to mobile devices, thin client options have expanded from their early days to include many varieties of devices and embedded operating systems, as well as new zero client devices, with no operating system at all. Unified communications and VOIP have gained new traction, with possibilities of merging communications, and collaboration into desktop and application virtualization strategies.

Estimates today are that there are 1.4 billion user devices, with the average corporation having over 1 million unique user configurations. The average user has three to five devices. As a result, IT needs to shift from a device-centric (desktop) focus to a user-centric focus, supporting desktop and applications across whatever devices users may have.

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OS choices

One of the major issues in desktop support over the years has had to do with patching and upgrading software versions, both operating systems and applications. This continues to be true, with major efforts currently underway in most enterprises to upgrade enterprise desktops to Windows 7, given the Windows XP end-of-life target date of April 2014.

Windows 8 is next, with many enterprises already planning for that upgrade as well. Application software upgrades need to be considered as part of these efforts, with consideration for which legacy applications might or might not run in these new environments. As mobile devices become more prevalent, Windows is only part of the issue, and other mobile operating systems such as iOS and Android and their apps and upgrades must be considered as well.

Virtualization: Desktop & Application Virtualization Trends

Of course, one of the biggest trends in desktop and application delivery is the ongoing evaluation, implementation and adoption of many flavors of both desktop and application virtualization.

Adoption

Despite many early, failed proof of concept (POC) attempts implementing VDI (Virtual Desktop Infrastructure), successful implementation and adoption of VDI along with other desktop and application virtualization technologies has increased substantially over the past several years. (See Figure 1.)

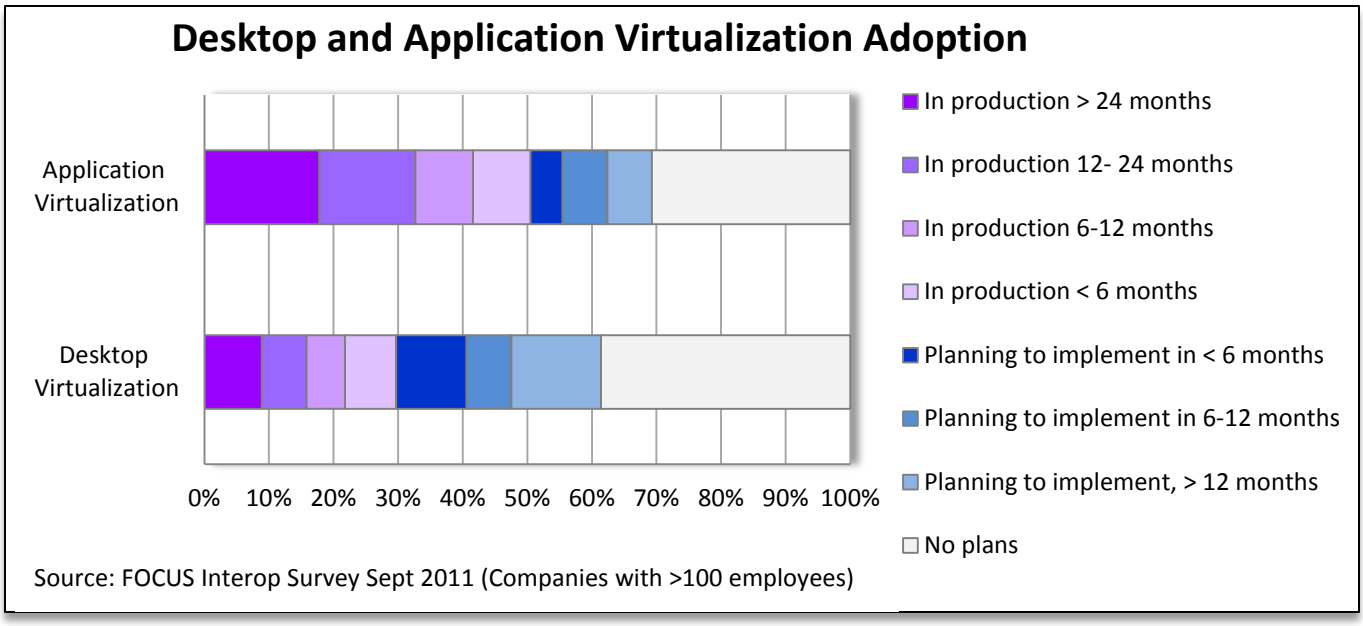


Figure 1 - Desktop and Application Virtualization Adoption

According to a recent FOCUS/Interop survey of Interop NY attendees, in companies with over 100 employees, adoption of desktop virtualization reached 42% of respondents in production, with 35% in various stages of planning (from less than 6 months to greater than 12 months). These numbers were up significantly from the previous year, which showed 20% in production, and 40 % in the planning stages.

Application Virtualization adoption is actually higher than desktop virtualization, with 50% in production, and 20% in the planning stages. This is likely due to several reasons:

1. Many users in the past few years have evaluated/implemented both of these technologies to help with the migration to Windows 7.
2. Both application and desktop virtualization offer help in this migration process; however, application virtualization is far simpler to implement.
3. There have been various barriers to desktop virtualization that have only recently been overcome (see the Section on Desktop Transformation Barriers below), and many POCs in previous years have stalled due to these barriers.
4. Application virtualization can be used both with and without desktop virtualization.

As a result, the adoption of application virtualization has grown more quickly for the past few years, both in conjunction with desktop virtualization and as a standalone technology.

Desktop and application virtualization progress

The recent growth in adoption of these technologies has been accelerated by a number of key factors, including various technical improvements in the major vendors' solutions, and emerging technologies and best practices for successful implementation.

The architecture for early VDI solutions required significant investment in expensive SAN storage, causing the cost per desktop to be far greater for VDI than for traditional desktops. As a result, many early POCs resulted in cancelled projects. As VDI solutions have matured, more sophisticated storage architectures allow smarter use of storage, bringing down the CapEx cost for VDI such that, if implemented well, CapEx for VDI is now in the same ballpark as traditional desktops. Additional technologies have now emerged and matured involving layering of application virtualization and personalization, to enable stateless desktops and better cost models. In addition, practitioners have gained more experience, and recognized that VDI is only one option, and should be used in conjunction with other technologies such as terminal services/remote desktop services (TS/RDS) from Microsoft, or multi-user/published applications via XenApp from Citrix. This use of multiple technologies, coupled with the increase in the use of multiple hypervisors (see Figure 2) is part of a clear trend towards hybrid desktop and application virtualization environments.

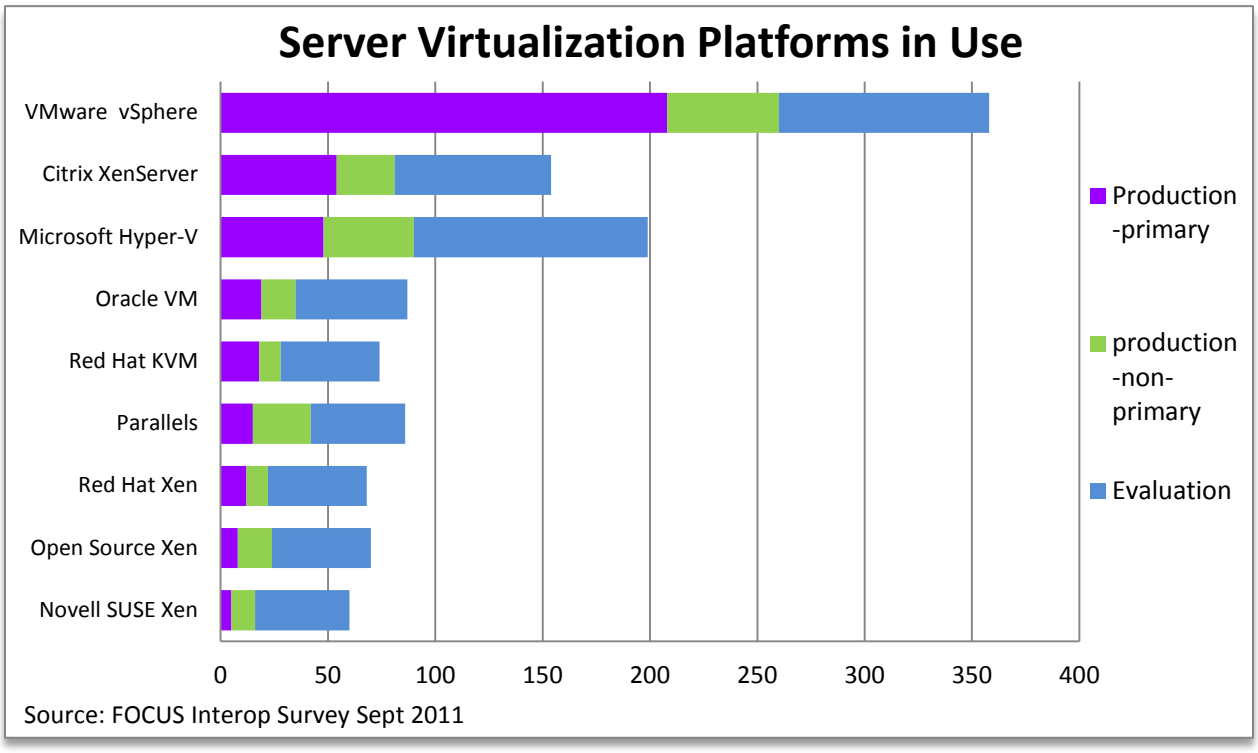


Figure 2 - Server Virtualization Platforms in Use

Going forward, in order to be successful, most organizations will have a hybrid environment, with both multiple virtualization technologies (server virtualization, VDI, published applications, client hypervisors, personalization, etc.) and multiple virtualization vendors (VMware, Citrix, Microsoft and others.) As a result, management tools that support multi-vendor, hybrid environments will become increasingly important.

Transformation Business Drivers: IT issues

There are a number of strong business drivers for desktop transformation and modernization, both from IT's perspective and from the users' perspective. Desktop support and application support and management in general, and during operating system and application software patches and upgrades, in particular, consume a huge amount of resources, and operating costs and upgrade costs are extremely high. Reducing support time and costs through improved and centralized management would be a big win for IT.

In addition, other business changes within organizations are placing new demands on IT. Users working from home, and other BYOC/BYOD requests are driving additional requirements for IT to support various devices, connections and desktop and application access. The increase in mergers and acquisitions in various business segments, along with turnover in the user base (terminating former employees and onboarding new employees) has also put pressure on IT to provide instant capability to turn on or turn off user desktops and applications. Finally, the increase in security issues and risk of

information theft of data stored on laptops has driven many IT organizations to seek ways of storing data centrally behind the firewall, rather than on hundreds or thousands of laptops.

Transformation Business Drivers: Changing User Needs

Users are pushing for this transformation as well, with changing user needs in terms of mobility, use cases and new devices.

Increased user mobility

Users today are increasingly mobile, with fewer users working only from a single corporate desktop. Even users with a single primary location are asking for the ability to access their applications and data from different locations across corporate offices. Many users also want remote access while traveling, both to remote offices connecting inside the corporate intranet, and when connecting from outside the firewall, over the internet. Economic conditions have increased the number of contract workers being used, creating the need for companies to give contractors temporary access, often from computers that are not owned by the company, and often over international borders. And of course, with workdays no longer being nine to five, working from home has become the new norm, again often from computers not owned by the company.

Broad range of user types and requirements

Along with increased mobility in general, there are also more types of users to support, each with their own types of requirements. Task workers for example, tend to access the same few applications repeatedly, with little to no customization. These users, often reservation agents or call center workers are well suited to hosted or published applications via RDS or XenApp environments. Power users, such as developers or CAD engineers may need complete access to a full desktop that they can reconfigure and reboot as needed, and are a better fit for either traditional desktops or a VDI virtual desktop. Knowledge workers, using apps like the MS Office suite, to create data used by others, may need one or the other, or a combination. Users such as road warriors, whose main characteristic is being mobile and often disconnected from the network may be a good fit for offline VDI or client hypervisors.

The changing "Desktop"

The recent onslaught of new devices like iPhones, iPads and Android tablets is one of the biggest drivers of desktop transformation/modernization. Although most corporate users still have either a traditional desktop or laptop (or both), most also now have a smartphone or tablet (or both). They may also connect from thin clients, newer zero clients, and/or netbooks. And with many of these devices now owned by C-level executives, supporting these new devices has become a requirement, rather than an option, provided the IT user support manager wants to stay employed. It is better to be the hero offering secure access to corporate applications from all the new devices, than to be the one saying no.

Need to assess user requirements and use cases

With all the different types of devices, users, and connections, there is rarely a one size fits all solution. Assessing the user base and really knowing your users is critical. The key to success is understanding all of the different user requirements and use cases, and applying the correct blend of technologies to

meet all of the various users' needs. The more you know about your users the better; what applications they are using, what horsepower they need (processing, memory, storage and networking), what devices they use and where they connect from are all important factors. Finally, knowing what percentage of users fit into which use case can be very helpful in choosing the best combination of solutions for your environment.

Desktop Transformation Technologies: More than VDI

One of the early lessons learned in desktop virtualization POCs was that force fitting all types of use cases into a VDI model is a mistake, both in terms of user satisfaction and cost per desktop. Along with that lesson came the understanding that desktop virtualization alone was not sufficient, and that coupling desktop virtualization with other technologies at the application and user layers offered a much better user experience AND at a lower overall cost.

Desktop Virtualization Layering

Experienced practitioners today agree that a layered approach is the best approach. Not all layers are necessarily used in every case, but having the right layers available as needed can make a huge difference.

Figure 3 shows a full traditional desktop stack on the left and the relationship between the various virtualization layers on the right.

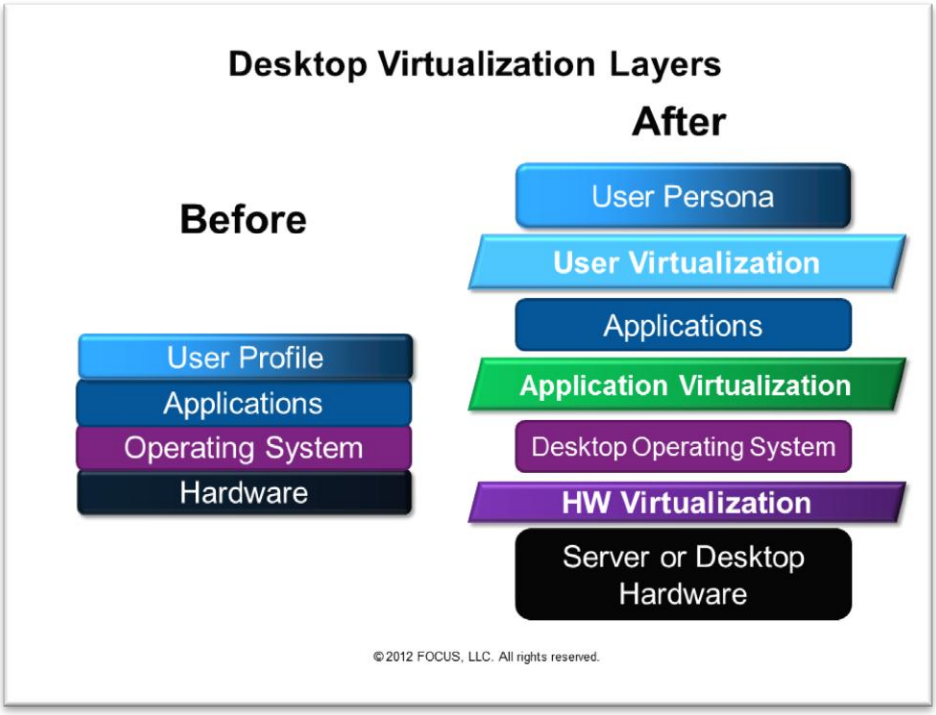


Figure 3 - Desktop Virtualization Layers

Virtualization at its basic level can be described as abstracting one layer away from the layer beneath it. Hardware virtualization, whether on a server or a desktop abstracts the operating system away from the underlying hardware, making the virtual server or desktop portable across hardware systems. Likewise, application virtualization abstracts applications away from the operating system, making them portable as well. User virtualization, also known as personalization or persona management, abstracts all of the user settings and preferences away from the underlying applications. Leveraging this layering approach allows users to operate in their own environment with all their own applications and settings, while operating in a stateless virtual machine, sharing common operating system and application images, dramatically reducing the cost per desktop, both of storage and of ongoing support. (See more information on this below.)

Desktops

There are two major types of desktop virtualization: server-hosted desktop virtualization and client-hosted desktop virtualization. Server-hosted options leverage software that operates on a server, and delivers desktops or applications over a network to user access devices (historically, a rich, thin or zero client device, now also including tablets and smartphones). Server-hosted options include two different technologies – virtual desktop infrastructure (VDI) and hosted/published desktop and/or applications via Citrix XenApp and or Microsoft Terminal Services (TS), now known as Remote Desktop Services (RDS). Published desktops/applications have been around much longer, and were known for years as Server Based Computing (SBC), pioneered by Citrix. There are millions of users running this model, largely task users such as call center agents and reservation agents.

For these types of applications, this approach, especially when layered with today's personalization techniques, provide the best solution, with the highest density or consolidation ratio (i.e., number of users/server). For users requiring their own complete virtual desktop, which can be for a variety of reasons (e.g., the need for users to have more control over their desktop, to reboot or reconfigure), VDI offers additional control. Leading VDI solutions are available from Citrix (XenDesktop), VMware (View), Microsoft (VDI Suite), and Quest/Dell (vWorkspace).

Client-hosted approaches leverage a virtualization layer that operates directly on a client PC, allowing multiple virtual desktops to run directly on that PC. Options are available for managing these platforms locally or centrally. These solutions are available in both hosted virtualization platforms (type 2 hypervisors) and bare metal (type 1 hypervisors). Leading client-hosted solutions are available from VMware (Workstation, ACE, VDI Local mode), Citrix (XenClient client hypervisor), and Microsoft (Virtual PC, Microsoft Enterprise Virtualization (MED-V), Windows 7 XP Mode, and Windows 8/Hyper-V).

Figure 4 gives an at-a-glance look at these various desktop virtualization options.

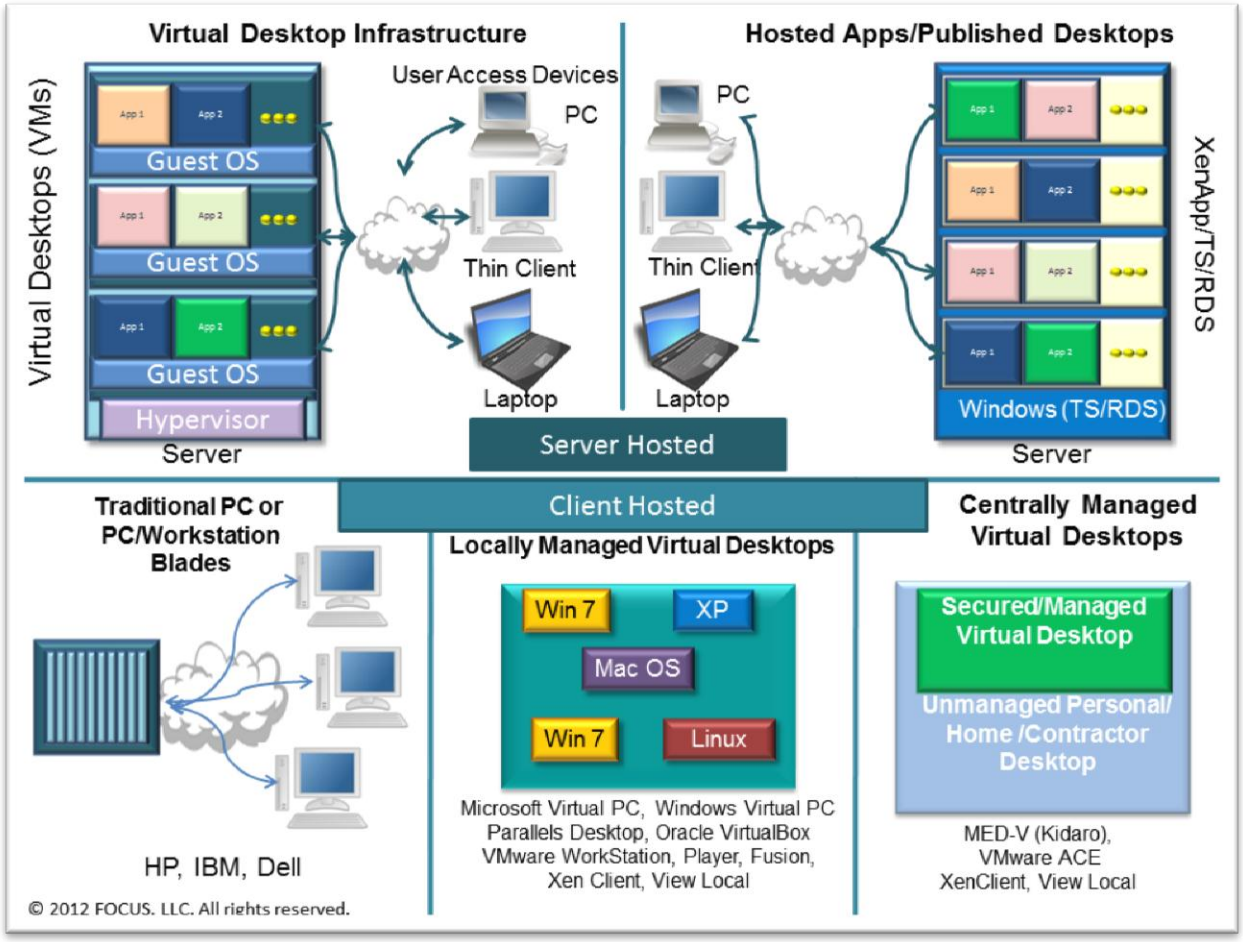


Figure 4 - Desktop Virtualization Options At-a-glance

Applications

Application virtualization and streaming technologies abstract applications away from both the operating system underlying the application, as well as from other applications running in the same environment. Applications run inside a "sandbox", with their own virtualized registry, file system, etc., minimizing application interaction problems and easing migration to new operating systems (e.g., legacy Windows application can run virtualized in a Windows 7 environment). Some solutions also allow applications to be managed centrally then streamed from a central location to remote PCs (either traditional physical PCs or virtual desktops), and executed locally. Layering virtual applications onto a common virtual desktop image allows virtual desktops to be managed using one (or several) common images, with different virtual applications layered on top for different user types or groups. This approach both improves manageability and reduces costs. Leading application virtualization solutions are available from Microsoft (App-V), VMware (ThinApp) and Citrix (XenApp).

As application virtualization has evolved, and as consumerization of IT and BYOD initiatives have progressed, application management has matured to include enterprise app stores and service catalogs containing virtual applications in various formats. These app stores allow users to search for apps, and

download them in the correct format (e.g. App-V, ThinApp, and MSI). Managing the packaging and licenses for all these flavors of applications is a critical part of successfully managing desktop transformation.

Clouds

The momentum of cloud computing has also had a major effect on desktop transformation. In addition to traditional applications, users are now taking advantage of web applications, Software-as-a-Service (SaaS) applications, and mobile applications that connect to the cloud. Data sharing and synchronization via the cloud across devices has also become a hot area, with new capabilities coming from all the key players. Although there are many advantages to leveraging cloud computing, not all applications belong in the cloud, and for most organizations, there are many applications that should not migrate to the cloud, whether for security, cost or other reasons.

Desktop Transformation Barriers

Rapid adoption of desktop virtualization has been predicted for the past five years, and yet production use of virtual desktops has been slower to materialize than expected. This has been due to a variety of barriers that were present early on, most of which have been eliminated or greatly mitigated. This progress and the features that have evolved to overcome these early barriers, together address cost, complexity and maturity concerns, and are now resulting in successful POCs and more virtual desktops in production.

Barriers	Advances Helping to Overcome Barriers
Storage issues; high storage cost per desktop	Improved shared image management and storage techniques, layering techniques, application virtualization, personalization
User experience; user interface	Protocol enhancements (3D rich graphics, peripheral support, etc.), User interface improvements (touch screens, small screen sizes, etc.)
Lack of personalization	Layering user info on top of virtual desktops and virtual applications via personalization or persona management solutions
Mobile and offline user issues	Offline/local mode, client hypervisors, application streaming
Licensing and software costs issues	New licensing types, license management technology advances

Table 1 - Overcoming Desktop Virtualization Barriers

The Role of Application Virtualization

Although desktop virtualization gets more press, application virtualization actually has a higher adoption rate. Used with both desktop virtualization and traditional, physical desktops, application virtualization has gained significant traction due to a variety of key benefits:

- Easing OS migration by allowing legacy Windows applications to run on Windows 7
- Allowing multiple versions of an application to run simultaneously on the same desktop

- Avoiding conflicts between applications (e.g. registry issues) and eliminating DLL Hell
- Layering onto VDI virtual desktops to create stateless desktops with different applications by user or user group
- Simplifying application management & minimizing regression testing, reducing costs
- Extending existing ESD tools & infrastructures to continue to bring value in today's virtualized world

Personalization/User Virtualization

The uppermost layer of virtualization, abstracting the user workspace and settings from the applications and operating systems, is known as user virtualization, personalization, or persona management. It began years ago at its most basic level with Microsoft roaming profiles and folder redirection, and has now matured to include a wide variety of user settings, printer settings, user location and other context information, user policies, and user installed applications.

Like application virtualization, many personalization solutions can be used across both virtual and physical desktops, and across various virtualization vendor solutions. Leading vendors in this space include the major desktop virtualization vendors – Citrix, VMware and Microsoft, with varying solutions (both in-house developed and gained through acquisition), and smaller vendors such as RES, AppSense, Liquidware Labs, Unidesk, and others.

Why (Re-)Evaluate Desktop Strategies?

With all the other priorities facing IT, why re-evaluate desktop strategies now? The answer is that if done well, centralizing and modernizing desktops and applications can dramatically reduce desktop management and support costs AND improve user satisfaction. The caveat is that if done badly, it can drive up the cost per desktop and make for very unhappy users!

However, leveraging the latest technologies, paying attention to the lessons learned from past mistakes, understanding your users, thinking through all the necessary considerations, and carefully planning right from the start can bring the following benefits:

- Provisioning and updating from shared OS and application images can reduce both storage costs and management/support costs
- Minimizing the number of OS and application software versions and images, layering applications and leveraging application virtualization can reduce or eliminate application interaction support problems
- Optionally implementing thin or zero client devices can minimize or eliminate any software running on physical desktops
- Running virtual desktops in the datacenter and storing user data behind the firewall rather than on laptop hard drives increases security by reducing the risks involved with stolen or lost laptops

- Centrally managing and controlling software releases can increase desktop reliability, availability, serviceability by eliminating user errors in software installation and configuration

- Using current desktop hardware as thin clients while running newer OS and application software on centralized desktops can increase the lifespan of current hardware

- Running virtual desktops in the datacenter allows IT to automatically backup user data

- Centrally managing virtual desktops and applications allows successfully integration with new tablet, mobile and BYOD strategies

The bottom line is that carefully planning, implementing and managing a well-thought-out desktop transformation strategy can provide cost-effective, secure desktop and application access from any device, anywhere.

Desktop Transformation Considerations

Planning for your transformation efforts is critical to the success of the entire project, and this planning should start with considering who your users are, what they do currently, and what they will need going forward. The following considerations are a starting point for understanding all the requirements of all your users:

- What are the various use cases that exist within your user base? What percentage of your user base fits in each type?
- Which desktop operating systems and applications are used by which users today and in the future?
- What devices are being used to access corporate applications?
- What network connections are being used to access corporate applications?
- Who owns the PCs and other devices accessing corporate applications?
- What is the Windows upgrade status/plan (for Windows 7, Windows 8)?
- Which, if any, users have offline requirements and for which applications?
- What are the performance requirements for various users and applications
- What type of graphics capabilities do various users require?

You should add your specific additional considerations, based on your knowledge of your users. The combined list then provides a foundation for building your desktop transformation strategy, including how to select the right types of technologies to implement, and the best combination of vendors to deliver those technologies.

Desktop Transformation Conclusions and Recommendations

Desktop modernization and transformation today can bring many benefits. If done well, it can help IT reduce time, energy and money spent on user support while also improving the users' experience, allowing access from any device to any application, anywhere. However, if it is done badly (and there are many opportunities to do it badly), it can greatly increase the cost per desktop, and cause a big uproar in the user base.

Here are some final recommendations for ensuring success:

- Examine ALL your use case requirements, understanding what your users do, what applications they run, what they need access to, and how they work every day
- Consider all access devices – PCs, thin/zero clients, tablets, mobile - and be clear on what you will support, and develop policies for supporting each type of device
- Consider storage, networking, compute and security as key parts of your decision and build cross-functional teams including representatives from each of those areas as you build your strategy
- Evaluate both the user experience and the IT infrastructure impact (storage, network, and compute) as part of your decision processes
- Don't just treat desktops like servers – the workloads and characteristics are very different. Understand the characteristics of how your users do their work
- Include both CapEx and OpEx in any ROI/TCO analysis – breakeven CapEx is a reasonable expectation, but the savings will come from OpEx.
- Consider but don't limit your solutions to your installed virtualization vendors – there are many new features coming from both big players and emerging innovators, and most successful transformation projects leverage multiple vendors. Don't be afraid of mix and match solutions, in terms of both vendors and technologies.
- One size does NOT fit all – understand your use cases, and then match the right technologies and the right vendors to each use case.

The road to desktop transformation is not an easy road, but it can bring a huge payoff, if done well. Start with understanding your users, building your list of criteria, matching the various available technologies to your needs, and only then evaluating the various vendor solutions for each appropriate technology. Focus on users' needs, assess the impact on IT, and plan carefully. **Start right, to end right**

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About Focus, LLC

Barb Goldworm, is founder, president and chief analyst of **FOCUS, LLC (**www.focusonsystems.com) a research, analyst and consulting firm focused on transformational technologies in virtualization, cloud computing, systems and storage.

Barb is a well-known industry expert, frequent keynote speaker, analyst, book author and columnist, with thirty years' experience in virtualization, systems, and storage, in various technical, marketing, sales, senior management, and industry analyst positions with IBM, Novell, StorageTek, Enterprise Management Associates (EMA), and multiple successful startups. Barb started with virtualization and storage in the 1970s with IBM and delivered the industry's first PC Electronic Software Distribution (ESD) Solution in the late 1980s.

Barb currently chairs and keynotes at many industry events on virtualization and cloud computing and is content chair for many industry events including *Interop – Virtualization & Desktop Transformation (and Advisory Board member), Enterprise Cloud Summit – Private Cloud, Cloud Connect – Private Cloud, and ComdexVirtual Virtualization, and former chair of Data Center Insights, Blade Systems Insight, and Server Blade Summit.* She has been a regular keynote speaker at hundreds of virtualization, cloud, datacenter and storage events throughout North America, along with numerous webcasts and podcasts, and been one of the top rated expert speakers at major events such as *Tech Target Data Center Decisions, Storage Networking World* and *Interop.* Barb has also published extensively and has been a regular expert columnist and speaker on systems and storage since the 1990s for NetworkWorld, ComputerWorld, Storage Networking World Online, IDG, TechTarget SearchServerVirtualization, Information Week, Network Computing and Ziff-Davis. Barb has authored hundreds of business and technical white papers, market research reports, end-user surveys, and articles, and authored the Wiley book "Blade Servers and Virtualization: Transforming Enterprise Computing While Cutting Costs" (available on Amazon.com).

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