

Desktop Virtualization

Understanding the benefits and challenges to enable a transformation in the way the end user experience is delivered.

Until recently, organizations have faced a relatively simple choice when provisioning the end user environment – laptop or desktop. While this lack of choice removed much of the complexity from the decision-making process, it regularly resulted in over spending, inefficiency and, in many cases, a less-than-satisfying end user experience.

The emergence of technologies such as virtualization and cloud computing, the increasing use of sophisticated, ultra-portable devices and the changing landscape of the Operating System (OS) market, combined with broader developments, such as globalization and evolving attitudes towards work practices, have changed our understanding of the end user landscape. For businesses, desktop virtualization has been heralded as a ‘game changer’ and promises to transform the way the end user IT experience is provisioned, paid for and operated. The benefits – both to IT and the business – are many and much vaunted:

Improved centralization and security of data

Bring corporate data firmly back into the hands of the IT department, while minimizing the threats posed by lost or stolen devices, rogue usage and security breaches.

Lower support and administration costs

The ability to make changes (patches or introduction of new applications) centrally and roll them out to entire user groups, thereby reducing local support visits. The deployment of

low-function devices in place of conventional units also dramatically reduces the incidence of device failure at end user side.

Increased user productivity

Tailor the user experience to the needs and characteristics of the end user and role, while simultaneously reducing the likelihood of downtime caused by IT failure.

Improved flexibility

Business agility can be boosted thanks to the ability to provision/de-provision users more quickly than previously possible, thereby improving the speed at which the business can complete mergers, acquisitions and divestitures. Flexibility at end user level is improved thanks to the desktop experience theoretically being accessible from multiple devices.

Enhanced business continuity and disaster recovery capability

User profiles and data can be backed up quickly and independently of what happens on, or to, the end user device, thereby dramatically reducing the downtime implied by unanticipated disruptions.

When realized, these benefits contribute to a significantly reduced total cost of ownership for the end user environment. In addition, desktop virtualization has a role to play in fulfilling increasingly pertinent business objectives such as improving the corporate carbon footprint of the IT department and business as a whole. By enabling users to access their desktop experience from multiple devices and locations,

desktop virtualization facilitates work-from-home initiatives, while the potential to replace conventional PCs with low-function, energy-efficient thin-client devices reduces energy consumption down and extends the period of time between CapEx-intensive hardware refreshes. In the shorter term, certain desktop virtualization compute models enable existing PCs to be re-deployed as ‘thinner’ clients, thus extending their lifespan and reducing the volume of capital investment required to begin reaping the potential benefits.

The aforementioned benefits, combined with evolving work practices such as work-from-home or bring-your-own-computer (BYOC) initiatives, mean that desktop virtualization – and the suite of technologies it encompasses – will challenge the dominance of the traditional laptop and desktop approach to end user provisioning, or, in other words, the ‘one-size-fits-all’ approach.

However, as compelling as the benefits appear, there is currently a great deal of confusion surrounding how best to deploy desktop virtualization technology. There are many delivery models and it is

difficult to know how each works and differs from the others. Different solutions provide better fits for some user groups than others, yet the wealth of information and a less-than-comprehensive understanding of user groups within the organization can make the task of identifying the right solution, or combination of solutions, difficult. As if that were not enough, the rising number of vendors competing the desktop virtualization market, each with their own terminology, marketing speak and value promises, serves to muddy the waters further still.

In addition to the confusion arising from the wealth of options available, the perceived high capital cost of transforming the desktop environment and the different Total Cost of Ownerships (TCO) and CapEx-OpEx structures implied by the various models mean that despite the benefits being clear, for many organizations, a decision to proceed remains difficult to justify.

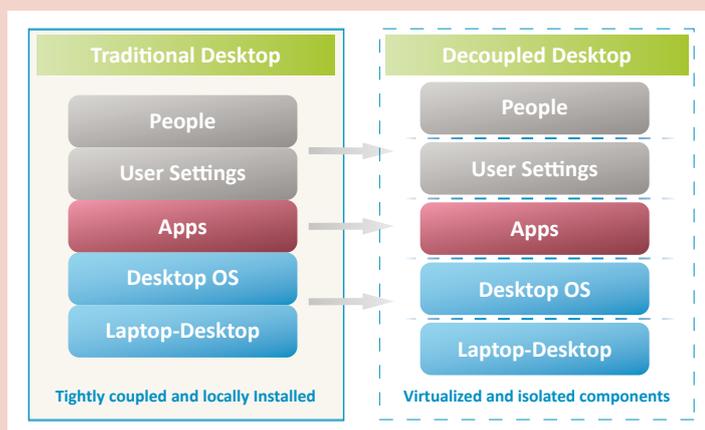
This document seeks to provide insight and perspective on some of the issues around desktop virtualization and the questions that need to be asked when considering a desktop virtualization strategy.

“IT managers understand the value of client virtualization. They cite improved data security and centralization, increased user productivity, lower support costs, improved employee satisfaction and flexibility, and stronger business continuity and disaster recovery” ¹

Forrester Research, Inc.

Defining desktop virtualization

The desktop experience is made up of several components. In the prevalent desktop-or-laptop-for-all model, all of these components are bound together and to the access device. Desktop virtualization is the act of decoupling one component of the desktop from the others and from the device itself without compromising the ability to deliver the end user experience. It is this reduced interdependency, this flexibility, that opens the door to many of the benefits commonly associated with desktop virtualization.



Defining desktop Virtualization – Decoupling the Desktop

Formulating a desktop virtualization strategy

If we consider the question of ‘why desktop virtualization?’ to have been answered at the outset of this document, there are four key questions that should be considered before embarking on a desktop virtualization strategy:

Who?

End user environment and requirements

What?

Compute models and virtual layers

Where?

Location of virtualization execution

How?

Delivering virtual desktops to end users

“A combination of technology and market developments means that enterprises face significantly more choices in how they work with user devices and how they deliver applications to those devices.”²

Gartner Inc.

Who?

The first step is to understand the end user landscape. An organization will typically comprise many different types of users, each with their own needs and requirements. The variety of solutions falling under the umbrella of desktop virtualization and the differences between them dictate that, in the majority of cases, no single solution will be appropriate for the entire end user environment. As such, an end user profiling study that assesses work patterns and roles is an essential part of building the comprehensive view required to identify how, where and what type of desktop virtualization technology should be deployed across the end user landscape.

Here are some examples of roles that will be common – or at least familiar – to most businesses:

- **Information worker**
For example, a customer service assistant. This user is typically desk-based, has little exposure to sensitive data and requires access to just a handful of applications.
- **Offline information worker**
This could be a shift supervisor or field engineer. This user’s daily tasks require little interaction with IT; access to voice communication tools is the primary IT requirement.
- **Knowledge worker**
For example, an engineer or software developer. This user is primarily deskbound but requires access from both the office and home. Duties require rich, sophisticated applications and ‘read and write’ access to corporate data and processes. This user will have a large peer network and so access to a wide range of communications tools is a must.
- **Mobile knowledge worker.**
This might be a sales agent who spends most of the working day

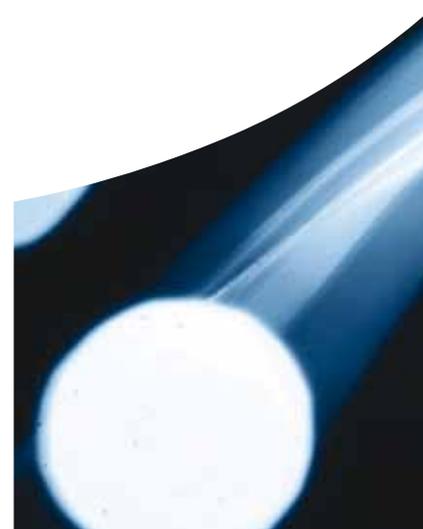
on the road or at client locations. Anytime, anywhere access to IT services is a prerequisite, as is access to a variety of communication tools.

Once a comprehensive understanding of the different users across the organization has been established and user groups, or families, have been identified, the next steps should be to look at the different forms of desktop virtualization and begin considering which solutions, or combination of solutions, provide the best fit for the users while addressing IT and business objectives.

What?

Desktop virtualization can be separated into three distinct layers:

- **User state virtualization** is the simplest layer of virtualization. Here, user data and user settings are separated from the end user device. Data is stored centrally and is accessible from any end user device.
- **Operating system virtualization** is the adoption of hypervisor technology to abstract the operating system from underlying hardware.
- **Application virtualization** refers to the adoption of application virtualization technologies that enable applications to run in their own specific environments.



Where?

The next step in adopting desktop virtualization technology is to decide where the virtualization should occur. Virtualization can take place either client side (the end user device) or server side (in the data center).

Client-side virtualization refers to software instructions being performed locally on the client device and includes the following compute models:



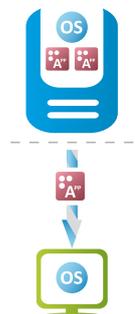
Client Hypervisor

Often referred to as client desktop virtualization, this is a type of machine virtualization technology that separates the operating system from the physical hardware and enables a single laptop or desktop to run virtual machines side by side. These can run on either a host operating system, such as Windows 7, or a native (otherwise known as 'bare metal') hypervisor that interacts directly with the desktop hardware.

Ideal for...

Mobile users dependent on access even in offline mode.

Note: Streaming technologies are commonly classed as a form of client-side virtualization, however, as they rely on both server-side and client-side compute resources to deliver the user experience, they can, strictly speaking, be considered to be a hybrid of client- and server-side virtualization. Streaming technologies also provide the opportunity to extend the lifespan of existing PCs by redeploying them as devices to which applications or the Operating System (OS) are streamed.

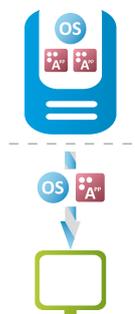


Application Streaming

Applications are managed and reside centrally on a server. When required, they are streamed to end user devices and executed on the device in much the same way as a locally installed application. This method provides the advantage of centralized manageability and security, while the ability for applications to be cached when in offline mode helps preserve the end user experience and capability to cater to mobility requirements. Potential drawbacks with application streaming include the need to resolve possible issues surrounding compatibility and interdependencies between applications as well as possible complexity around user licensing.

Ideal for...

Mobile users dependent on both a rich user experience and offline access.



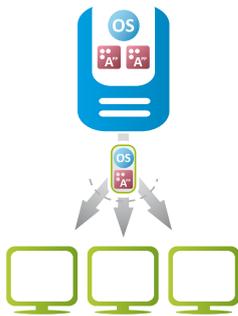
Operating System (OS) Streaming

Here, the client access device redirects to the server for booting the end user device OS. The OS and/or associated applications are streamed from the server to the user device's main memory for local execution, thereby delivering the benefits of centralization and a rich user experience. In comparison with application streaming, this method adds a higher level of security by removing the state of the client, thereby achieving a higher level of regulatory compliance. In addition, the elimination of the hard disk drive from the equation improves the device's service level. OS streaming models do, however, require that the access device be connected to the network, making them ill suited to user groups with mobility requirements.

Ideal for...

Data-sensitive environments where both security and user experience are priorities.

Server-side virtualization models operate on the basis that software instructions – though ordered by the end user device – are performed remotely, typically in the data center. As such, the client device must be connected to the network in order for the full end user experience to be delivered. All computation is performed centrally and all data resides on centralized storage devices. Server-side virtualization includes the following compute models:

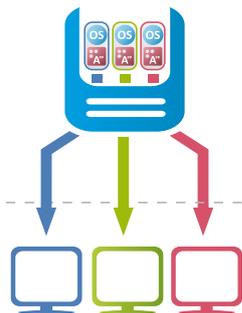


Hosted Shared Desktops

Hosted Shared Desktop (or Terminal Services) is the original incarnation of server-based computing for a Microsoft Windows experience. Here, both the desktop operating system and applications run on a central server farm and the access device acts strictly as a display and input device. This architecture provides strong cost, security and centralization benefits for the organization but is unsuitable for environments where end users have personalization and mobility requirements. Thin clients are seen as an obvious choice of access device, although conventional PCs can also be deployed in this architecture, thus increasing their useful life.

Ideal for..

Task-based workers, such as call-center operators.

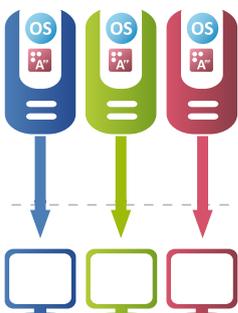


Hosted Virtual Desktops

Also referred to as Virtual Desktop Infrastructure or VDI, this model is a derivative of server virtualization and comprises a desktop operating system and applications running on a server hypervisor. The server hypervisor 'remotes' graphics (or screens), mouse and keyboard instructions to the end user device connected to the network. Importantly though, Hosted Virtual Desktop architectures enable each user to benefit from their own virtual machine, and so personalized desktop experience (OS, applications and user settings). Though the concept of Hosted Virtual Desktops seemingly reconciles the needs of both IT (centralization, security, etc) and users (personalized user experience), it does require that all compute, graphics and memory resources be provisioned by the data center, which potentially implies high capital cost.

Ideal For...

Office-based knowledge workers.



Hosted Blade PC

A Blade PC is a physical desktop with hardware condensed onto a single, integrated system board. This board can be inserted into a server chassis within the data center. End user devices connect to the Blade PC on a one-to-one basis to access the desktop operating system and applications. This model facilitates the customization of the user experience (in this case, an assigned blade), while ensuring no data resides at client side. Drawbacks of this architecture include the need for devices to be connected to the network at all times as well as the potentially high costs implied by the specific nature of the architecture and the need to accommodate all compute, storage and graphic-display capacity within the data center.

Ideal for...

Graphic designers, engineers or any users with particularly heavy compute requirements.

“The strengths and weaknesses of the various client architectures almost guarantee that no one architecture is a perfect fit for all requirements”³

Gartner Inc.



How?

As the picture around user groups and delivery options becomes clearer, the question of how to deliver the virtual presentation to the end user can now be considered.

Generally, server-side virtualization is delivered using a remote display protocol (RDP). This is the method used to present the virtualization layer to the end user device.

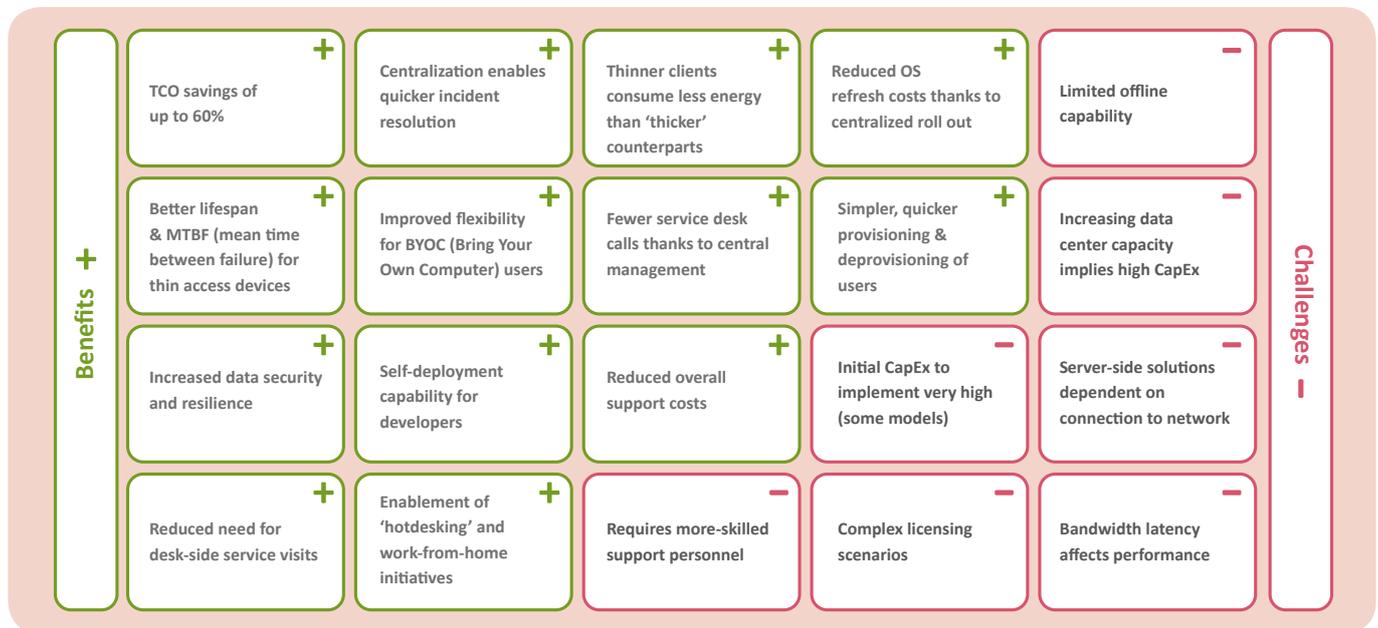
Examples of these protocols are ICA (Independent Computing Architecture), RDP (Microsoft) and PC-over-IP.

The client access device is the hardware that runs or displays the user's desktop experience. Today, there are many types of access devices available and the number of options continues to rise rapidly. These devices have different selling and price points, and vary in level of user experience, mobility and sophistication offered. Aside from conventional laptop (including netbooks) or desktop options, newer device options can be divided into the following categories:

- **Mobile Client** – This category includes smart phones, iPhones, tablet devices (e.g. iPad) and also USB-bootable devices. These devices are ultra portable and provide quick, on-the-move and on-demand access to the most essential productivity and communication tools. Though this segment is rapidly evolving and expanding, these devices are currently limited in their usage to less-sophisticated applications.
- **Thin Client** – These are devices that typically contain just a processor and flash memory and run a local cut-down operating system such as XPe or Linux. The benefits of these devices include improved security, low power consumption and reduced maintenance requirements due to having few or no moving parts.

- **Ultra Thin Client (UTC)** – Very similar to Thin Clients, but with no local storage. These devices usually run a propriety operating system from firmware.
- **Zero Client** – Similar to Ultra Thin Client, but with no local processing capabilities; only custom application specific integrated circuits (ASICs).

The benefits and challenges of deploying desktop virtualization technology



The benefits of desktop virtualization technology are both clear and compelling, however, as the diagram above illustrates, there are several potential barriers to adoption.

Looking at the challenges outlined above, some can be considered to be short term in nature and with a solution already in sight. That being said, there are challenges that will require due consideration:

Communication, education and organizational change

Introducing desktop virtualization technology will require a re-definition of existing IT support roles. Data center and desktop IT support staff will see their roles overlap and there will be a demand for new skills to accompany the new technologies. At end user level, changes to device provisioned and user experience must be accompanied by adequate support and clear communication of the benefits.

Existing IT infrastructure capacity and potential future requirements

Depending on compute model, or models, selected, the adoption of desktop virtualization technology implies an increased demand on data center resources. Existing storage, service and network capacity will need to be ascertained and planned carefully to take into account the increased burden implied by higher compute demand, users logging in 'en masse' and entire desktop images being stored centrally.

User license agreements

While there may be little in terms of technical limitations to prevent existing applications from being delivered through a

desktop virtualization model, in some cases this may contravene existing license agreements. Though licensing models are maturing to reflect the interest in desktop virtualization, in the meantime usage and agreements should be monitored to ensure compliance.

Without due consideration for the challenges above, implementation attempts may fail to deliver the benefits promised, however, the compelling overall argument for implementing desktop virtualization suggests that these challenges, if dealt with correctly, will provide little long-term impediment to mass adoption.

Desktop virtualization as a step towards the cloud

Virtualization represents a crucial step towards the adoption of cloud technologies and the consumption of the desktop experience 'as a Service'.

Sourcing the desktop experience – either in part or in full – using cloud computing will emerge as an attractive alternative to conventional, and often complex, efforts to transform the desktop environment. Whether this be in the form of sourcing services from privately owned or operated infrastructure, or the procurement of web-based services supplied on an on-demand, 'pay as you go' basis, the benefits to businesses – large and small – are clear. For larger businesses, the option of sourcing the desktop experience on an 'as a Service' basis, has the potential to free up internal IT resources to focus on facilitating the pursuit of business objectives. For smaller organizations, cloud-based services hold the promise of making a wider variety of technologies and services available to end users than would be possible if entirely reliant on proprietary IT.

Conclusion

The benefits of desktop virtualization are both clear and compelling – the wealth of options available, though potentially overwhelming, renders the existing 'one size fits all' approach to end user IT services sub-optimal and, ultimately, tantamount to competitive disadvantage.

However, as with any emerging technology, there is much to consider before implementation and the following steps should be followed to ensure maximum benefit:

Assess the end user landscape

An end user assessment or user profiling exercise should be seen as a 'must-do' task when considering desktop virtualization. Only by understanding the needs and characteristics of the different user families can the correct delivery methods be chosen.

Understand the technology

Understand the differences between the various types of desktop virtualization technologies and how they fit – or do not fit – with business and IT objectives. Despite apparent similarities, each of the solutions falling under the banner of desktop virtualization has its own advantages and drawbacks – poorly informed deployment decisions can prove costly.

Develop a roadmap

A road map that incorporates where and when to deploy each technology option identified should be generated. Any such roadmap needs to consider the existing IT estate and be sufficiently flexible to accommodate some of the uncertainties of working with emerging technologies.

Desktop virtualization holds the promise of bringing management, security and control back to IT, while generating efficiencies through a centralized, virtualized infrastructure and delivering a highly satisfying – and productive – user experience.

Simply put, it presents organizations with the opportunity to change the way the end user experience is provisioned, paid for and operated.

¹ "Predictions 2010: Client Virtualization", Forrester Research Inc. 25 January 2010.

² Gartner Inc: "Choosing From 10 Client Computing Architectural Options", Brian Gammage, 18 February 2010

³ Gartner Inc: "Choosing From 10 Client Computing Architectural Options", Brian Gammage, 18 February 2010

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