Application Virtualization
Solutions Overview and Feature Compare Matrix

PQR

Eenvoud in ICT

DOCUMENT OVERVIEW

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CONTENT

1. INTRODUCTION

More and more people are asking to themselves the following: When do we need application streaming, application virtualization or application isolation? What are the main application virtualization players and how do these solutions fit into the application delivery market space?

1.1 PURPOSE OF THIS DOCUMENT

In April 2007 Ruben released the first Application Virtualization Feature Compare Matrix, aka 'The Matrix'. In December 2008 a new whitepaper is released.

This document will provide information about the various application- and desktop delivery solutions, application virtualization in general, the main application virtualization vendors and a matrix with feature details of the different virtualization solutions.

It's important to understand that the vision of application- and desktop delivery and the focus of the vendor is more important than only comparing the features of each solution. Despites of that, comparing features can help in finding the right application virtualization solution that fits in the business and technical requirements of your organization.

Frequently customers are wondering which solution is the best? it's impossible to give a general answer to that question. It depends on the demands of IT management, customers needs, business case and the current ICT infrastructure.

This document is created to help people finding their right solution for dynamic application delivery!

1.2 ABOUT THE AUTHOR

Ruben Spruijt, born in 1975, studied Computer Science in Ede and started his career as a Systems Engineer at A-Tree Automatisering. He has been operative as a Solutions Architect at PQR since 2002.

Focusing on Server & Storage, Virtualization and Application Delivery solutions, PQR advises, designs, implements and migrates advanced ICT-infrastructures and has achieved the highest certifications of its most important partners: HP Preferred Partner Gold, Microsoft Gold Certified Partner, Citrix Platinum Solution Advisor, VMware Premier and Consultancy Partner.

In his job, Ruben is primary focused on Application and Desktop Delivery, hardware and software Virtualization. He is a Citrix Certified Integration Architect (CCIA), Citrix Certified Enterprise Administrator (CCEA) as well as Microsoft Certified Systems Engineer (MCSE+S). Ruben has been awarded with the Microsoft Most Value Professional (MVP), Citrix Technology Professional (CTP) and RES Software Value Professional (RSVP) title.

At various local and international conferences Ruben presents his vision and profound knowledge of 'Application- and Desktop Delivery' and Virtualization solutions. He is initiator of PQR's conceptual modes of 'Application and Desktop Delivery solutions' and 'Data & System Availability solutions' and originator of www.VIRTUALL.nl, the solutions showcase of PQR. He has written several articles that have been published by professional magazines and informative websites.

1.3 ABOUT PQR

PQR is the specialist for professional ICT infrastructures with a focus on server and storage, virtualization and application availability.

PQR stands for simplicity, freedom and professionalism. We provide our clients innovative ICT solutions that ensure that application availability and management are optimal: We have demonstrable references and a wide range of expertise in the field, as witnessed by our many high partner statuses and certifications.

PQR is an HP GOLD Preferred Partner 2009, HP Enterprise Specialist Partner 2007/2008, VMware Premier Partner and Gold Authorized Consultant Partner, Citrix Platinum Solution Advisor, Microsoft Gold Partner Advanced Infrastructures & Security, RES Platinum Partner, NetApp Platinum Partner, Cisco Partner, CommVault Value Added Reseller, HP ProCurve Master Partner, Platespin Platinum Partner and Websense Platinum Partner.

As a Trusted Advisor for our clients, we also provide advice about new technologies with which it is even easier for clients to keep their ICT environments running, whereby optimal performance is important and the user can always access the information from anywhere. This not only applies to system administrators but also to users. By using application and desktop virtualization, for example, users experience the ease and speed with which they can access applications and the associated data that they need. We therefore offer our clients an ICT environment that is manageable and well-organized and, above all, entails significant cost decreases, not only in management but also as regards energy use This way PQR provides medium-sized and larger companies and institutions an ICT infrastructure that is stable, flexible and ready for the future.

PQR also has extensive experience in designing and developing Storage Area Network (SAN) environments. Large storage environments have been our specialty for quite some time, and this ensures that we work efficiently. Our approach is clear for all processes. We begin with an inventory of needs and a preliminary examination. We carefully map out what is required in terms of functionality – naturally, taking into consideration future plans – and we give advice regarding which changes are needed and feasible. During the entire project, from design through implementation, PQR takes responsibility for on-time delivery of sub-projects and for the end result. We usually do this for a price that is agreed upon in advance and with the associated guarantees. This way you always know where you stand from the very beginning. We call this simplicity in ICT. And *that* is the PQR approach that delivers success – and has been doing so since the company's founding in 1990.

PQR is headquartered in De Meern and has some 100 employees. In fiscal year 2006/2007 the company posted sales of € 72.3 million and a net after-tax profit of € 4.3 million. PRQ's client's are active in all sectors of society. A significant part of our sales is achieved by non-profit organizations, the health care industry, education and local and federal government.

1.4 CREDITS

Jurjen van Leeuwen, one of my colleagues within PQR, investigated some of the features of the different Application Virtualization solutions. Jurjen, thanks for your time and effort!

1.5 WE NEED FEEDBACK

We try to provide accurate, clear, complete, and usable information. If you have any comments, corrections, or suggestions for improving this document, we want to hear from you! Please send e-mail to ruben.spruijt@pqr.nl Include the product name and version number, and the title of the document in your message

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2. UNDERSTANDIG ALL THE APPLICATION AND DESKTOP DELIVERY SOLUTIONS IN 30 MINUTES

2.1 INTRODUCTION

The "Application and Desktop Delivery solutions" diagram has been developed in order to be able to provide a complete overview of the various applications and desktop delivery solutions. This article was written by Ruben Spruijt in order to introduce the highlights of the delivery solutions in 30 minutes. There are so many delivery solutions that the functionalities can be confused through incomplete knowledge. The point of this article is not to describe all of the application scenarios or the technical advantages or disadvantages, but purely as a high level, vendor dependent overview of the start of technology in the applications and desktop delivery segment. Hopefully this overview will be helpful!

2.2 WORKPLACE SCENARIOS

Trusted and Untrusted workplace scenarios . Trusted workplaces are devices that have a network connection to existing IT backed infrastructure via the LAN or WAN.
Untrusted workplaces are devices that have no secure LAN or WAN connection with the existing IT backed infrastructure. Examples are devices that are active at home, at a stage work station or in connection with security in a separate network segment.
Each organization has various work station and application delivery scenarios. It is important for the IT department to have insight into the different workstation and delivery scenarios. This reflects how the users are working with or would want to work with the applications.

2.3 SECURE ACCESS

Secure Access solutions assure secure access of untrusted devices to corporate IT. The symbol consists of two parts, the shield stands for secure and the stoplight stands for access. The access can also be close linked depending on the chosen secure access solution. Solutions that realize secure access scenarios are, for example, Cisco ASA, Citrix Access Gateway and Juniper SSL VPN.

2.4 WEB APPLICATION ACCELERATION

Web Application Acceleration solutions assure acceleration and security of web based applications. Today we all make use of these solutions. The largest number of the internet applications that we all use, such as Google, MSN, eBay or marketplace, make use of these applications. Web application acceleration solutions are not only for the large internet organizations, but also for your web applications. Solutions that make web application acceleration and security possible are, for example, JuniperDX, Citrix Netscaler and F5.

2.5 DESKTOP BROKER

The desktop of connection broker determines which remote desktop will be made available to the client. With this it is possible to make available a dedicated or a pool of remote desktops.

The automatic turn on, deletion or pausing of remote desktops is a functionality that can be provided by a desktop broker. There are various suppliers of connection brokers. Citrix with Desktop Server and VMware with VDM are the most well known solutions in the Netherlands. Depending upon the supplier, the connection broker can have additional functions. Functionality such as a web interface that assures secure (SSL) and easy access to the remote desktops, Active Directory integration, USB port redirection and integration with Terminal Services in order to provide access to a Terminal Server or a personal Remote Desktop through rules set by IT.

2.6   APPLICATION STREAMING AND VIRTUALIZATION

With the aid of application streaming and virtualization, windows applications can be used without any changes to the local operating system, let alone that application software is installed on a workstation. In other words: the application is implemented, saves data and prints as if it is locally present, without anything being changed on the local client. Sources such as CPU, memory, hard disks and network cards are used for the execution of this application. Application Streaming and Virtualization assure the availability of applications on desktops, laptops, VDI and Server Based Computing platforms whereby the application is executed on the "client" platform. No changes are made to the platform.
A number of advantages for Application Virtualization are: installation, upgrade, roll back and the ease of application support. Installations of applications is now in the past; conflicts are not longer possible. It creates a dynamic application delivery infrastructure.
Solutions for Application Streaming and Virtualization are: Microsoft Application Virtualization (SoftGrid), Altiris SVS, Thinstall and Citrix Application Streaming Feature for Citrix Presentation Server.

2.7   OS STREAMING

OS streaming makes it possible that VDI, SBC and desktops start up and work from an image file saved on the network. A single image can be used by multiple workstations simultaneously. The advantage is that complete operating systems, including applications and clients can be made available quickly and securely. The availability of a single image on multiple VDI, SBC and desktops is possible without conflict. Through this, an upgrade or roll back of an OS is possible quickly, easily and without great risks. When virtual desktops make use of OS streaming in a VDI environment, this solution also saves valuable storage and the administration of the virtual desktops is simplified. Virtual or physical machines that make us of OS streaming thus become "stateless devices". Citrix Provisioning Server (Ardence) is a solution that makes OS streaming possible.

2.8   VIRTUAL DESKTOP INFRASTRUCTURE

VDI, Virtual Desktop infrastructure = "Dedicated Virtual Remote Desktop"
Virtual Desktop Infrastructure (VDI) is a solution for remote access to Windows XP/Vista or Linux desktops that are implemented on a virtual machine in the data center. VDI can be a server hosted solution (online computing) or a client side solution (offline computing). This overview describes VDI from the server hosted solution. With this, access to the desktop is not bound to one location or end user device. Each user possesses a unique personal desktop environment. Program execution, data processing and data storage take place centrally on a

personal desktop. The information appears on the client screen via RDP/ICA/VNC or RGS. The protocol for the reproduction of the correct information dependant on operating system, bandwidth, application properties and technical or company requirements. Just as other solutions for desktop delivery, VDI consists of various infrastructure components that assure administration, load balancing, session control and secure access to virtual work stations. Suppliers of complete VDI solutions are VMware and Citrix. Suppliers of Virtual Infrastructure solutions are VMware, Citrix (XenSource) and Microsoft.

2.9   BLADED WORKSTATIONS

Bladed workstation = "Dedicated Physical Remote Desktop"
BladePC, a physical professional workstation in a blade enclosure, offers many of the advantages offered by VDI. A BladePC solution consists of hardware as well as software. The hardware consists of a physical professional workstation; the software assures that access to the physical workstation is possible. The software consists of a minimum of two components: a transmitter and a receiver. The transmitter is installed on the BladePC and the receiver on the client desktop, laptop or ThinClient. The BladePC solution offers, in addition to the VDI advantages, even extra advantages such as:
Access to graphic intensive applications: In combination with HP Remote Graphics Software, this solution provides graphic intensive applications just as fast as the end user would expect. 2D, 3D and multimedia applications are executed centrally on the physical BladePC and reproduced locally on the client workstation via the RGS protocol.
Use of resource intensive applications: Resource intensive applications make full use of the resources present on the physical machine. It is a workstation-class centralized workstation. Performance is maximized through this.

The specific properties of the virtual infrastructure such as Distributed Resource Scheduling, Higher Availability and Live Migration naturally do not apply to the BladePC solution.

2.10   SERVER BASED COMPUTING

Server Based Computing (SBC) = "Shared Remote Desktop"
SBC is a solution for access to desktops or loose applications on terminal servers in a data center. Access to the desktop or application is not bound to a location or end user device and program execution and data processing occur centrally on the terminal servers. The data are saved on a fileserver. The information appears on the client screen via RDP or ICA. SBC consists of various infrastructure components for administration, load balancing, session control and support. Some advantages of SBC are the rapid and secure availability of applications, low TCO, location and workstation independent application access. Suppliers of SBC solutions are, for example, Microsoft, Citrix and Provision Networks.

2.11   CLIENT MANAGEMENT

Each professional IT organization will make use of a Client Management solution. Client Management provides, for example, OS deployment, patch management, application and client deployment, asset management, integration with service desk and remote control. Client management solutions are, for example, Microsoft System Center Configuration Manager

(SCCM), RES Wisdom, Altiris Deployment Solution, LANdesk Client Management and Novel ZENworks.
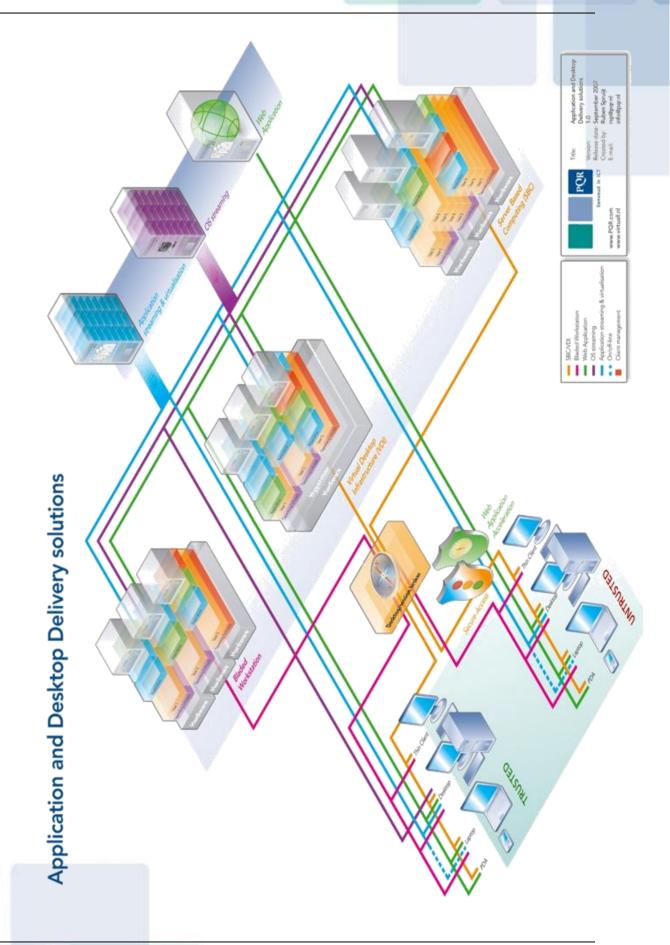
2.12 IN CONCLUSION

The solutions that are reproduced in the solutions diagram assure that applications and desktops can be offered in various manners and in an effective and dynamic ways.
What is THE best solution? There are various business needs and technical requirements that together determine which solution is the best one for you.
In order to make the correct choice, it is important to know the pros and cons of the various solutions. Workshops are often held for this purpose. In addition to this form of information provision, there are various technical in depth articles written by Ruben Spruijt. If you would like the Solutions diagram in a digital format:
http://www.virtuall.nl/articles/applicationanddesktopdelivery/PQR_ApplicationAndDesktopDeliverySolutions_A4.jpg

3. APPLICATION VIRTUALIZATION SOLUTIONS

vir·tu·al·i·za·tion the act of isolating or unbinding one computing resource from others. Server Virtualization is the solution of hosting an entire computer environment within the operating system of another computer. The dynamic delivery of applications is an essential functionality and part of a broader strategy of an optimized ICT infrastructure. Making applications available to the end user is probably the most important functionality of an ICT infrastructure. With the help of application virtualization, the end user can use their Windows applications without requiring adjustments to the local operating systems.

In conversations with customers and during workshop sessions I regularly receive the question, "What is the difference between application deployment and delivery?"

With application deployment, the applications are installed on the execution platform. The execution platform could be a local desktop or laptop, a central virtual desktop, a bladedPC or a Terminal Server. When speaking of application delivery in the context of application virtualization, the applications are no longer installed, but they are made almost instantly available and executed on the execution platform. The execution platform does not undergo any alterations.

Application Virtualization enables fast application delivery in a central and local environment whereby mutual application conflicts are excluded. This considerably reduces the throughput times of application packaging and delivery compared to the traditional deployment methods. The packaging of applications with the help of the Application Virtualization is a lot simpler than making traditional MSI packages.

What are the primary reasons for applying application virtualization?
- Applications are no longer installed on the workstations;
- No more conflicts between applications;
- Eliminates the need for regression testing;
- Multiple versions of applications can be used simultaneously;
- Supports Web, Client-Server and Server Based Computing applications;
- Consolidation of Terminal Servers;
- Fast application roll-out and upgrades;
- Stabilizes Windows profiles;

Creates a dynamic application delivery infrastructure which allows applications to be used online, offline, on-site, off-site, locally and centrally.

Over the past years Application Virtualization has out-grown the niche market and has become the main solution for application delivery. Over the past years customers, from small to large enterprises see the benefits of application virtualization. Nowadays there are several proven, well-known virtualization solutions. These vendors and also the upcoming vendors are from a Feature point of view described in the next paragraphs.

3.1 ALTIRIS SVS PROFESSIONAL

Altiris Software Virtualization Solution (SVS) Professional is an on-demand application distribution and license management platform that puts the priority on user productivity. It is the optimal solution to serve the application management needs of diverse and dynamic enterprise environments, providing high productivity with controlled, guaranteed access to any Microsoft Windows® based applications from any location at any time, including remote and mobile users. With the option to virtualize some or all applications, users will have more reliable applications and more stable systems

SVS Professional Means Better Manageability

Virtualization enables the separation of key desktop elements for better manageability and instant desktop configuration that is based on the user who logs in and their role in the enterprise.

SVS Professional leverages three distinct technologies to provide the best on-demand environment for the user and save time and effort for IT managers:

- Virtual distribution—streaming allows the user to acquire applications from any endpoint, according to his productivity needs, while minimizing bandwidth requirements and optimizing license consumption.
- Virtual execution—layering applications on disk ensures that each application includes all of its appropriate resources, eliminates conflicts with other applications and the base operating system, and enables instant repair.
- Rule-based management—Proactive license compliance and optimization is achieved by applying a set of rules to govern the consumption and use of applications by the right people, and automatically recovering unused licenses.

Streaming with SVS Professional

SVS Professional is an on-demand application distribution and license management platform that provides an optimal solution to serve the application management needs of enterprise environments, providing high productivity with controlled, guaranteed access to any Windows based applications from any location at any time, including remote and mobile users.

Virtualization with SVS Professional

SVS Professional provides a robust and secure environment for applications with a revolutionary approach to software management. By placing applications and data into managed units called Virtual Software Packages, SVS Professional instantly activates, deactivates or resets applications and completely avoids conflicts between applications, without altering the base Windows installation.

3.2 CITRIX XENAPP CLIENT-SIDE VIRTUALIZATION

Client-side application virtualization technology in Citrix XenApp is comprised of two main functionalities: *application streaming* and *application isolation*. The application streaming feature enables applications to be delivered to client devices and run in a protected, virtual environment. Applications are managed in a centralized Application Hub, but are streamed to the client device and run in an isolation environment. Applications become an on-demand service that is always available and up-to-date.

The Challenge

The reality today is that many companies are hitting a wall of complexity when it comes to managing their ever-growing number of desktop applications and diverse access scenarios. This

complexity translates into a huge amount of time and money spent providing what amounts to a patchwork solution.

Application Streaming Overview

Client-side application virtualization reduces the cost of testing, installing and supporting applications. Using isolation and application streaming technologies, client-side application virtualization enables local virtualized applications. Rather than installing applications on each user's PC, applications are streamed to a protected isolation environment on their client device. The isolation environment controls how applications interact on the user device, which prevents application conflicts.

Streaming applications into the isolation environment greatly accelerates their delivery by reducing regression testing and simplifies management with streamlined maintenance, upgrades and de-provisioning. In fact, using streaming for de-provisioning an application is the most efficient method of removing all traces of an application. Caching technology makes applications available even when users are not connected to the network.

With server-side application virtualization, the server acts as the client. Applications are streamed to a protected isolation environment on the server as opposed to the local device. This has many of the same benefits of client-side application virtualization and also helps reduce application silos and greatly improves management of XenApp farms.

Key Benefits

As a key component of both client-side and server-side application virtualization, Application streaming enables IT to:

- Eliminate application conflicts and OS instability resulting from desktop application installation

- Reduce the costs associated with regression testing, deployment, maintenance, updates, and de-provisioning for applications running locally on users' machines

- Offer applications as an on-demand service

- Lower support costs by automatically updating and repairing applications every time they are used

- Speed regulatory compliance by eliminating the need for extensive testing to certify applications

- Enhance security by giving IT administrators complete control over applications delivered to desktops, even those of unmanaged partners and users

3.3 ENDEAVORS APPLICATION JUKEBOX

Application Jukebox - Enterprise Edition is the next generation of application virtualization designed to deliver any Windows application to any PC, anytime, from anywhere, without the need for downloads or installs. Application Jukebox is an out of the box technology solution for instantly delivering existing Windows software across the enterprise. Application Jukebox Studio creates stream able and virtualized application sets from an original installer. Application Jukebox Server controls and delivers those application sets to the clients. Application Jukebox Player runs on the client machine creating a virtual environment to run the application. Instead of using traditional push technology such as Microsoft Systems Management (SMS), or client-server based solutions to install or run entire applications, Application Jukebox responds to user requests for applications and immediately pulls the application to a user's desktop.

Application Jukebox – New Features

Configurable Virtualization

Applications held in Application Jukebox can be fully integrated with the end user client environment, fully isolated or any combination in between. This unique functionality gives the administrator complete control on how applications are delivered and interact with client devices. A simple example being, an application that is shipped with fonts only licensed for use with that application. The application could be streamed as a fully integrated application, interacting with local system resources and other locally installed software. The fonts, however, could be streamed in an isolated virtual environment, hidden from the resident OS and installed applications, and therefore only available by the licensed application.

Mixed Media Streaming

Application Jukebox makes it possible to stream applications from different media sources; CD, USB stick or network delivery. This gives the Enterprise increased flexibility in deploying applications. For instance, if a user is in a remote location with limited network access, they can receive a preloaded application on a CD containing only the necessary data to launch the application and then stream any additional data blocks as needed, on-demand from the network.

Multistage Progressive Streaming

Applications can have additional blocks of data streamed using macros once the activation and prefetch have taken place. An Enterprise can publish an application with a small prefetch allowing users to start working more quickly, while in the background additional data is being streamed.

Incremental Patching

When bug fixes and minor point versions of applications are released, Enterprises need to get the updates to their users in a timely manner; Application Jukebox makes it possible to quickly and easily patch the application and stream only the differential, not the whole application saving time and effort.

Anytime – Anywhere

Application streaming and virtualization gives users on-demand access to desktop applications anytime, from anywhere. Application Jukebox dramatically reduces the cost and complexity of delivering applications to desktop and laptop computers across the enterprise.

Reduced Total Cost of Ownership

Most organizations deploy and manage their business applications using methodologies that were introduced over a decade ago prior to the 'digital age' and the internet phenomenon as we know it today. The exponential growth of our dependence on the PC, and the increase in remote workers, has led to a spiraling application and hardware Total Cost of Ownership (TCO).

Application Jukebox allows organizations to rapidly deliver desktop applications, upgrades and patches. It gives users access to software as they need it, when they need it and where they need it on a "pull-based" application delivery model. Maximizing existing infrastructure organizations can serve many more users per server, dramatically reducing TCO.

Avoid Compatibility and Stability Issues

Application Jukebox avoids application compatibility issues by isolating the streamed application from other application's configuration/run-time environment and dramatically reduces the cost and complexity of delivering applications. Software delivery becomes an on-demand service – one where the latest release of the application is always accessible, where application maintenance releases are automatically detected and instantly made available. Central administration eliminates the need to recall or visit the client computer. By isolating the streamed applications, the enterprise can guarantee software stability with

an immediate roll out of new builds to their users. This reduces the need for complex and lengthy regression testing procedures and the need for an intricate testing infrastructure.

3.4 INSTALLFREE BRIDGE AND MINI BRIDGE

InstallFree products enable organizations to virtualize applications and dynamically deploy them to any Windows environment based on user login credentials and with no dependencies or installed components. InstallFree products enable IT departments to virtualize and separately package various desktop elements such as applications, add-ons, plug-ins and updates and download or dynamically stream them as compact, clientless, virtual executables for local processing on any XP or Vista based PC regardless of the host's operating system settings and language, server-based solutions such as Citrix XenApp, Windows Terminal Server and Windows-based Virtual Machines. Implementing InstallFree products do not require any software, or client to be installed on the host PC or at the datacenter and enables full application functionality and complete user autonomy on any Windows-based computing environment including non-dedicated and locked-down computers with both on and off-line availability.

Using InstallFree products, corporate IT personnel can perform mass application deployment and on-the-fly patching by easily assigning applications, add-ons and updates to Users, Groups and Organizational Units (OU) listed in the organization's Active Directory (AD). These dynamic applications function without installing anything anywhere – providing a true end-to-end software distribution solution covering the entire scope of the organization's computing scenarios. This enables IT Departments to provide end-users with their own true customizable application whether they log-in to a traditional managed desktop, a Citrix Session, or non-dedicated public PCs in airports, hotels, internet cafes, etc.

InstallFree provides three platforms for deploying InstallFree Virtual (IFV) applications across the enterprise and beyond – The IFV MiniBridge, The IFV Bridge, and the IFV Desktop.
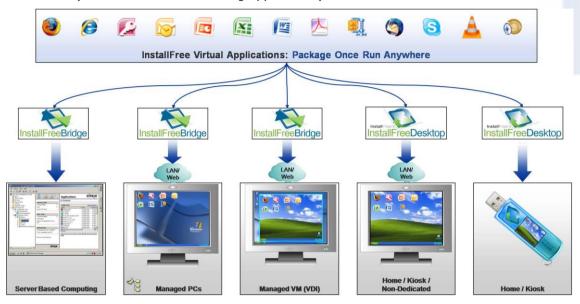
The InstallFree MiniBridge allows IT managers to create standalone executables of InstallFree Virtual (IFV) applications and deploy them using the organization's existing Electronic Software Distribution (ESD) or Terminal Server based solutions while maintaining centralized management capabilities including updates, incremental patching and dynamic binding of add-ons, toolbars and other virtual applications. This simplifies application life cycle tasks by eliminating the need to install applications and ultimately streamlining IT operations. The MiniBridge does not integrate the IFV Application into the host PC environment yet allows it to operate with complete functionality without limitations.

The InstallFree Bridge is a clientless platform that deploys IFV applications to the host PC seamlessly and transparently to the end-user, based on the customer's existing infrastructure, allowing virtual applications to function as if they were installed on the host computer. By assimilating applications into the host's environment, the InstallFree Bridge provides the end-user with a natural user experience and conventional application behavior. The InstallFree Bridge does not need an agent to be installed on the host computer in order to function and does not alter the host PC in anyway. The platform includes complete integration with Active Directory (AD) or any LDAP application and the capability to deploy applications, add-one, patches as well as control the entire application life-cycle through a centralized management application.

When a user logs in to any Windows computer through AD, a simple logon script downloads a small executable (The Bridge Agent) and runs it on the host PC with no installation process at all. The Bridge Agent then streams or downloads the decoupled Dynamic Desktop Elements (applications, add-ons and updates) and dynamically binds them in the runtime execution environment together with the user's own personal settings creating an IFV Application. The

IFV Application integrates with the local non-virtual desktop elements, applications and environment, thus providing the IFV Application with all the conventional points of contact such as start menu and desktop shortcuts, right-click menu options, file association and uninstall information (for use with license tracking applications).

3.5 MICROSOFT APP-V

Microsoft Application Virtualization (App-V) transforms applications into centrally-managed virtual services that are never installed and don't conflict with other applications. App-V streams applications on-demand to desktops, servers and laptops. It changes application management from a series of tedious, manual tasks into an automated, streamlined process. App-V dramatically accelerates application deployment, upgrades, patching and terminations by eliminating time-consuming processes and simplifying the application management lifecycle.

With App-V, applications run reliably without failure—no matter what other software is running on that computer. All applications are instantly available on any licensed device. App-V even allows controlled application use when users are completely disconnected. Because App-V centralizes management of applications, users can only get the applications they have the rights to; application usage and license metering are managed centrally so that administrators can ensure compliance. Centralized control also enables IT to patch or upgrade once to the server and the next time the users access the network, their applications are updated without impacting their productivity. App-V provides various delivery mechanisms including http and file streaming, terminal services integration, and standalone mode which provide application caching on the local client for offline usage.

Microsoft Application Virtualization fully integrates with Microsoft System Center Management products, providing both users and administrators a seamless experience for running and managing applications in the enterprise.

Application virtualization is at the heart of Microsoft Application Virtualization (App-V). It decouples applications from the operating system and enables them to run as network services. Application virtualization can be layered on top of other virtualization technologies—network, storage, machine—to create a fully virtual IT environment where computing resources can be dynamically allocated in real-time based on real-time needs. App-V's patented application virtualization, dynamic streaming delivery, and centralized management technologies make everything from deployments and upgrades to migrations and business continuity initiatives easier and faster with better agility:
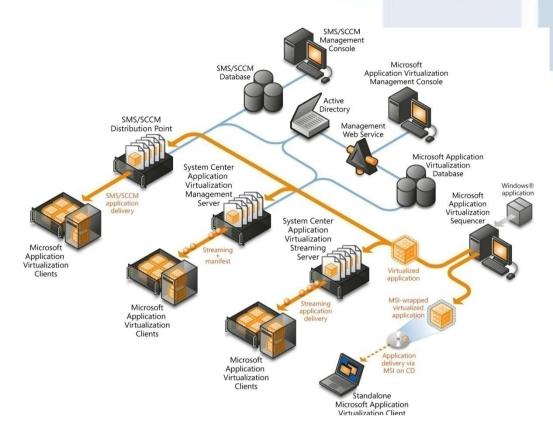
Application virtualization: Enable applications to run without the need to visit a desktop, laptop, or terminal server. Applications are no longer installed on the client—and there is minimal impact on the host operating system or other applications. The most extensive virtualization technology on the market, App-V virtualizes per user, per application instance, as well as key application components. As a result, application conflicts and the need for regression testing are dramatically reduced.

Dynamic streaming delivery: Applications are rapidly delivered, when needed, to laptops, desktops, and terminal servers. In most cases only a small percentage of the application is needed to launch the application. Additional components are delivered when transparently requested by the application. This results in faster delivery of the application when needed.

Centralized, policy-based management: Virtual Application deployments, patches, updates, and terminations are more easily managed via policies, and administered through the App-V console or via your ESD system. Use Microsoft App-V Application Virtualization to help reduce the complexities inherent in enterprise application management. With App-V you can reduce challenges and transform your computing environment into a dynamic, services-oriented infrastructure.

The diagram illustrates the key components of Microsoft App-V Application Virtualization.

3.6   VMWARE THINAPP

Run any version of virtually any application on a single operating system without conflicts. You can even run multiple versions of the same application. Plug VMware ThinApp, formerly known as Thinstall, into your existing management infrastructure and accelerate your software development and desktop deployment. Deliver and deploy applications more efficiently, more securely, and more cost-effectively with agentless application virtualization.

Eliminate Installation Conflicts with Application Virtualization

Application virtualization encapsulates the applications from the OS and each other; eliminating costly regression testing and conflicts from badly behaving applications. Just plug in an .MSI or .EXE file to deploy a virtual system environment, including registry keys, DLLs, third-party libraries, and frameworks without requiring any installation of agents or applications on the underlying operating system.

Package Once, Deploy Everywhere (Network, USB, Physical or Virtual Desktops)

Deploy virtualized applications in user mode, without administrative rights. No device drivers are installed and no registry changes are made because the entire application and its virtual OS are delivered as a single EXE file. Transparently stream large applications from a shared network drive with no server or client software to install. Upgrade or roll-back applications while they're running. The new version will execute the next time the user starts the application

Cater to Your Mobile Workforce

Let your users run applications on virtually any computer they have access to, including kiosk and hotel PCs. They won't need to install software or device drivers and won't need admin rights. Applications run directly from portable storage devices, including Flash drives.
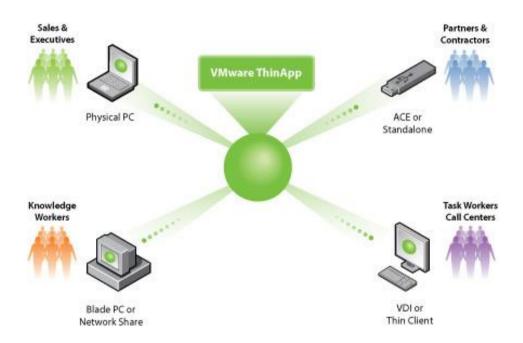
Improve Your Software Distribution Process

Deliver software that protects the local OS from modifications that might cause instability or breach security using your existing configuration management tools. Even restricted user accounts can safely run virtualized applications without requiring a local installation, making it much more appetizing for IT staff concerned about security.

Ease OS and Application Migrations

ThinApp agentless application virtualization eases OS migrations by enabling applications to run side by side on the same operating system. Users can continue with business as usual without disruption from problematic applications. Furthermore, if an application needs to be removed from the endpoint—it is a simple file-remove with no mess left to clean up in the system registry.

3.7 XENOCODE

Xenocode OS virtualization technology give your users **instant access** to all of your applications, **pre-configured** and **ready to run**. Virtualized applications can be deployed on file shares, intranets, the Internet, portable USB flash drives, or existing infrastructure, including SMS, Altiris, LANDesk, ZENWorks and Unicenter.

By isolating applications from the host operating system, Xenocode OS virtualization allows applications to execute on **locked-down desktops** which are **immunized** against potential failures due to application collisions, upgrades, or Vista migration.

Xenocode Virtual Application Studio allows IT professionals to virtualize existing applications **quickly and easily**. Xenocode virtual applications work immediately within your **existing infrastructure**, with no specialized servers or client installations required. You will begin enjoying the benefits of your virtualization investment via enhanced employee productivity and reduced administrative costs almost immediately

Xenocode is a next-generation virtualization technology that allows applications to be deployed in lightweight, pre-configured, single-executable files that execute instantly on any Windows desktop. The core of Xenocode virtualization technology is the Xenocode Virtual Operating System kernel, a compact implementation of Windows operating system APIs, including the filesystem, registry, process, and threading subsystems, completely implemented within the

user mode space. The Xenocode Virtual OS kernel is embedded directly into each virtualized application executable, allowing applications to be executed immediately without any client software, device drivers, or player installations.

Applications executing within the Xenocode Virtual OS environment interact with a virtualized filesystem, registry, and process environment, rather than directly with the host device operating system. The virtualization engine handles requests within the virtualized environment internally or, when appropriate, routes requests to the host device filesystem and registry, possibly redirecting or overriding requests as determined by the virtual application configuration.

4. APPLICATION VIRTUALIZATION FEATURES

Each application virtualization solution has its own feature-set which is dependant off the version of the virtualization solution. This chapter describes all the features in a very detailed way. This matrix is developed with the following Virtualization versions:

4.1 PRODUCT VERSION

Product	Version
Altiris SVS Pro	SVS 2.1 SP2 Streaming System 5.2.2 SP3
Citrix XenApp	5.0
Endeavor Application Jukebox	Enterprise Edition in isolation mode
InstallFree Bridge Suite	1.5.0.1
Microsoft App-V	4.5.0
VMware ThinApp	4.0.0.2200

4.2 FEATURE COMPARE MATRIX

	APPLICATION VIRTUALIZATION SOLUTIONS AND FEATURES
Goal:	Detailed description of virtualization features
Requirements:	Hands-on-experience, vendor involvement
Result:	Whitepaper
Method of Execution:	Hands-on experience, read articles, communicate with ven-dord and discuss with colleagues

Legenda:

√ = Applicable;

X = Not applicable;

~= It depends;

= Under development;

4.3 FUTURE ADDITIONS

Xenocode Virtual Application Studio will be added, Q2-2009

Category / Functionality	Altiris SVS Pro	Citrix XenApp	Microsoft App-V	VMware ThinApp	InstallFree Bridge	Endeavors	Remarks
Virtualization Characteristics							
The solution isn't limited to file system en registry redirection only	X	~	√	√	√	√	This is virtualization 'vs' redirection
There is no need for application regression testing	X	~	√	√	√	√	
Applications wil operate without any chance of conflicts	X	~	√	√	√	√	
Applications integrates and communicates seamless with the OS	√	X	X	X	~	√	
Manageability							
Central management platform for application delivery	√	√	√	X	√	√	
Application is on-demand streamed and delivered as a service, usable in Software as a Service sceanrio's .	√	√	√	X	X	√	
Application is delivered in a efficient way, quick up-and running	√	X	√	X	X	√	
Application specific license metering, track application usage	√	X	√	X	X	√	
Application Virtualization Solution license usage metering	√	√	X	X	√	√	
Role based administration	X	√	X	X	√	X	
Application 'rollback'	√	√	√	√	√	√	
Application upgrade	√	√	√	√	√	√	
Application upgrade, centrally managed	√	√	√	√	√	√	
Application upgrade while in use	√	√	√	√	√	√	
Application upgrade using deltas	√	√	√	√	√	√	
Communication between server and client can be secured without additional solutions	√	√	√	~	√	√	
Native integration with (3rd party) Electronic Software Distribution solutions	√	√	√	√	√	X	
Native integration with Access Gateway A/E edition and WebInterface	X	√	X	X	X	X	
Native integration with other vendor solutions	√	√	√	√	X	X	RES, Scense, DVS4SBC, BMC, LANdesk and Provision Networks

Category	Functionality	Altiris SVS Pro	Citrix XenApp	Microsoft App-V	VMware ThinApp	InstallFree Bridge	Endeavors	Remarks
	Pre-launch and post-exit scripting	√	√	√	√	X	√	
	Pre-launch and post-exit scripting, centrally managed	√	√	X	X	X	√	
	Determine virtual application pre-requirements	√	√	√	√	√	√	
	Determine virtual application pre-requirements, centrally managed	√	√	X	X	X	√	
	Limit application usage based on AD security groups	√	√	√	√	√	√	
	Limit application usage based on AD computer objects	X	X	X	X	√	√	
	Limit application usage based on AD OU's	X	X	X	X	√	√	
	Machine targeting, centrally managed	X	√	X	X	√	X	
	Machine targeting, application runs dependant of target OS, centrally managed	√	√	√	X	X	X	
	Machine targeting, application runs dependant of target OS/language/service pack, centrally managed	X	√	X	X	X	X	
	Application streaming source can be based on client IP-subnet	X	√	X	X	X	X	
	Application streaming source can be centrally managed	X	X	√	X	√	√	
	Offline application usage can be time limited	√	√	√	~	√	√	ThinApp: external scripting
	File Type Association (FTA) centrally managed	X	~	√	X	√	√	
	File Type Association (FTA) locally managed	√	X	√	√	√	~	
	Support for protocol handlers; (MAILTO://, FTP://, FILE:// etc.)	√	X	X	X	X	X	
	Manageable by scripting; command-line	√	√	√	√	X	√	
	Manageable by API	√	√	X	√	X	√	
	Integration with Add or Remove programs	√	X	√	√	√	#	
	Group policies can not, from a security point of view, be omitted	√	X	X	√	√	X	
	Roaming user profile support	X	√	√	√	√	√	
Usability								
	Desktop and/or Laptop Online	√	√	√	√	√	√	
	Desktop and/or Laptop Offline	√	√	√	√	√	√	

Category	Functionality	Altiris SVS Pro	Citrix XenApp	Microsoft App-V	VMware ThinApp	InstallFree Bridge	Endeavors	Remarks
	Microsoft Terminal Services supported	X	√	√	√	√	X	
	Applications can run anonymous, without authentication with a directory service	√	√	√	√	X		
	No Microsoft Active Directory or NT4.0 domain required for management platform	√	#	X	√	X	√	
	Usable in a Novell NDS environment	√	√	√	√	X	√	
	Usable in a Novell eDirectory environment	√	√	√	√	X	√	
	Application and user preferences can run from removable storage without installing a client/agent component	X	X	X	√	X	X	
	Application package is portable and can be stored on and imported from removable storage	√	X	√	√	√	X	
	Support for localized client operating systems	√	√	√	√	#	√	
Application Characteristics								
	Compression of package	√	√	√	√	X	√	
	Dynamic path relocation	√	√	√	√	√	√	
	Possible to package and deliver application with build-in kernel mode drivers	X	X	X	X	X	X	
	Virtualization of applications with user mode services	√	X	√	√	√	√	
	Virtualization of applications with boot time services	X	X	X	X	X	X	
	Application package can be digitally signed	X	√	X	~	X	X	
	Files and Registry virtualization	√	√	√	√	√	√	
	COM virtualization	X	X	√	√	#	√	
	COM+ virtualization	X	X	X	X	X	#	
	DCOM virtualization	X	X	√	#	#	√	
	Named Pipes virtualization	X	√	√	#	#	√	
	Virtualization of fonts on desktops	X	X	√	√	√	√	
	Virtualization of fonts on terminal server	X	X	X	√	√	X	

Category	Functionality	Altiris SVS Pro	Citrix XenApp	Microsoft App-V	VMware ThinApp	InstallFree Bridge	Endeavors		Remarks
	Communication between different application virtualization environments	√	√	√	√	√	X		
	High Performance impact when virtualized applications communicate with ea-chother	#	#	#	#	#	#		
	Side by Side(SxS) support for virtualized applications	X	X	√	√	√	√		
	Run application with elevated privileges(RunAs)	√	√	√	√	X	√		
	Compatible with Windows Vista User Account Control	√	√	√	√	√	√		
	Windows long filename support	√	√	√	√	√	√		
	Microsoft .NET framework virtualization	X	X	√	√	√	√		
	Virtual reboot during packaging supported	X	√	√	√	#	√		
	Terminal Server drive remapping supported	X	X	√	√	√	X		
	Windows Dynamic disks support	√	X	√	√	√	√		
	Software development kit(SDK) available	√	√	X	√	X	√		
	Different versions of Internet Explorer can run simultaneous on the same client platform	X	X	X	√	#	X		
	No maximum application package file size limitation	√	√	X	√	√	√		
	Win16 application support on x32 platform	X	X	√	√	√	√		
	Win16 application support on x64 platform (Windows limitation)	X	X	X	X	X	X		
	Win32 application support on x64 platform	X	√	X	√	√	X		
	Win64 application support	X	X	X	X	X	X		
	MSI to virtual application package conversion with 3rd party tools	√	√	√	√	X	X		
Architecture									
	Management platform is included	√	√	√	X	√	√		
	Application delivery using streaming HTTP/S protocol	√	√	√	X	#	√		
	Application delivery using other than HTTP/S protocol	X	X	√	√	#	X		
	Application delivery using SMB	X	√	X	√	#	X		

Category	Functionality	Altiris SVS Pro	Citrix XenApp	Microsoft App-V	VMware ThinApp	InstallFree Bridge	Endeavors	Remarks
	No need for client/agent installation	X	X	X	√	√	X	
	Virtualization with client-code in user-mode	X	X	X	√	√	X	
	Virtualization with client code in kernel-mode	√	√	√	X	X	√	
	Original Microsoft Windows API's are used by application	√	√	√	X	X	√	
	Multiple concurrent client or agent versions on the same platform	X	X	X	√	√	X	
	No need for a license server	√	X	√	√	√	X	
	No need for a file server	√	√	√	√	X	X	
	No need for dedicated server	X	√	X	√	X	X	
	MSI wrapper to deploy virtualized applications with ESD	X	X	√	√	X	X	
	No need for ESD infrastructure for enterprise wide deployment	√	√	√	X	√	√	
	Data store can be on: Microsoft SQL	√	√	√	X	X	√	
	Datastore can be on: Oracle	√	√	X	X	X	X	
	Datastore can be on: IBM DB2	X	√	X	X	X	X	
	Datastore can be on: MySQL	√	X	X	X	X	√	
	Datastore can be on: Other	Altiris: PostGreSQL, App-V-SQL EE						
	The Application package is not a proprietary format	√	√	X	X	X	X	
	Client-side persistant cache	√	√	√	X	√	#	
End user experience								
	Full Windows Explorer context menu integration	√	X	X	X	√	X	
	User driven application repair	√	X	√	X	X	√	
	Self service application provisioning	√	X	X	X	X	√	
	No change in how users use applications	X	√	√	√	√	√	
	Performance impact	#	#	#	#	#	#	www.virtualrealitycheck.net Q1/2009
	Automatic shortcut and file type association creation centrally managed	√	√	√	X	√	√	

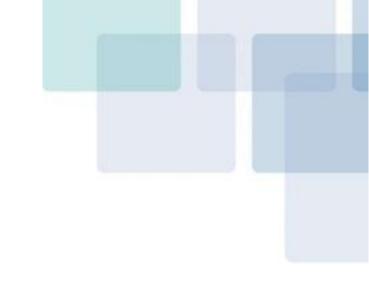| Category	Functionality	Altiris SVS Pro	Citrix XenApp	Microsoft App-V	VMware ThinApp	InstallFree Bridge	Endeavors	Remarks
	User settings are preserved between application launches	√	√	√	√	√	√	
	User settings can be redirected and stored on the network	X	√	√	√	√	√	
	User settings can be streamed between user and server	X	X	X	X	√	X	
	Localized client interface available	~	~	√	X	X	#	
Supported Client Platforms								
	Windows NT 4 – Workstation	X	X	X	√	X	X	
	Windows NT 4 - Terminal Server Edition	X	X	X	√	X	X	
	Windows 2000 - Pro	√	√	X	√	X	X	
	Windows XP - Pro (SP2 and up)	√	√	√	√	√	√	
	Windows XP - Embedded	X	X	X	√	X	√	
	Windows 2000 - Server	√	√	X	√	X	X	
	Windows 2000 - Terminal Services	√	√	X	√	X	X	
	Windows 2003 - Server	√	√	√	√	√	√	
	Windows 2003 - Terminal Services	√	√	√	√	√	X	
	Windows Vista	√	√	√	√	√	√	
	Windows Server 2008 - Server	√	√	√	X	X	X	
	Windows Server 2008 - Terminal Services	X	√	√	X	X	X	
	MacOS, running Win32 applications on MacOS	X	X	X	~	X	#	
	Linux, running Win32 applications on Linux	X	X	X	~	X	#	
Licensing Model of Solution								
	Concurrent	√	√	√	X	X	√	
	Device	√	√	X	X	X	√	
	Unlimited	√	X	√	X	X	√	
	Per named user	X	√	√	X	X	√	
	Free for personal usage (FFPU)	X	X	X	X	X	√	Altiris SVS (only) has FFPU li-

Category	Functionality	Altiris SVS Pro	Citrix XenApp	Microsoft App-V	VMware ThinApp	InstallFree Bridge	Endeavors		Remarks
									cense
									Endeavors Jukebox Lite
Solution in general									
	Proven technology, the solution is being used for 1+ years in enterprise production environments	√	√	√	√	X	X		
	Varity of public available enterprise references in Europe	√	√	√	√	X	X		
	Varity of public available enterprise references in US	√	√	√	√	X	X		
	Low learning curve	X	X	X	√	√	X		
	Quick up and running	X	X	X	√	√	X		
	Time needed for packaging OpenOffice, compression and package	#	#	#	#	#	#		
	Time needed for packaging OpenOffice, NO compression used and package	#	#	#	#	#	#		
	Time to load initial instance of OpenOffice	#	#	#	#	#	#		
	Difficulty for packaging an application, "the art of packaging"	√	√	X	√	√	√		
	Doesn't require a clean OS during packaging process	X	X	X	X	√	X		
	Possibility of creating a High Available platform	√	√	√	√	√	√		
	Load Balancing is part of the solution	X	X	X	X	X	#		
	Official application virtualization training classes	X	√	√	X	X	X		
	Certification program	X	√	√	X	X	X		
	Large community resource	√	√	√	√	X	X		

4.4   PRICE

Price is end-user list price based in Euro's (November2008) excl. support

Solution	Price/user
Altiris SVS Pro	
Altiris SVS for clients	<contact vendor>
Citrix	
Citrix XenApp Enterprise Edition, minimum of 5 users are needed	445.50
Citrix Application Streaming for Desktops (concurrent user)	60.00
Endeavors	
Endeavors Application Jukebox	<contact vendor>
InstallFree	
InstallFree Mini Bridge, 100-500 users	41.67
InstallFree Mini Bridge support	7.50
InstallFree Bridge, 100-500 users	83.33
InstallFree Bridge support per/client	15.00
Microsoft	
Microsoft App-V Client Access License for Terminal Server OPEN	18.95
Microsoft App-V Client Access License for Terminal Server OPEN + SA	28.00
Microsoft App-V Client for Desktops (part of MDOP)	11.45
Microsoft App-V Client Access License for Terminal OPEN VALUE	10.75
VMware	
VMware ThinApp Suite, once per customer includes 50 clients	4.583
VMware ThinApp Client License	35.75
VMware ThinApp Suite Gold support for Suite	962.50
VMware ThinApp Client Gold support per/client	7.51

Eenvoud in ICT

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