

Application Virtualization Comparison: VMware ThinApp 4.0 versus Microsoft App-V 4.5 CU1 and Citrix XenApp 5.0

EXECUTIVE SUMMARY

For enterprises seeking to save time and money with application virtualization, VMware ThinApp offers the most efficient packaging and deployment solution with considerably less administrative overhead, client-side requirements, and infrastructure investment than Microsoft App-V or Citrix XenApp.

Application Virtualization can provide significant benefits to enterprises. By reducing application conflicts, enabling legacy applications for OS migration, and no longer requiring 'install' of applications, IT staff can significantly reduce the cost of regression testing, deploying and managing applications. Insulating applications from the operating system delivers IT flexibility by allowing a reduction in the number of OS images to support, centralizing update of application dependencies (.Net Framework, Java JRE, etc.), and enabling a transition to stateless virtual desktops.

While the benefits above can quickly translate to dramatic cost savings, IT should also carefully consider what is needed to deploy the application virtualization solution in terms of ongoing administration and dedicated server investment. VMware ThinApp is a unique agentless application virtualization solution enabling customers to efficiently realize the benefits of application virtualization without dedicated infrastructure and cumbersome ongoing administration.

In this comparison, Tolly engineers evaluated the implementation requirements, packaging, deployment, update mechanisms of three application virtualization offerings.

THE BOTTOM LINE

VMware ThinApp:

- 1** Provides application virtualization benefits to IT without the administrative overhead found in Microsoft App-V and Citrix XenApp
- 2** Uses a package-centric configuration model allowing flexibility of deployment, portability, and efficient management without dependence on a management server as with App-V and XenApp
- 3** Provides a unique agentless solution that allows immediate use of applications without any client installation or configuration
- 4** Provides customers an enterprise-class solution without requiring the dedicated infrastructure, database, and web service dependencies required with Microsoft App-V and Citrix XenApp



Background & Findings

Tolly engineers evaluated all three solutions with an identical set of virtualized applications along with a mix of deployment models. The deployment models evaluated a streaming scenario and a scenario where application packages were deployed to endpoints for offline use.

Engineers packaged each virtualized application using the corresponding vendor-provided packaging utility and assessed the necessary infrastructure that would be required for an enterprise-class deployment. The exact versions of software used are shown in figure 2.

Infrastructure Requirements

The objective of this test case was to determine the infrastructure requirements to implement and support on an

ongoing basis, a given application virtualization solution that provided:

1. Centralized administration for role-based access to virtualized applications.
2. Support for streaming and offline deployment.
3. Updating virtualized applications without user downtime.

The engineers chose to evaluate the infrastructure requirements in terms of functionality, and not in terms of user load. This approach provides the reader with a better understanding of the requirements without the uncertainty involved in predicting application usage, network throughput, and server utilization. The following sections discuss each vendor's requirements and are accompanied by figure 1 to illustrate the components and grouping by function.

VMware ThinApp

For the VMware ThinApp environment, the engineers noted that the primary component required for the streaming



deployment is a highly available file share providing access to the application packages. The offline deployment scenario has no dedicated infrastructure or client requirements.

To fulfill the requirement for role-based access, engineers configured Group Policy which specified a one-line logon and logoff scripts for users. The scripts added and removed shortcuts, file-type associations, and Control Panel Add/Remove Program entries. The highly available file share combined with the logon/logoff scripts met the requirements for the deployment scenario.

Application Virtualization Functional Elements & Implementation Method

| Element | Citrix | Microsoft | VMware |
|--|--|-------------------------|--|
| Application Publication & Registration | XenApp Server | App-V Management Server | Login Script |
| Distribution Point | Profile Share | Content Share | File Share |
| Endpoint Client | XenApp Client for Hosted Apps XenApp Client for Streaming | App-V Client | None (Agentless) |
| Packaging Utility | Citrix Profiler | App-V Sequencer | Setup Capture (no installation required) |

Source: Tolly, August 2009

Figure 1



Microsoft App-V

The design of the Microsoft App-V environment consisted of the following items: the App-V Management Server, a SQL database instance, an App-V Streaming Server, and a 'content' share which housed the virtualized application packages.

The App-V Streaming Server was necessary in order to perform updates to applications in use without requiring user downtime.

Citrix XenApp

In order to utilize the application streaming and offline capability of Citrix XenApp, the engineers built a server and installed the following components: Citrix XenApp 5.0 (required for streaming to physical devices), a Citrix Licensing Server, a SQL database instance, and the Citrix Web Interface.

In addition, a file share, termed 'Application Hub' was created to house the application profiles.

FINDINGS FROM INFRASTRUCTURE REQUIREMENTS

Both App-V and XenApp rely on dedicated server infrastructure with database components and web services which require specialized App-V and XenApp specific skills to support on an ongoing basis.

The VMware ThinApp solution meets the criteria by using native Active Directory functionality without the need for a dedicated infrastructure.

High Availability and Enterprise Management Based on document research and not necessarily tested

High Availability

As application virtualization becomes a critical part of the IT infrastructure, organizations must examine how to maintain high availability for their chosen solution. The following guidance was gleaned from vendor provided documentation. Microsoft Distributed File System (DFS) is recommended by all three solutions to support the file-share of virtualized packages.

Microsoft App-V Management service is not cluster-aware. Microsoft recommends using either Network Load Balancing (NLB) or a hardware solution to protect this function against downtime.

Citrix XenApp high availability is typically accomplished by maintaining redundant servers with certain roles on dedicated machines per Citrix Farm. A highly available deployment for Citrix XenApp will require at minimum a second XenApp Server hosting the same components as the main one. Best practices also recommend separating out the roles of the Web Interface and Licensing Servers.

In contrast to the measures outlined above for Citrix and Microsoft, VMware ThinApp can leverage the high availability and redundancy built into Active Directory (AD). Both DFS and logon scripts are aware of AD sites and replicate without need of additional infrastructure.

Enterprise Management

Effective implementation of application virtualization will include inventory, usage reporting, and update of virtualized applications. Microsoft provides additional products for this function such as Microsoft Systems Center Configuration Manager. The Citrix infrastructure provides in-depth reporting for streamed applications via its own management console and reporting infrastructure. VMware ThinApp does not provide a separate management console or infrastructure but rather advises customers to use the tools that are currently in use in their environment today. As an added module to the testing, engineers installed and configured HP Client Automation Enterprise version 7.5. This desktop management suite provides integrated deployment and reporting of ThinApp packages, along with custom jobs that can be configured to trigger AppSync updates. Using the management console, engineers were able to easily create reports that listed both natively installed and virtualized ThinApp applications across the desktops.



VMware ThinApp Application Streaming and the Stateless Desktop

VMware ThinApp has a unique native ability to stream any application package without any infrastructure or client requirements. The execution of the application in this 'streaming' mode is identical to when the same package is run locally. This offers administrators flexibility in deployment without reconfiguration of packages.

In streaming mode, VMware ThinApp application packages transfer blocks of data from a file-share into memory to be executed, instead of 'caching' that data to the

local disk. This speeds application execution because only the necessary files and registry are transferred to memory on a just in time basis according to each application request. The net transfer to run applications is dramatically less as demonstrated in the streaming test case.

The native streaming capability which prioritizes execution and does not require local disk storage allows IT administrators to make use of a stateless desktop model. The desktop OS becomes a mere container for virtualized

applications streamed at run-time, thus the administrator can dramatically reduce the time and effort to patch the operating system as it becomes a disposable container with no applications or user data.

Please see the following document for a comprehensive discussion of VMware ThinApp Streaming Execution Mode.

<http://www.vmware.com/resources/techresources/10027>

(Source: VMware)

Also the support burden only requires the skills to support a replicated read-only file share.

To implement our test case scenario, Microsoft App-V required four separate components and Citrix XenApp needed five, while VMware ThinApp made use of only two native functions within Active Directory.

Client Deployment and Management

The next exercise was to deploy the client-side components required for each solution.

VMware ThinApp

VMware ThinApp does not require any client or agent install to run virtualized applications in streaming mode or offline. End-user access to applications

is enumerated through the Group Policy logon and logoff scripts.

Microsoft App-V

To deploy Microsoft App-V, the Application Virtualization Client is required. As most companies deploy software with MSI packages; it should be noted that the Microsoft-provided guidelines recommend deploying three pre-requisites: Microsoft Visual C++ 2005 SP1 Redistributable, Microsoft Core XML Services 6.0 SP1, and Microsoft Application Error Reporting before installing the App-V client.

Also, for the 3rd pre-requisite, the APPGUID parameter with the appropriate App-V product code must be specified during the installation. Specific instructions for this procedure are provided on the Internet¹.

Once the pre-requisites have been installed, the App-V client can be installed and subsequently configured.

The App-V client will need to be configured to point to a publishing server to retrieve the list of applications. It is assumed that the administrator will create a silent install for this component as there are a number of configuration items that will vary depending on the user groups and location.

Microsoft advises reviewing the default settings before deployment, as by default the App-V client will automatically load all applications available which will have a significant impact on network and local disk space.

Citrix XenApp

The Citrix XenApp solution requires two separate client installs to use streamed and offline virtualized applications.

¹ Please refer to: <http://technet.microsoft.com/en-us/library/cc843841.aspx>



The first installation, which provides the client virtualization environment, is the XenApp Plugin for Streamed Apps which deploys drivers, the Citrix Streaming Service, and the Ctx_StreamingSvc user account on each workstation. The installation requires administrative rights and a reboot but does not require users to enter any configuration information. The Microsoft Visual C++ 2005 Redistributable is also required for this install.

The second client install is the XenApp Plugin for Hosted Apps. This is the client side component that interacts with the XenApp server 'application publishing' mechanism.

Both clients are required to enumerate role-based application access and run virtualized applications offline. In addition to the above requirements, in order to run a virtualized Microsoft Office 2007 package, the .Net Framework must also be installed locally.

FINDINGS FROM CLIENT DEPLOYMENT

1. Deploying the required clients for Microsoft and Citrix solutions will require multiple installs and ongoing client management. This greatly increases the implementation cost and effort.
2. Ongoing client patching is required for both Microsoft and Citrix clients. For example, there have been 4 client hotfixes released for the App-V client since April 2009.
3. VMware ThinApp has no client requirement, being an agentless

solution that embeds the virtualization functionality into the application package. Users can run applications immediately upon receiving access to the application packages.

Packaging Process

Each of the application virtualization solutions make use of a packaging process which captures the necessary application components to 'virtualize' the application.

In addition, each solution provides a mechanism to 'link' applications to other applications or components. This is an important function of application virtualization because it provides a means to create modular packages to separate the update process of frequently used components (such as .Net Framework, Java JRE, etc.) from their dependent applications.

The engineers used each vendor's packaging process to virtualize the following applications: Microsoft Powerpoint Viewer 2007, Mozilla Firefox 2.0.8 and 3.0.5, Paint.Net 3.36, .Net Framework 3.5 SP1, and Microsoft Office 2007. In addition to packaging applications, the engineers established a mandatory link between the Paint.Net application and the .Net Framework.

VMware ThinApp

For VMware ThinApp, a drive was mapped to the extracted files from the VMware ThinApp MSI. There was no installation pre-requisites and no need to install the packaging utility. The Setup Capture process was run entirely from the mapped drive which took a

pre-scan snapshot and a post-scan snapshot creating the virtualized application.

When packaging with VMware ThinApp, the administrator authorized Active Directory groups, created application dependencies, and set update sources and time limits for packages. These administrative settings are embedded into the package and cannot be modified by users.

When specifying the application dependency, engineers could configure a logical link to a directory using wildcards rather than a specific application package. This allowed engineers to configure an application to get the version of .Net Framework that it needed from a directory without mandating the specific location or naming a specific package. This flexibility made managing dependent packages much more efficient.

Microsoft App-V

The Microsoft Application Virtualization Sequencer required the creation of a separate partition, recommended to be the Q: drive. As applications were sequenced, the program's installation was changed to the Q: as the installation directory. There is an 8.3 short filename limitation that hampers the naming of applications and versions.

For Microsoft App-V, the process to create the dependency on .Net Framework required the download of a resource kit utility - the Dynamic Suite Composition (DSC) Tool - which is not available on the original App-V installation media. This utility has to be extracted and executed from a machine

¹ Please refer to: <http://technet.microsoft.com/en-us/appvirtualization/dd146065.aspx>



with access to the previously packaged applications. The DSC tool then allows selecting a primary package and making a mandatory link to the existing .Net Framework package in the Content Share. It should be noted that Microsoft does not officially support virtualizing .Net Framework 3.5 SP1¹.

Citrix XenApp

For Citrix XenApp, the engineers conducted the same process by 'profiling' the applications using Citrix Profiler on a separate Virtual Machine (VM). The Citrix Profiler requires the installation of the .Net Framework.

Although the Citrix Profiler provides an interface to create dependencies between existing packages, Citrix does not support the virtualization of the .Net Framework¹. This prevented the engineers from creating the dependency on the .Net Framework.

FINDINGS FROM PACKAGING PROCESS

1. VMware ThinApp is the only solution that completely supports virtualization of any version of the .Net Framework.
2. The preparation requirements and process of packaging was more complex with App-V and XenApp.
3. The Setup Capture process of VMware ThinApp automatically picked up user settings that included customized toolbar settings in Microsoft Office 2007 which the XenApp packaging processes failed to record.
4. Creating dependencies with VMware ThinApp allows for greater extensibility with wild-card and directory support.

After the virtualization packages were created, they were transferred to their respective distribution point for testing in the next phase.

Deployment: Streaming Mode

Engineers utilized the virtualized application packages created during the packaging phase. The first exercise was to stream the Microsoft Office 2007 application to a device on a LAN. Engineers recorded the amount of local disk space, then launched each application observing the time to launch, and confirming functionality of the application, then again recorded the available disk space.

VMware ThinApp

Administrators copied the application packages to the VMware ThinApp file share allowing desktops to receive shortcuts, File Type Associations (FTAs), and Control Panel entries upon login.

Microsoft App-V

Engineers imported the application package into the Microsoft App-V Management server, specifying the location of the OSD and ICO files, and assigned Active Directory user groups.

Citrix XenApp

Engineers used the Access Management Console to create the Program Neighborhood Agent website to provide the published applications to the Citrix clients.

After creating the website and setting the appropriate authentication method, it was necessary to publish the

application and assign Active Directory groups for access.

FINDINGS FROM STREAMING MODE DEPLOYMENT

Each virtualization solution successfully streamed the Microsoft Office applications with the exception of Citrix because of the requirement to install the .Net Framework when virtualizing Microsoft Office 2007. Once the engineers installed the .Net Framework locally on the Citrix client VM the applications were functional.

The local disk space used when streaming Microsoft Office 2007 for Microsoft App-V, Citrix XenApp, and VMware ThinApp was 950MB, 320MB, and 20MB, respectively.

No specific time measurements were taken but it was apparent that application launch time and execution was significantly faster with VMware ThinApp. See the VMware ThinApp Native Streaming section for further explanation of the difference between caching and streaming.

Deployment: Offline Use

The second deployment test case involved providing a virtualized application package to an end client that would execute the application offline.

VMware ThinApp

For VMware ThinApp the same application packages were deployed to the endpoint using the native Active Directory capability to deploy MSI

¹ As per the Citrix Application Streaming Guide available at: <http://support.citrix.com/article/CTX116414>



packages. Deployment and execution of the package worked as expected.

Citrix XenApp

Citrix XenApp does not provide a means to 'push' the deployment of virtualized applications. Users can enumerate and launch applications from either the Web Interface or the XenApp streaming client but both of those methods rely on the end user to initiate the process.

The Citrix Application Streaming Guide¹ documents a command line utility, RadeDeploy, which can be used to 'pull' the application as an administrator. Engineers chose to log in to the Web Interface site as a user to initiate the application streaming.

Microsoft App-V

Microsoft App-V also generates MSI packages from the sequencing process - however the MSI does not include all the files necessary for installation at the endpoint. By default, the SFT file must be in the same directory as the MSI file.

For seamless deployment of an App-V package, the administrator should use Microsoft System Center Configuration Manager or use an alternative ESD solution to deliver the MSI and SFT together.

Alternatively, administrators could change the SFTPATH to specify an alternate location of the SFT file which would allow the MSI package to be run from one location and the SFT file to be installed from a different location.

Engineers manually placed both files locally in the same directory on the endpoint device to complete the test.

The Microsoft App-V client supports a stand-alone mode for offline application execution, however, the client can only be in one mode at a time. Configuration of the App-V client to stand-alone mode involved manually changing five registry keys per the instructions in the trial guide titled Microsoft App-V 4.5 Trial Guide² available online.

Once all the packages had been run in a fully offline mode, engineers compared the authorization controls for deployed packages.

FINDINGS FROM OFFLINE MODE DEPLOYMENT

Engineers noted that the applications packaged as Microsoft App-V MSI's are not protected without the enforcement of an App-V Management or Streaming server. Conversion of the App-V client to stand-alone mode bypasses the access control provided by Active Directory security groups. Engineers were able to install and execute an App-V package only authorized for domain users as a local administrator on a machine that was a member of a workgroup rather than a domain.

Citrix XenApp provides the Access Management Console to assign users and groups the right to use applications offline for a period of days. This setting is a farm-wide setting¹ that is consumed by the XenApp client and applies to all applications streamed for offline use.

Application Virtualization Solutions Under Test

| Solution/Function | Citrix XenApp 5.0 Feature Pack February 2009 | Microsoft App-V 4.5 CU1 April 2009 | VMware ThinApp 4.0.3 July 2009 |
|-------------------|---|---|---|
| Client | XenApp Client for Hosted Apps 11.0 XenApp Offline App Client 5.1 | Application Virtualization Desktop Client 4.5.1 | None (Agentless) |
| Packaging Utility | Citrix Profiler 1.3.1 | Application Virtualization Sequencer 4.5.1 | Setup Capture 4.0.3 |
| Server | Citrix XenApp 5.0 | System Center Application Management Server | None (no dedicated infrastructure required) |

Source: Tolly, August 2009

Figure 2

¹ Available online at: <http://support.citrix.com/article/CTX116414>

² Available online at: http://download.microsoft.com/download/f/7/8/f784a197-73be-48ff-83da-4102c05a6d44/MSAppVirt45Trial_Guide_Final.docx



VMware ThinApp embeds the 'Time-to-Live (TTL)' of the application and the Active Directory security groups authorized, into the package.

These configuration settings are not visible and cannot be changed once the package is deployed. These configurations are specified for each package; thus allowing for the same applications to be deployed to different audiences with varying expiration dates and Active Directory based access control.

Deployment:

USB Mode

As a further test of application portability, engineers copied the virtualized application packages to a USB drive and attempted to run them on a clean desktop.

Microsoft App-V

The Microsoft App-V package on USB required the installation of the App-V client, configuration to change to stand-alone mode, a reboot, and then installation of the MSI package with the SFT file. Once this was complete the application ran as intended.

Citrix XenApp

The only public information that Tolly engineers found for XenApp USB support is from the Citrix blog². This manual workaround involved configuration of the Streaming Client using the ClientCache.exe utility to change the RadeCache location to the USB drive, and then reboot to use the application from the USB.

VMware ThinApp

For VMware ThinApp packages, administrators copied the executable version of the package which is automatically generated during the packaging process to the USB device and executed without any installation.

Engineers were also able to save specific application settings to the USB device so that when the application was run from the USB device on a different desktop the user specified settings within the application were preserved.

FINDINGS FROM DEPLOYMENT

1. VMware ThinApp deployed in all three scenarios with the least amount of effort by merely placing the package in the appropriate location. this was a dramatic contrast to the additional configuration for each scenario with app-v and the limited deployment options with XenApp.
2. Microsoft App-V MSI packages are vulnerable as any device can install the App-V client and run MSI based packages without authorization.
3. The caching mechanism of XenApp and App-V lead to significant network load and local disk footprint (App-V used 970Mb, Citrix used 320Mb). One Microsoft document³ discusses details of Microsoft's own implementation of App-V stating that the client cache can be as much as 3 times the size of the SFT file.

4. VMware ThinApp's package-centric approach yields a better deployment model with its native streaming and superior package portability with effective security. (see section entitled VMware ThinApp Application streaming).

Test Environment

A single physical server loaded with VMware ESX update 3 was used to house all of the server and desktop virtual machines.

The physical machine was outfitted with dual quad-core Intel® Xeon® E5430 2.66-GHz, 64-bit processors, 16 GB RAM, and 1 TB of usable disk space. Microsoft Windows XP SP3 was used for the administration console to interact with the isolated network which housed all the virtual machines.

All hardware and software was acquired through normal distribution channels.

All three solutions used the common infrastructure components of Active Directory, DNS, and DHCP hosted by a Windows Server 2003 R2 virtual machine. VMware vCenter running in its own server VM was used to speed the deployment and management of virtual machines from templates for our testing scenarios. All virtual desktop machines were configured identically and consisted of the following software and virtual hardware components: 1 CPU core, 512 MB RAM, 8 GB Hard disk drive storage, Microsoft Windows XP SP3.

¹ See Citrix Application Streaming Guide: <http://support.citrix.com/article/CTX116414>

² <http://community.citrix.com/pages/viewpage.action?pageId=21792025>

³ <http://download.microsoft.com/download/4/2/F/42FBBC16-894D-4343-8ABB-35979785523C/0574SeqencingAtMicrosoftTCS.doc>



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In accordance with Tolly's Fair Testing Charter, Tolly personnel invited representatives from the Citrix Systems, Inc. and Microsoft Corporation to participate in the testing. Both firms respectfully declined to participate in the testing. At the end of testing, Tolly shared the observations from the testing with both firms, but did not receive any comments at the time of publishing.



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