



# The Top Eight Best Practices for Deploying Citrix XenApp and XenDesktop 7.7



## Summary

Citrix XenApp and XenDesktop 7.7 are fast becoming the standard platforms for deploying application and desktop virtualization. Based on the new Flexcast Management Architecture (FMA), XenApp and XenDesktop 7.7 provide a unified platform that makes application and desktop delivery fast and easy.

The move from the IMA to the FMA architecture in XenApp and XenDesktop 7.7 introduces many changes in the way these architectures operate. In this white paper, you will learn how to take advantage of all the new Citrix features and enhancements to improve the security, manageability and remote access of your virtual applications and desktops. We will present real-world experiences, along with the top eight best practices in deploying Citrix XenApp/XenDesktop 7.7.

## Citrix XenApp and XenDesktop 7.7 Architecture

### Moving from IMA to FMA

For many years and versions, Citrix XenApp has been based on the Independent Management Architecture (IMA) which provided a framework for communication between XenApp servers in a server farm. An IMA service ran on every server in the farm and was responsible for tracing sessions, applications, licenses and server load. The IMA Data store which is a database stored farm and server configuration including published applications, licenses, load balancing configuration, security right, printer configurations, etc. To handle situations where the data store was not available and to improve performance, each XenApp server had a local host cache. The local host cache stored information about the servers in the farm, the published applications, Windows domain trust relationships etc. and this information was periodically synchronized with the data store.

Some of the XenApp servers could be configured as Zone data collectors that received real-time information from all XenApp servers in the one and handled load balancing in the zone.

Citrix XenApp and XenDesktop 7.7 uses a FlexCast Management Architecture (FMA). With the IMA architecture, we had XenApp servers that performed dual roles – of servicing user sessions as well as functioning as zone data collectors. This dual role reduced the number of user sessions that the XenApp servers could handle. To address this, the Citrix FMA architecture has a separate Delivery Controller or a connection broker that performs the load balancing and resource scheduling functions. This new architecture also allows support for desktop virtualization in a common architecture. The FMA architecture continues to have a data store. Clients access the Citrix StoreFront first, and then connect to the Delivery Controller which then directs them to a XenApp server instance or to a virtual desktop (see Figure 1).

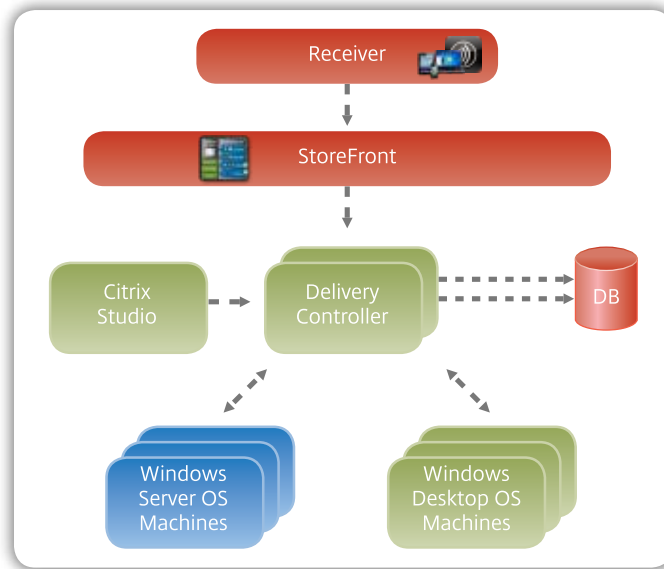


Figure 1: The Citrix FlexCast Management Architecture used in Citrix XenApp and XenDesktop 7.7

Some of the key differences in the new Citrix architecture include:

- The IMA service and the underlying IMA protocol are no longer used. Virtual delivery agents (small footprint agents) installed on the XenApp servers and virtual desktops provide health reports to the Delivery Controller(s).
- In the past, Citrix XenApp servers could be run in one of two modes – in a worker mode or as a session host only server, or in a controller mode or as a data collector. In the FMA architecture, all XenApp servers can only be run as session only servers.

### Best Practices for Citrix XenApp and XenDesktop 7.7

#### #1 The Citrix Data Store is More Important Now Than Before

##### Sub: Separate databases for Site Configuration, Logging and Monitoring

As we discussed earlier, the data store holds their types of information: a) site configuration information including policies, machine catalogs, delivery groups and published applications, b) login information, and c) live runtime monitoring data including server load and connection status that is used for load balancing. By default, when you deploy Citrix, all the above information is stored in one database. For best performance, it is not advisable to keep this configuration. That is, site configuration should ideally not be stored in the same database as logging and monitoring information. The reason for this is if for any reason, the logging database grows wildly, it could slow down logins to Citrix Studio (the management console) or even affect the user experience when accessing Citrix. Therefore, a best practice is to use different databases to store site configuration, monitoring and logging information.

High availability of the data store is critical in the new Citrix FMA architecture. If the data store becomes unavailable, the Citrix Studio console will not start, affecting all management operations. User accesses will be limited to only the applications that have been accessed in the last two weeks. Because of these key limitations, high availability of the data store is critical. When

selecting the kind of database to use for the data store, there are three options – SQL AlwaysOn Availability Groups, SQL Mirroring or SQL Clustering. If you look at licensing, SQL Mirroring is the cheapest option because you have two SQL nodes and a witness and only the active node has to be licensed with two standard licenses. With SQL Clustering, most configurations will have both nodes active and in this case, you will need an enterprise license which is significantly more expensive. Often the choice of the database technology is based on which of these options is readily available in the target environment.

Ideally, before you start installing the Citrix environment, decide on the choice of database technology you wish to use and make sure the SQL environment is available. If you want to start with a single database instance upfront and then move to a cluster, you can. However, the process of reconfiguring the data store is not simple and involves extensive scripting.

Given how much critical data is stored in the data store, make sure you are regularly backing up the data store, so you can restore from the back up in case a disaster strikes.

## **#2: Ensure Connection Leasing Is On**

### **Sub: Provides access to some of the site resources even if the data store is down**

In the earlier versions of Citrix XenApp, each XenApp server had a Local Host Cache which had a cached copy of the central database, so the XenApp server did not have to contact the data store to authenticate users or to see what types of applications a user was entitled to. The server could also make real-time load balancing decisions as well, based on the data in the Local Host Cache. The presence of the Local Host Cache allowed servers to operate even if the data store was not available.

In XenApp and XenDesktop 7.7, the Local Host Cache does not exist anymore. The alternative is to use connection leasing. With connection leasing, when a user accesses a resource and uses it, the Delivery Controller keeps a list of resources the user requested. This information is stored for the last two weeks in an XML file. Once it detects that the data store is not available, the Delivery Controller moves to a cached mode. In this mode, it reads the XML file to validate if a user has requested for a resource in the past, and if so, access to that resource is permitted. This capability ensures that Citrix users still have access to some of the resources in the farm when the data store is not available. Hence, make sure that connection leasing is turned on in your Citrix farm.

Connection leasing is not a direct replacement for the Local Host Cache. For instance, if a user has connected to a Citrix XenApp server in the last two weeks and if that server is now under maintenance, in the cached mode, the Delivery Controller will not direct the user to any other server in the farm. Another limitation is that connection leasing does not work for a pooled virtual desktop environment. This is because in a pooled virtual desktop environment, a user is connecting to a different desktop each time

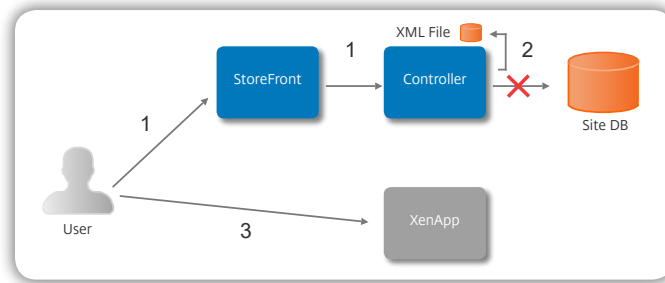


Figure 2: How connection leasing works. When the data store is down, the Delivery Controller uses a cached XML file to determine the resources that each user can have access to.

When it operates in the cached mode, the Delivery Controller handles additional workload – e.g., reading of the XML cache (see Figure 2). Real-world experience indicates that the additional CPU and IOPS load on a Controller when it is operating in the cached mode is not very significant. In general, given how critical the functions of the StoreFront and the Delivery Controllers are, you should size them correctly to handle the incoming load. These applications should be run on systems with adequate CPU and memory.

### #3: Use Session Pre-Launch and Session Lingering to Improve User Experience Sub: Trade-off Resources for Improved Response Times

Session pre-launch is one of the features intended to provide a better user experience. With pre-launch, when all or specified users login to their client receiver, the session prelaunch feature helps users quickly access applications by starting sessions before they are requested. The advantage is that the user's wait time to start the application is low.

By default, session pre-launch is turned off and must be configured manually. Use this capability judiciously for specific users or applications. You can also set pre-launch to be turned on when the load on a server is higher than a certain percentage, so as to reduce the access time for an application or session.

While application pre-launch improves the user experience, it will also cost resources on the servers – an application that is pre-launched is taking resources unnecessarily. Therefore, a timeout value for the pre-launch can be specified. If the user does not access the application or session for this time period, the application or session will be closed. The default timeout for pre-launch is 15 mins and is configurable.

Session lingering is another feature that works in a similar way. When a session is closed, applications in that session linger on for a short period of time – so if a user decides to reconnect to a session, within a short period of time, the applications do not have to be re-launched and the application contexts are preserved.

Session lingering is a complementary option to session prelaunch and in most XenApp implementations both these option will be used together to provide the best user experience and to make access to published resources fast and easy. Session lingering similar to session prelaunch was reintroduced in XenApp and XenDesktop 7.6

#### #4: GPU is a Must For Better Graphics Performance

##### Sub: Even more important than having more CPUs

Newer versions of many common applications including the Microsoft Office suite are much more graphical than before. On standard systems, graphics processing is handled by the CPU.

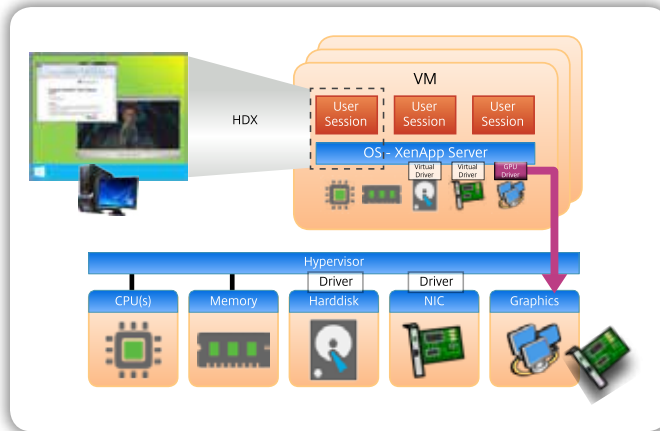


Figure 3: GPU sharing for Virtual Citrix XenApp servers

In this case, normal computations and graphics processing will be time-sliced. Since graphics is time sensitive, time slicing graphics processing results in poorer user experience. In addition, the load on the CPU is also higher, thereby reducing the scalability of the servers. For Citrix XenApp and XenDesktop deployments with graphics oriented workloads, it is recommended to have graphical processing units (GPU) installed on the servers to provide better user experience.

In a virtualized environment, the GPUs are configured on the hypervisor and can be made available to the virtual machines – VMs (see Figure 3). A GPU can be shared by many VMs, or you can have a pass-through configuration where a VM gets a dedicated GPU. For normal uses with standard desktop applications and web accesses, sharing a GPU across user sessions is sufficient. For graphics intensive applications in CAD/CAM or healthcare, a pass-through or dedicated GPU per VM is the recommended approach.

Since graphics applications are time-sensitive, in our experience it is even more important to have sufficient GPUs than CPUs.

GPUs in VDI should stop being Optional!

“Look at regular desktops and laptops. How many of them can you buy without a GPU? And if you price out a business desktop and then you have to shave off some costs, do you ever do that by removing the GPU? No!

So by that logic a GPU should be 100% required for VDI, and if you don't like the “added” cost of it, then you can offset it by putting 10% more users per server.”

**Brian Madden, Independent desktop virtualization expert, TechTarget**

## #5: Use Framehawk for Enhanced User Experience

### Sub: A new ICA virtual channel and supporting HDX technologies



Framehawk is a new technology that is available from XenApp and XenDesktop 7.6 with Feature Pack 2. This technology significantly improves the user experience seen by users who are connecting to a server farm from Wi-Fi connections and satellite offices that may not have very reliable network connectivity.

Network packet loss, congestion, latency and network jitter can all affect user experience. Slow scrolling of web pages, sluggish application loading and very slow echo back of characters typed by a user are some of the artifacts of network issues.

To understand how Framehawk works, think of it as a software implementation of the human eye, looking at what's in the frame buffer and discerning the different types of content on the screen. What's important to the user? When it comes to areas of the screen that are changing rapidly, like video or moving graphics, it doesn't matter to the human eye if some pixels are lost along the way because they will quickly be overwritten with new data. But when it comes to static areas of the screen, like the icons in the systray or a toolbar, or text after we've scrolled to where we want to start reading, the human eye is very fussy; we expect those areas to be pixel perfect.

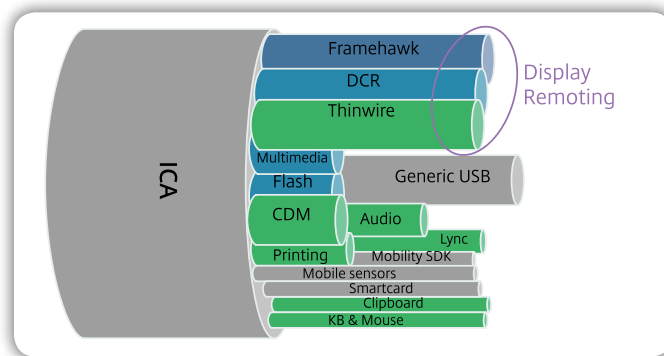


Figure 4: Framehawk introduces a new virtual display ICA channel

Framehawk uses data compression and self healing transforms with interpolation to hide data loss caused over the networks so that the user still perceives good image quality while enjoying a more fluid experience. Framehawk's algorithms also intelligently distinguish between different types of packet loss; for example, random loss (send more data to compensate) versus congestion loss (don't send more data since the channel is clogged). Unlike the existing Thinwire virtual channel which is TCP-based, the new Framehawk virtual channel (see Figure 4) is UDP-based. This is one of the ways that Framehawk overcomes network packet losses.

Framehawk is turned off by default. If you have a lot of roaming, Wi-Fi or remote users, consider turning this on to enhance the user experience.

## #6: Use PVS Enhancements for Performance and Reliability

### Sub: Automate provisioning, minimize configuration drifts

Citrix Provisioning Services (PVS) enable the operating system to be streamed to servers or desktops. The advantage from an administrator perspective is that you only have to update a single image which is then streamed to hundreds, or thousands of desktops/servers. Software can now be installed on a master image and PVS clients (“target devices”) get the updated OS image with the new software when they reboot (see Figure 5).

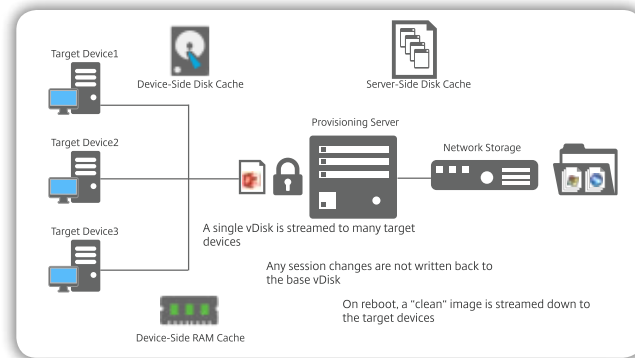


Figure 5: How Citrix Provisioning Services works

Since a PVS server can be streaming to a number of targets, its disks can be very busy. Earlier versions had a RAM cache – as far as possible data was retrieved from the cache, minimizing reads and writes to the physical disks. Caching in RAM provided significant throughput improvements and better response times. However, if the RAM cache filled up, the target device would encounter a blue screen of death (BSOD)! This was a problem with having the cache entirely in RAM.

Now, Citrix PVS has an option to cache in RAM with overflow going to hard disk. This avoids the BSOD problem. With this implementation, data is written to the non-paged pool memory first and when the memory buffer is full, least recently used data is flushed to the disk. Make sure you use this option to cache in RAM with overflow going to hard disk to benefit from the performance and reliability improvements.

Anti-virus configurations can also have a big impact of performance of a streamed Citrix infrastructure. Set exclusions to avoid scanning PVS related files and the write cache. Also, scan a vDisk before closing and set a signature that the vDisk has been scanned. Otherwise, as soon as the target is streamed and boots up, its disks will be scanned. Also, make sure you avoid scanning key PVS related processes and system drivers on the target devices.

## #7: Use Citrix Director/NetScaler Insight for Performance Visibility

### Sub: Insights into Users and Sessions for Troubleshooting

Since Citrix technologies are often used to support business-critical and productivity applications, any slowness or non-availability of the infrastructure is business impacting. Proactive monitoring and rapid diagnosis of problems in the infrastructure are critical.

Citrix XenApp and XenDesktop include two built-in tools to allow administrators to monitor the performance of the Citrix infrastructure:



- Citrix Director with Edge Sight is a tool that administrators can use to see which users are logged in to the Citrix farm. If a user calls in with a problem, administrators can use Citrix Director to see how long it took the user to login, why login was slow, what applications the user is executing on the server and what resources each application is utilizing. This information is useful in troubleshooting the user's performance issue.
- Citrix NetScaler Insight analyzes AppFlow data from NetScaler devices and uses this information to track application launches, HDX sessions, WAN and ICA latency on each user's session and a number of network related metrics (including client and server-side jitter). One of the key advantages of Citrix NetScaler Insight is its ability to provide ICA and network latencies, comparing which administrators can determine when a user complains of slowness, is his/her issue related to the Citrix stack or whether it is due to the network.

### #8; End-to-End performance visibility is key for success

#### Sub: Must see all Citrix and non-Citrix tiers in a single unified view

Citrix Director and NetScaler Insight provide part solutions to the performance monitoring problem for Citrix XenApp and XenDesktop infrastructures. While Citrix Director provides drilldown into the performance seen by a specific user of Citrix XenApp or XenDesktop, NetScaler Insight provides visibility into the performance of the network connections between the user terminals and the Citrix site.

However, a typical Citrix XenApp/XenDesktop infrastructure includes many tiers of hardware and software. Just focusing on the Citrix components in the infrastructure, you may have Citrix StoreFront servers, Citrix License servers, Citrix PVS, Citrix CloudBridge, Citrix XenMobile, Citrix XenServers, Citrix NetScalers, Citrix XenApp servers and Citrix XenDesktop desktops. When a user complains that "Citrix is slow", the problem could be in any of these tiers. To troubleshoot such problems, you need to use different administrative consoles for each of these tiers. This results in a slow and manual troubleshooting process (see Figure 6).



Figure 6: To troubleshoot a performance problem, administrators need to use multiple different administration and monitoring consoles. This leads to a very slow and manual troubleshooting process.

Often, Citrix performance is affected by the performance of the other tiers of the infrastructure. For example, if Active Directory is slow to authenticate users, Citrix logins will be slow. An increase in network latency can lead to Citrix slowness. Likewise, a bottleneck in the virtualization or storage

**Citrix is often wrongly blamed for slowness**

65% of respondents to a DABCC/eG Innovations Citrix Performance Survey indicated that over half of the problems reported with Citrix slowness were NOT due to Citrix issues.

tiers results in slow Citrix performance. Hence, it is also important to monitor the non-Citrix tiers of the infrastructure that affect Citrix performance (see Figure 7).

To effectively monitor and troubleshoot Citrix performance issues, enterprises and service providers need:

- Unified monitoring of the Citrix stack – every Citrix tier - from a single pane of glass
- Unified monitoring of the non-Citrix tiers (network, virtualization, storage, infrastructure services, etc.) from the same console
- Correlation between the performance of the different tiers to determine exactly which tier is the root-cause of a slowdown

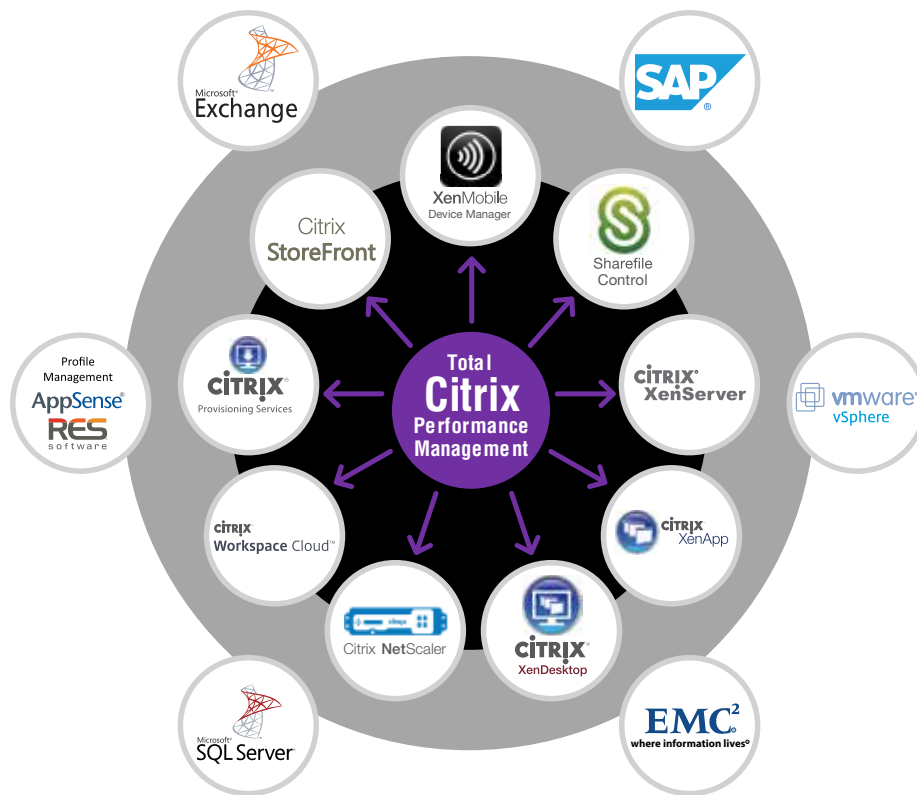


Figure 7: Total Citrix performance management must provide administrators with a unified console from where they can monitor every one of the Citrix tiers and the different non-Citrix tiers that affect Citrix service performance.

This is where the eG Enterprise solution from eG Innovations comes in. The eG universal monitor tracks the performance of every Citrix and non-Citrix tier of the infrastructure. eG Enterprise's auto-baselining engine computes time-of-day baselines for each metric, indicating what the normal values of these metrics are. When the monitored values exceed the baselines, eG Enterprise generates proactive alerts to administrators. Alerts from different tiers are correlated by the industry's first truly virtualization-aware correlation engine. By discovering application-to-application inter-dependencies, application to VM mappings and VM to physical machine mappings and analyzing the different alerts in this context, eG Enterprise identifies exactly where the root-cause of problems lie (see Figure 8). This unique capability makes Citrix problem diagnosis



Figure 8: eG Enterprise discovers the different inter-dependencies in a Citrix infrastructure and uses this information for automatic root-cause diagnosis, to pin-point where the root-cause of a problem lies.

simple – administrators can now quickly and easily determine why Citrix access is slow and where they need to focus their attention to fix a problem. This results in improved user satisfaction and productivity, shorter problem resolution times and more efficient use of IT experts (because they spend less time on routine fire-fighting).

### Conclusions

Citrix XenApp and XenDesktop 7.7 represent a significant change from earlier versions of these products. Not only has the architecture changed, but several new capabilities have been added to make remote application and desktop delivery seamless and efficient. In this white paper, we have covered eight best practices you should keep in mind as you deploy Citrix XenApp and XenDesktop 7.7.

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**Credits**

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