Key Considerations for a Performance Monitoring Solution for Your Citrix Infrastructure

An Analysis and a Checklist

A Technical White Paper

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Total Performance Visibility

Introduction

Citrix XenApp and XenDesktop are among the most performance sensitive applications in use in enterprise networks. These technologies are used for highly interactive tasks, so even a slight performance glitch can result in user disconnects, keystroke lags or slow screen refresh, all of which can be extremely discomforting for users. Furthermore, because these technologies are often used to replace or augment conventional thick clients or applications on local desktops, users expect virtualized performance to be comparable, if not better than conventional technologies.

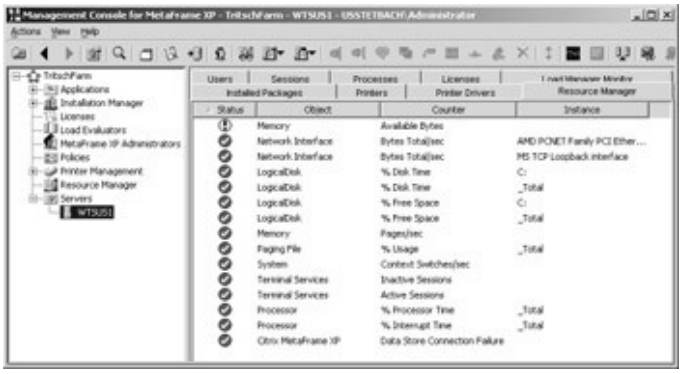
Unlike physical desktops where performance issues on a desktop affects one user, performance issues with Citrix technologies impact hundreds to thousands of users. For example, if the primary server providing profile access to a Citrix farm is slow, then all the users logging in to the farm will experience slowness. Therefore, performance monitoring is one of the most critical operations functions in a Citrix infrastructure.

If we look back about a decade ago, Citrix deployments were simple and involved just two tiers. These consisted of a Citrix MetaFrame server (as it was then called) to which users would connect through a Citrix client. Today's infrastructure is far more complex. Most Citrix deployments include Citrix NetScaler for bandwidth optimization and acceleration, Citrix StoreFront for web access, Citrix Delivery Controllers for mediating accesses and load balancing, Citrix session servers for serving client applications, Citrix Provisioning Services for streaming OS images, a central license server and backend data stores. And, all of these tiers can be virtualized. While modern Citrix architectures offer scale and varied functionality, they are difficult to monitor and troubleshoot. Slowness in any of the tiers of the infrastructure affects the user experience.

The Citrix administrator's job has not gotten any easier. Users continue to call the helpdesk saying, "Citrix is slow" or "Citrix is not working" and an admin is expected to handle all the complaints and resolve them quickly. In the past, the admin only had to look at the Citrix MetaFrame server to troubleshoot issues, today the admin must be adept with many different Citrix tiers. Furthermore, slowness in tiers that the Citrix admin does not control can also affect the user experience. If the virtual tier (e.g., VMware vSphere), storage, network, or even the application itself is slow, your users will still see this as a Citrix issue. You have a thankless job on your hands – how can you troubleshoot an issue where the cause is not in one of the tiers that you control?

Performance Monitoring for Citrix

Performance monitoring tools are a Citrix administrator's best friend. Ask anyone who has used Citrix Resource Manager over the years! Early on, Resource Manager was a great tool that provided real-visibility into the performance of Citrix MetaFrame and Presentation Servers. As the Citrix infrastructure expanded to include multiple tiers and technologies, Citrix replaced Resource Manager with EdgeSight. Designed mainly for application virtualization via Citrix XenApp, EdgeSight provided visibility into the functioning of the XenApp servers. Detailed insights into the Citrix logon process and the ICA protocol's virtual channels were two of its key features.

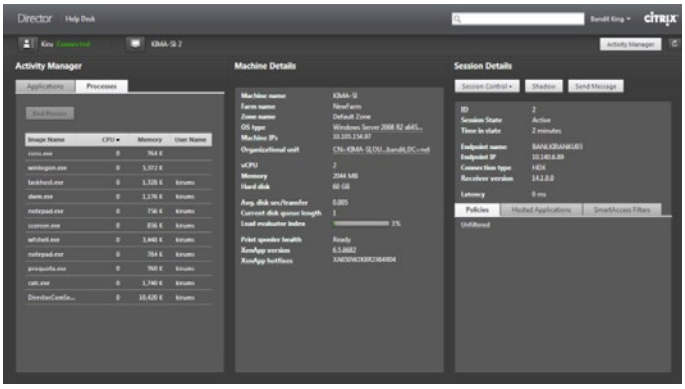


Citrix Resource Manager – An old favorite of Citrix admins

For Citrix XenDesktop, Citrix introduced Director. Director is a troubleshooting tool – administrators can search for specific users, see their session and resource usage, shadow their sessions and terminate any run-away processes, or terminate the user session completely.

As Citrix unified the Citrix XenApp and XenDesktop architectures in version 7, Citrix EdgeSight in its original form has been discontinued. Some EdgeSight functionality has been added to Director, but the new Citrix Director/ EdgeSight solution is not an adequate monitoring tool for your Citrix infrastructure.

This change has left Citrix administrators in a precarious position. No longer able to rely on the tools included with Citrix XenApp and XenDesktop for monitoring of their infrastructure, as they deploy Citrix XenApp and XenDesktop 7.x, they must look to third party tools to meet their ongoing performance monitoring needs.



Citrix Director – A helpdesk tool for troubleshooting specific user complaints

Many vendors have seen the lack of in-built Citrix performance monitoring capabilities as a great opportunity to "fill the gap."

Are all of these tools good candidates to be the next Citrix performance monitor? What are some of the key considerations that you should take into account as you evaluate monitoring solutions for your Citrix infrastructure? This rest of this paper looks at these and other related questions in detail.

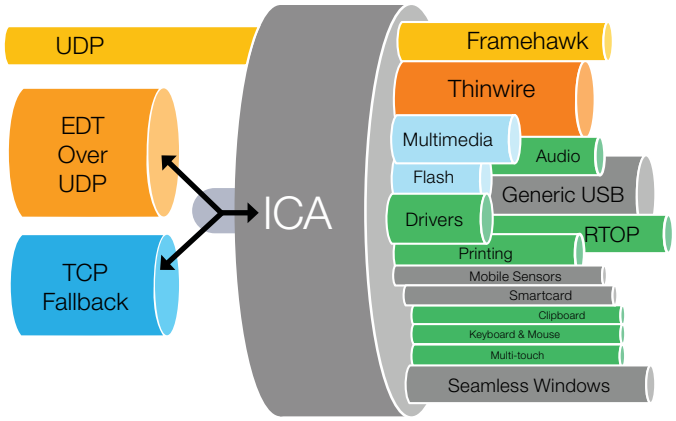
Key Considerations for Citrix Performance Monitoring

There are several key considerations that come to mind when evaluating the various choices for Citrix performance management:

1 Server monitoring is necessary but not sufficient for Citrix performance monitoring

There are many monitoring solutions that track usage of a server's CPU, memory and disk resources and can alert you if usage of these resources is high. Most organizations have deployed server monitoring in some form. You may be under pressure from your management to simply adopt the server monitoring tool used by your organization for monitoring Citrix XenApp and XenDesktop as well. Is it sufficient to extend this tool to the Citrix infrastructure?

Although necessary, server resource monitoring is not sufficient for ensuring good Citrix performance. Requirements for Citrix monitoring and reporting are often very specific to the Citrix infrastructure: Who logged in, when did they login, and how much bandwidth is a user consuming on his/her HDX channel. These are just some of the questions for which you need answers. Therefore, an effective monitoring solution must be aware of the way Citrix servers and applications work to provide insights and diagnostics that help administrators identify and troubleshoot problems.



Server monitoring tools do not provide visibility into HDX virtual channels, a must for Citrix performance management

2 User experience monitoring is a must

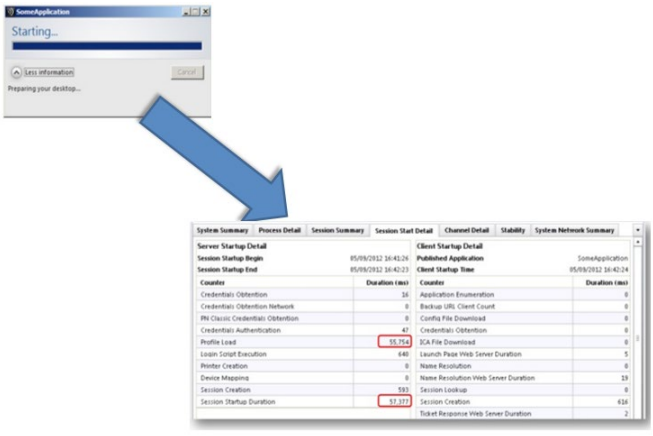
Since user experience is a key to the success of Citrix deployments, a Citrix performance management solution must be able to monitor the user experience and alert you to situations where users are seeing performance issues. There are several ways that this can be achieved:

- **Active, synthetic monitoring:** One of the ways to monitor a Citrix infrastructure is by actively emulating user sessions to the server farm: A typical user session is recorded (e.g., a user logging in, launching a few applications, performing some tasks and logging out), a script is created and passed to a robot. The robot replays the recorded session repeatedly. Based on the session replay, the monitoring tool can report on the availability of the service and the time taken for each step of the user interaction. By deploying synthetic monitors at different locations in the network and having them execute periodically, Citrix administrators can keep track of the health of their infrastructure.
- **Passive, real user monitoring:** Another approach is to observe real users as they login and access the server farm. There are two common approaches for monitoring real user activity. One is to deploy network probes which observe all packets transmitted between the client and the server and can report

latency information for user accesses. A second approach involves deploying agents on the servers that either report transmissions from the servers to the clients, or integrate with Citrix server APIs to measure user perceived performance. Typical user experience metrics include how long does it take for a user to login, how long does it take to launch an application, and how long does it take for the screen to repaint.

Both of the above approaches to user experience monitoring have merits. Because a lot of the processing in a Citrix infrastructure is done on the server-side, even if you do not deploy agents on servers for monitoring the end user experience, you may still need them for deeper diagnosis (e.g., to know if an application is leaking memory, or if there are any errors logged in the server's Windows event logs). This requirement can make deploying server agents an attractive option.

Synthetic monitoring provides a consistent workload on the infrastructure, so any changes in performance are easily noticed. Furthermore, this approach provides an indicator of user experience even during times when no one is logged into the Citrix farm. However, synthetic monitoring only emulates one or a few users, so the performance reported may not accurately reflect what real users are seeing. As one example, when monitoring user logon times, the GPOs for a particular group in the domain may have an isolated problem and since synthetic monitoring may not be able to check every possible group there is, in effect, a gap in monitoring coverage.



The Citrix Logon Process is one of the most critical parts of Citrix access. Monitoring real user logon experience is a key to proactive Citrix monitoring

On the other hand, the results of real user monitoring are more difficult to analyze because the user experience can change with applications accessed, end client devices used, and networks that the user is connecting from. But overall real user monitoring is indicative of the performance delivered for real users, real workloads and real applications. Therefore, it is a very important indicator of user satisfaction. From real-world experience, we recommend adopting a combination of both approaches – synthetic and real user monitoring.

A key question that often comes up during any discussion of user experience monitoring is whether agents need to be deployed on the endpoints for tracking user experience. There are tools that specialize in this area and in fact, at one point, Citrix EdgeSight provided an endpoint monitoring solution as well. When adopting this approach, it is important to consider the associated cost and effort of distributing and maintaining agents on thousands of endpoints versus the additional performance visibility it offers. In our view, the instrumentation available in the Citrix product suite and the HDX protocol provides adequate visibility into the user experience. Problems that affect a significant number of users can be identified this way, and endpoint monitoring can be applied selectively, on-demand, to facilitate the troubleshooting of specific users or locations that have repeated performance issues.

3 Visibility into Citrix XenApp and XenDesktop usage and performance is essential

The Citrix XenApp servers that support HDX sessions and virtual desktops that users access through Citrix XenDesktop are the most critical components of the infrastructure. Visibility into all aspects of performance and usage of these components is essential for proactive detection, accurate diagnosis and immediate remediation of problems. Some of the key questions that must be answered about these components include:

- Which users are logged in? When did they login? For how long have they logged in?
- How long did the user take to login to the XenApp server/desktop? And where was this time spent – how much time was required for Active Directory authentication, for drive mapping, for applying group policies, for profile loading, etc.?
- What applications is the user accessing?

- What resources is each user session taking up?
- Which applications are responsible for the resource usage?
- What is the bandwidth usage by each user and which of the virtual channels is taking up bandwidth (is it printer traffic, or video traffic, or audio)?
- Are there any printing issues corresponding to these sessions?
- Are there excessive disconnects on the servers? Session disconnects leave processes running on the servers/desktops and are resource drains.
- Who are the most resource intensive users?
- Do any of the users have a very large profile and why?

The usage of browser-based applications in Citrix infrastructures has grown of late. Another trend is the increasing use of browser-side scripting in web applications. These two trends result in resources on the Citrix servers and desktops being taxed by browser-based accesses. We see growing interest in the ability to report on which URLs a user has been accessing when the resource usage of a browser is high.

In a Citrix XenDesktop deployment, visibility into the virtual desktops is very important. With Citrix XenApp, it is possible to easily track the applications that a user is accessing, but with Citrix XenDesktop, since each user has their own virtual machines, it is harder to get this level of visibility. Further, a majority of problems with virtual desktop environments arise from unusual or unexpected usage patterns in the virtual desktops (such as, a user watching a video or downloading an application that is not permitted). For effective monitoring and management, it is essential to have visibility into the virtual desktop infrastructure. Ideally, you would want virtual desktop monitoring to be agentless – eliminating the burden of deploying agents inside the virtual desktops and maintaining them. Also, agents running on the virtual desktop can take additional CPU and memory resources, and having these running on each and every virtual desktop can be overkill.

4 Monitoring of the Citrix Delivery Controller's performance is important

All accesses to the Citrix farm occur through the Citrix Delivery Controller (CDC). So, it is important to monitor the availability of the CDC and its responsiveness. For best performance, the server hosting the CDC must be adequately sized. So monitoring key performance indicators on the CDC's host is essential. The CDC is responsible for authenticating user access, validating license availability and assigning the user's session to the right (least loaded) server in the farm. This is also the place where administrators assign desktop pools and groups. On the CDC, it is important to track if there are any failed sessions or desktops. Usage of the desktop pools and groups is also tracked here to determine if the infrastructure usage is sufficiently within allowed limits.

5 Look for a single unified console from to monitor and manage all of the Citrix tiers

Every Citrix tier of the infrastructure plays a role in supporting user accesses. For example, if there are many retries on one of the devices of a provisioning server, this can result in slow boot times for desktops booting from this device. Likewise, if the Citrix NetScaler device is overloaded, this will affect all HDX sessions supported by it. Therefore, it is important to monitor all of the tiers supporting Citrix accesses – the StoreFront servers, NetScalers, CloudBridge, Provisioning servers, License servers, etc.

Today, Citrix provides different administration consoles for each of these technologies. Sifting through multiple consoles and correlating metrics across the consoles must be done manually and requires expertise. If you are dealing with an infrastructure supporting hundreds of users and using multiple monitoring technologies, it is advisable to look for tools that can provide a single unified console from which all Citrix tiers can be monitored. Also, since each tier provides different functionality, it is important to use monitoring tools that have specialized capabilities designed for the functions and contingencies of each specific tier.

Multiple consoles – one for each Citrix product, and one for each of the supporting tier – make the Citrix administrator's job challenging

6 To prove "It's Not Citrix", you need visibility beyond the Citrix tiers

How often have you been told that it's a Citrix problem and after hours of troubleshooting, you've found that the issue is not with the Citrix stack, but with the network instead? But even in this case, when a user calls and says "Citrix is slow", it is not sufficient to prove that the problem is not Citrix. You are required to prove exactly where the problem is – in the network, storage, virtualization, or in the application tiers. To manage this complex problem, you need monitoring tools that can provide visibility into all of the non-Citrix tiers that can affect Citrix performance. Further, visibility should not be limited to just up/down status of these tiers, because it is critical to be able to determine precisely when and how performance in any of the non-Citrix tiers is impacting Citrix performance.

Citrix is often blamed for slowdowns, even if the problem is elsewhere in the infrastructure. Citrix admins want to be able to prove that its not Citrix that is the cause of a problem.

Citrix is the front-end for key business applications including Microsoft Exchange and Salesforce, healthcare applications such as Epic and Cerner, ERP applications such as SAP, call center applications involving Siebel, and more. How far you want to go with monitoring the infrastructure depends on your organization's needs. Your organizational structure is also a consideration – will the ERP admin be interested in monitoring their applications with the same tool? Depending on your needs, it is advisable to take into account how far the monitoring tool can go – is it limited to just the Citrix and virtualization tiers or can it also monitor the core application tiers?

7 Look for tools with automation built in

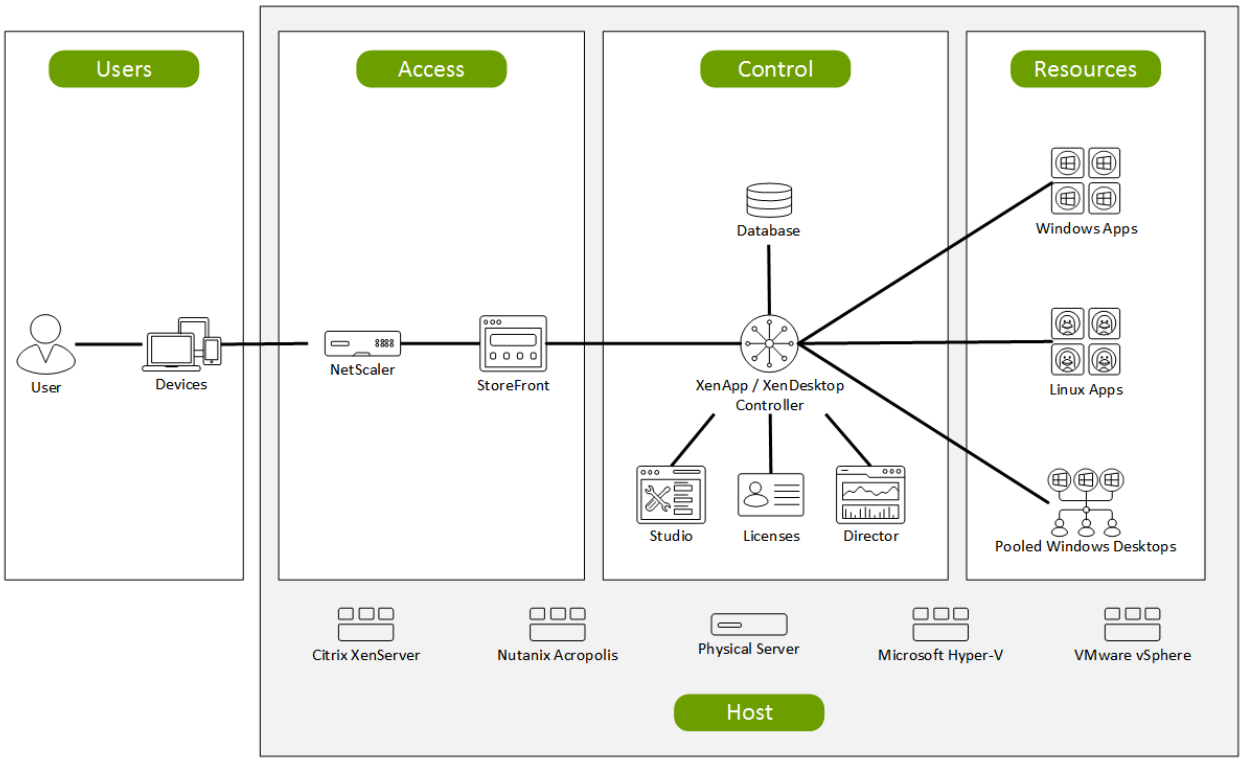
With many monitoring tools, you can easily get hundreds to thousands of metrics. Manually analyzing all of these metrics is impractical and extremely inefficient. Therefore, look for tools that can enable you to automate your troubleshooting and diagnosis. Some of the capabilities to look for include: The ability to automatically baseline your infrastructure – to determine what is normal and to alert you when a metric violates its baseline, the ability to automatically correlate between the performance of different tiers of the infrastructure and pinpoint where the problem lies, and the ability to automatically create and update trouble tickets in your incident management system. The more hands-free your Citrix monitoring and diagnosis can be, the more efficient you can be. Automated analysis saves you time – you can troubleshoot problems faster, and it can reduce the expertise needed to find and fix problems. With an automated tool, your helpdesk staff may be able to handle some issues without help and thereby reduce your workload, which leads to greater operational efficiency, as you can do more with less staff.

8 Monitor Citrix as a service, not as silos

When a user calls you and says "Citrix is slow", they are not talking about the Citrix servers. Rather, the user is complaining about the Citrix service. Yet, many organizations still monitor the infrastructure as silos – the web tier, the storage tier, virtualization tier, and so on. Siloed monitoring works when applications use one or a few tiers. But Citrix-based services rely on many tiers working in unison and if there is a problem in one tier, it can affect all other tiers, ultimately impacting the user experience. For instance, if profile loading takes time, users will see this as slow logons to the Citrix servers or desktops. In this way, your tools and monitoring practices should align to monitor your Citrix infrastructure as a service. Discover the dependencies in your infrastructure and use these dependencies for correlation and root-cause diagnosis. Tools that do this for you will save you hours of troubleshooting time, again and again.

9 Performance monitoring must keep up with evolution of the Citrix stack

Citrix technologies are rapidly evolving. For example, the Citrix architecture itself changed fundamentally in version 7.x. Furthermore, the transport protocol used by HDX has been changed. Adaptive transport, that uses one of UDP or TCP depending on the prevailing network conditions, is now the standard. Framehawk is a new technology used to overcome lossy network conditions. Linux VDAs and GPU (graphics processing units) technologies are now supported and are beginning to be deployed. The local host cache



A Citrix infrastructure has many tiers of software and hardware working in unison. Many types of dependencies exist in this infrastructure.

has been replaced with session lingering and pre-launch. And customers have an option to deploy the Citrix control plane in the cloud. It is important to make sure that your performance monitoring stays current with the evolution of Citrix technology. For example, your performance monitoring solution must provide insights into the performance of Citrix adaptive transport. It must be GPU-aware, and should provide similar insights whether your infrastructure is deployed on-premises or in a hybrid mode using Citrix Cloud.

10 Leverage your investments in Citrix products

You will not find a single tool that does everything by itself. So, look for solutions that complement and integrate with the tools you already have in place. Most Citrix deployments have Citrix Director and Citrix NetScaler Insight. Look for solutions that integrate with and leverage information that is available in these tools.

11 Historical reporting and analytics are more important than you might think

Very often, when monitoring tools are considered, the focus is on live monitoring and troubleshooting. But once you deploy the monitoring tool, you will find that historical reporting and analytics is very important. For instance, you may not have been around when a problem happened. Later, you may want to analyze historical data to determine what caused the problem to prevent it in the future, and this a key use case for historical reporting. Another use case is performance optimization. Through analyzing usage data from every tier, you may determine cases where the usage or load was not balanced evenly across the infrastructure, and rebalancing the workload can allow you to make better use of your hardware and software investments going forward. A third use case is for capacity planning. By knowing what the bottlenecks are – is it CPU, or memory, or GPU – you can determine where and how to invest to get the maximum return on your investments. Lastly, Citrix technologies are deployed in many industries that have strict compliance requirements (such as healthcare and finance). You may need to report on who accessed your server farm when, for how long, what applications they accessed, etc. Reporting capability included in the monitoring tool can help you respond to compliance requirements quickly.

12 Licensing flexibility and cost considerations play an important role in decision making

A critical factor in deciding on a monitoring tool is, of course, whether you can afford it. The licensing of the monitoring tool and its cost must be considered. The licensing model of different tools can be different: Some license by concurrent users, others by named users, some others by server

instances. Look for flexibility to decide which model works best depending on your specific configuration. If you have a large number of users per server, a server-based licensing model might work out to be less costly. On the other hand, if you are able to accommodate just a few users per server, a user-based licensing model might be better suited to your situation. It is important to consider extensibility of the solution as well. For example, you may currently be running Citrix XenApp 6.5, and what works for you now may not work if and when you upgrade to the next version. So, it is prudent to keep extensibility and future requirements in mind as you decide on your Citrix monitoring strategy.

13 Easy deployment is very important

Ease of deployment is a must-have today. If the vendor recommends agent-based monitoring, make sure that you can still monitor your NetScalers and network devices in an agentless manner. Likewise, deploying agents on each and every virtual desktop introduces overhead. Look for solutions that do not require agents on virtual desktops. If you are using provisioning services, be sure that the agent can be included in the gold image that is being streamed from PVS.

Many administrators focus on whether a monitoring solution is agent-based or agentless. We recommend focusing on the end result of the monitoring rather than on the tool architecture. Ultimately, the effectiveness of a monitoring tool is measured by whether it proactively alerts you to problems and whether it shortens the problem diagnosis and resolution time. At the same time, it's important to be sure that the overhead of monitoring is minimal (agentless does not necessarily mean low overhead).

Citrix Performance Monitoring Checklist

Based on the key consideration we have outlined for a Citrix performance management solution, the table below provides a checklist to keep in mind as you evaluate different options.

Category	Requirements	Vendor Capabilities
Server Monitoring	✓ Monitor key server status and performance parameters, including server hardware status, operating system resource usage (CPU, memory, disk, handles, page files), Windows event logs ✓ Support both physical and virtual machines equally well ✓ For physical machines, also monitor server hardware status	
HDX Session Monitoring	✓ Monitor all user sessions on a XenApp server or the user session for each virtual desktop ✓ Monitor the bandwidth usage of each HDX session ✓ Drill down into which virtual channel is taking up bandwidth for each user ✓ Track application usage within each user session and report re-sources used by each application ✓ Monitor GPU usage on each virtual desktop ✓ For browser applications, provide the URLs being accessed ✓ Monitor performance of sessions using the new EDT protocol ✓ Measure user's connection quality between the user terminal and Citrix server farm ✓ Track session login and logoff times and active and idle times for audit reporting ✓ Track client-receiver version, subnet etc. ✓ Ability to search by user, and drill down into that user's session statistics ✓ Report active/idle time for each session ✓ Support monitoring of virtual desktop sessions, even when the virtual desktops are in different Windows domains	

Published Application Monitoring	✓ Track concurrent accesses to each application ✓ Report resource usage level of each application ✓ Track which users are accessing an application at any particular time	
XenApp Server Monitoring	✓ Report resource usage on the server: Is the server sized correctly? What are peak usage times? ✓ Track session disconnects on the server: Is there resource waste because of disconnects? ✓ Monitor if the XenApp server is connected to its license server and the data store ✓ Monitor user profile sizes in order to identify users with large profiles	
User Experience Monitoring	✓ Support synthetic and real user monitoring ✓ Monitor real user logon times, provide breakdown of logon time – GPO, Profile loading, authentication etc. ✓ Track launch times for different applications ✓ Monitor HDX screen refresh latency for all HDX sessions	
NetScaler Monitoring	✓ Track user sessions active through NetScaler ✓ Track network latencies for user sessions, to distinguish HDX slowness from network slowness ✓ Monitor resource usage levels on the NetScaler device ✓ Validate SSL certificates in use on the NetScalers	
Citrix Delivery Controller Monitoring	✓ Track the state of controllers in the farm and report failures ✓ Verify status of all key DDC services – Broker Service, Machine Creation Service, ADIdentity, etc. – on each controller ✓ Ensure time synchronization with the Windows domain controller ✓ Track registration status of desktops/servers in desktop/delivery groups ✓ Monitor connection attempts and failures to different machines ✓ Track desktops in use and alert when utilization levels are too high or unusually low ✓ For a virtual desktop environment, check the connectivity between the DDC and the hosting infrastructure	
Provisioning Services Monitoring	✓ Monitoring the availability and responsiveness of the Provisioning (PVS) server ✓ Check the connection between PVS and its license and database servers ✓ Ensure that the provisioning server is able to stream the OS images to clients ✓ Monitor the I/O activity on each target device connected to the PVS server, so that if any target device has too many retries, it can be detected ✓ Track the write cache size and usage of the write cache ✓ Monitor vDisk status ✓ Monitor boot times for PVS targets	
License Monitoring	✓ Track licenses installed and used, to detect potential license limits ✓ Monitor license checkout times to determine times when the license server is slowing down	
StoreFront Monitoring	✓ Check availability and responsiveness of each store configured on StoreFront ✓ Monitor synchronization status of StoreFront server groups and the synchronization duration ✓ Track the time taken to enumerate applications/desktops for clients ✓ Scan StoreFront logs for errors/warnings	

Citrix Data Store Monitoring	✓ Monitor availability and responsiveness of the data store ✓ Check Database and transaction log growth ✓ Monitor locking activity on the data store ✓ Monitor session activity and user activity on the data store ✓ Report top I/O causing queries	
Citrix Cloud Monitoring	✓ Monitor the resource plane components (XenApp servers, XenDesktop VMs) wherever they are hosted – in the on-premises datacenter or in the public cloud ✓ Monitor the infrastructure supporting the resource plane components ✓ Track availability and performance of the Cloud Connectors ✓ Get visibility of the control plane components hosed and managed by Citrix ✓ Map dependencies between all the control plane and resource plane components on topology maps – for root cause diagnosis	
Monitoring of other Citrix tiers	✓ In-depth monitoring of other Citrix tiers including Citrix XenMobile, ShareFile, CloudBridge, XenServer, and others	
Hypervisor Monitoring	✓ Monitor IOPS on different storage LUNs ✓ Monitor CPU, memory utilization on the server ✓ Monitor data store availability and IOPS on each data store ✓ Check the resource usage of the control domain/service console ✓ Track I/O errors, discards, read/write times and queueing on each of the storage LUNs ✓ Monitor Live Migration across VM clusters ✓ Report VMs powered on and in use ✓ Report key VM performance metrics including physical CPU used, VM CPU ready time, active memory in use, IOPS for each VM, etc. ✓ Support common hypervisors – VMware vSphere, Citrix XenServer, Microsoft Hyper-V and Nutanix Acropolis	
Storage Monitoring	✓ Monitor hardware status ✓ Track storage controller status and resource usage ✓ Monitor all components of the storage system – device ports, physical disks, disk groups, LUNs ✓ Check if any physical disk is slower than others ✓ Monitor storage network statistics	
Network Monitoring	✓ Receive SNMP traps from network devices ✓ Track network latency and bandwidth usage ✓ Deploy monitoring from different locations in the network to understand if a specific network location is seeing poor performance	
Endpoint Monitoring	✓ Allow an agent to be deployed on end points for additional visibility into performance from the end point	
Backend Application Monitoring	✓ Able to be extended to monitor backend enterprise applications if true end-to-end visibility is required	

Thresholds and baselines	✓ Out of the box thresholds based on best practices ✓ Multi-level thresholds for alert escalation ✓ Ability to auto-baseline the infrastructure, including time of day and day of week analysis to understand usage patterns ✓ Support for blackout periods	
Automatic correlation and root-cause diagnosis	✓ Automatically discover the Citrix infrastructure and dependencies ✓ Analyze dependencies in real-time to prioritize alerts ✓ Is virtualization-aware: Correlates virtualization and application performance to identify root cause	
Alerting	✓ Multi-modal alerting – email, SMS, pager ✓ Integration with service desk/incident management systems (ServiceNow, PagerDuty, RemedyForce, etc.) for automatic ticket opening/closing ✓ SNMP integration with any SNMP-management tool	
Trending and Reporting	✓ Trend analysis of all metrics – hourly, daily, monthly ✓ Executive and operations reports ✓ Capacity planning reports ✓ Performance prediction reports ✓ Comparison and Top-N reports ✓ Citrix user reports, session activity reports, logon performance reports ✓ Ability to export as PDF/CSV/Excel ✓ Ability to auto-schedule reports	
Dashboards	✓ Pre-built dashboards to view performance metrics ✓ Customizable dashboards to match each user's needs ✓ Publish dashboards for executives to access ✓ Self-help capabilities to enable Citrix users to track their own session usage and performance ✓ Dashboards providing cumulative metrics of a server-farm, not just individual server metrics	
Licensing	✓ Support user-based licensing – named and concurrent user options ✓ Can be extended to monitor other application tiers	
Deployment and Access	✓ Deploy in minutes ✓ Supports Citrix provisioning services ✓ If agent-based monitoring is used, agents do not listen on any TCP ports ✓ Can be deployed across geographically distributed sites ✓ Web-based access, mobile access ✓ Supports role-based access (admins, helpdesk, architects), etc.	
Scalability	✓ Scale to support infrastructures with thousands of users ✓ Handle server farms in distributed data centers	

Integration	✓ Integrate with existing management systems/frameworks for unified monitoring (e.g., SNMP traps, native management packs, etc.) ✓ Integrate with Citrix Director and Citrix NetScaler Insight to leverage existing Citrix investments	
Control actions	✓ Automatically initiate control actions where appropriate (e.g., reboot failed desktops, restart services that have stopped, etc.) ✓ Allow administrators to remotely connect to the monitored servers and initiate actions to remedy a problem (e.g., logoff a user who is taking too many resources)	

Monitoring and management are critical for any organization deploying Citrix XenApp and XenDesktop. In this whitepaper, we have discussed many of the key considerations for a Citrix performance monitoring system. We hope you find the checklist we have created useful in determining the right solution for monitoring your Citrix infrastructure.

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About eG Innovations

eG Innovations provides the world's leading enterprise-class performance management solution that enables organizations to reliably deliver mission-critical business services across complex cloud, virtual, and physical IT environments. Where traditional monitoring tools often fail to provide insight into the performance drivers of business services and user experience, eG Innovations provides total performance visibility across every layer and every tier of the IT infrastructure that supports the business service chain. From desktops to applications, from servers to network and storage, eG Innovations helps companies proactively discover, instantly diagnose, and rapidly resolve even the most challenging performance and user experience issues.

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Total Performance Visibility