



Monitoring and Troubleshooting **Citrix Logon Issues**

How to monitor, diagnose and resolve Citrix logon issues to ensure great user experience.

An eG Innovations Technical White Paper

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Introduction

Citrix logon monitoring has been a topic that has been getting a lot of attention. In some domains, users logon multiple times into their Citrix infrastructure. Slow logons affect the user experience and reduce user productivity. This whitepaper discusses different ways of monitoring Citrix logon times, reviews what is necessary for complete visibility into the Citrix logon process and presents how to diagnose Citrix logon slowness issues quickly to improve the user experience and enhance productivity.

How Citrix Logon Works

The first time that a user interacts with the Citrix infrastructure is during logon. This also happens to be one of the most complex stages of a Citrix session. Citrix logon has several phases, involving interactions between Citrix applications, Microsoft operating system and infrastructure components and third-party applications such as profile management software from RES or AppSense.

Citrix has documented the logon process thoroughly in their [support article CTX128909](#). Figure 1 below shows the different steps that are involved when a user logs on to a Citrix infrastructure, and before he/she has access to the applications and desktops published for their use.

The different steps in the Citrix logon process are:

1. The user device submits credentials to the Web Interface (WI) or StoreFront (SF) web server.
2. For StoreFront, the credentials are verified directly to a Domain Controller (Similar to Step 3 below). The SF then passes the validation over to the Citrix Delivery Controller (DDC) to begin resource enumeration (Step 4). For Web Interface, the username and password is passed to the DDC.
3. The DDC then queries a Domain Controller with the end user's credentials to verify user authorization.
4. Next, the DDC then queries the site SQL database for the end user's assigned Delivery Groups. The resources defined by the Delivery Groups are sent to the WI or SF server and presented to the user (enumeration).
5. When the User clicks on one of the resource icons to start a desktop or application session, using the Delivery Group obtained from the database, the DDC queries the hypervisor about the status of resources within that group.
6. The DDC identifies to Web Interface/StoreFront the virtual machine it assigned for this particular session (in the case of XenDesktop).

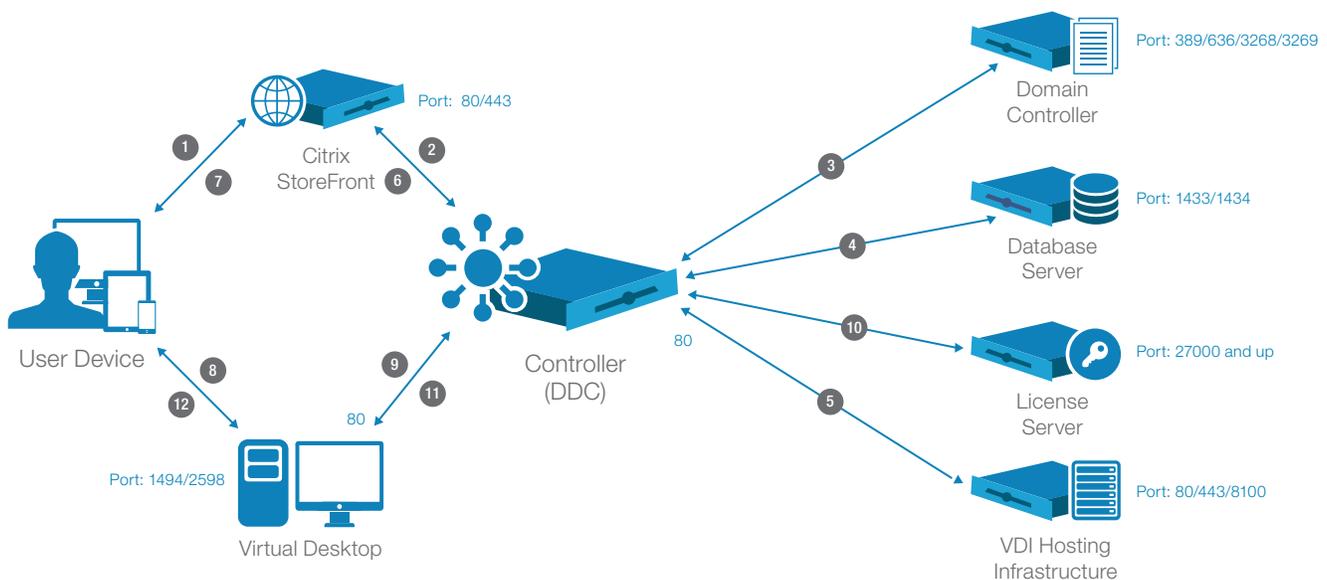


Figure 1: Communication flow during the different stages of the Citrix XenApp/XenDesktop logon process

7. The Web Interface/StoreFront creates and sends an ICA file to the Citrix Receiver pointing to the virtual machine that hypervisor identified.
8. The Citrix Receiver establishes an ICA connection to the specific virtual machine that the DDC allocated for this session.
9. The Virtual Delivery Agent (VDA) verifies the license file with the DDC.
10. The DDC queries the Citrix License server to verify that the end user has a valid ticket.
11. The DDC then passes session policies to the VDA, which in turn applies session policies to the virtual machine. Profile loading, GPO processing, loading of scripts, drivers, printers, etc. all occur at this stage.
12. The Citrix Receiver displays the selected resource to the end user.

Each of the above steps may involve multiple actions to be performed. For example, details of actions performed during GPO processing are highlighted in this Citrix support document - <http://support.citrix.com/article/CTX127612>.

Importance of Monitoring Citrix Logon Performance

Citrix logon time refers to the amount of time it takes from

the moment a user clicks on an application or desktop icon to the time when the application or desktop shell appears. Diagnosing Citrix logon slowness has always been a challenge in Citrix infrastructures. In the 2016 Citrix performance survey by eG Innovations and DABCC, we asked Citrix admins to indicate what were the most common complaints they received from Citrix users and slow Citrix logons ranked as the most common complaint (see Figure 2).

Citrix Logon Facts

- ▶ Typical rule of thumb used by Citrix administrators is that if the logon times are less than 30 seconds, they all doing well.
- ▶ Logon times will be much smaller when session sharing or session pre-launch is in effect.

While a user logs on only once to the Citrix farm in some industries, in others, one user may logon many times through Citrix. For example, consider the healthcare domain where a doctor or a clinician may have to logon many times – once on each device/terminal that they use. In such situations, slowness with Citrix logons can be extremely frustrating and can reduce user productivity.

What are some of the common complaints you receive about your Citrix infrastructure?

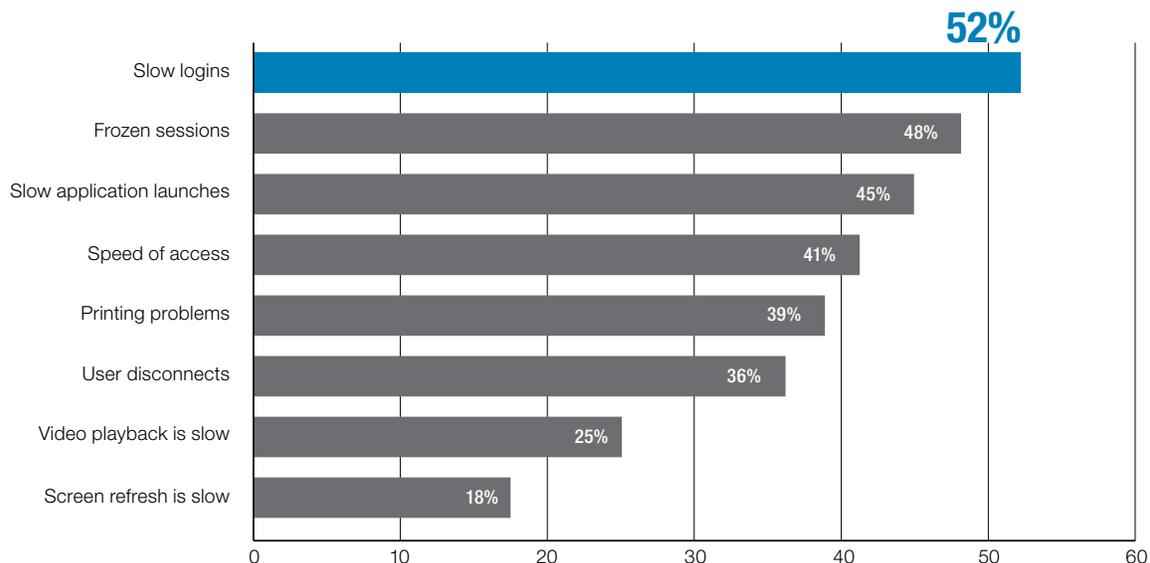
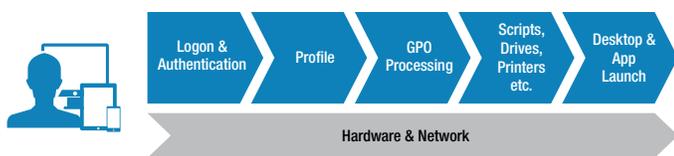


Figure 2: Slow Citrix logons ranks as the most common complaint that Citrix admins receive

Causes for Citrix Logon Slowness

When users notice that Citrix logons are slow, they are often unaware of what is causing the slowness. Citrix administrators have to determine where exactly the slowdown happened – which of the 12 logon phases mentioned above is slow – and why: Is it an Active Directory issue? Could it be a network issue? Is there an issue with the profile server? Or could it be with one of the scripts being run when the user logs on? Diagnosing the cause of Citrix logon slowness is often very complex and challenging.

The common causes for Citrix logon slowness can be categorized into six main areas:



- Hardware & Network
- Logon & Authentication
- Profile
- GPO Processing
- Logon script execution, Printer mapping, Folder redirection etc
- Desktop / application launch

Hardware & Network

Hardware virtualization helps to run Active Directory, Citrix XenApp servers, and other infrastructure servers such as DNS, DHCP etc., as virtual machines. Virtual Switches created in the hypervisor provide the network connectivity for the infrastructure servers to reach the outside world.

Trouble spots: Issues like misconfigured DNS settings, poor routing, dropped packets, insufficient bandwidth or physical network cards, and uplink issues can cause significant delays, as requests are timed out or passed to an incorrect location or a nonexistent domain controller/DNS server. Thus, virtualization adds an additional layer of complexity in troubleshooting the logon issues and significantly delays troubleshooting procedure.

Logon & Authentication

Each session is created after the credentials are validated against the domain controller.

Trouble spots: Incorrect sites in a multi-forest domain, unavailable domain controller, an over-utilized domain controller server and DNS issues can delay this phase from milliseconds to seconds.

Profile

This phase starts after the user credentials are validated by the domain controller and continues until the user profile is downloaded from the file server. Roaming profiles are generally used in Citrix environments as it provides consistency across XenApp servers/virtual desktops and preserves user settings and changes.

Trouble spots: It is recommended that all user folders be redirected to a file server except “AppData,” as it is used heavily by applications. Large profile size, unavailable file server, network congestion, and corrupted profiles are typical causes of slowdowns during this phase.

GPO Processing

Many organizations use Group Policy to manage the Citrix XenApp servers and virtual desktops and apply policy settings and customizations.

Trouble spots: Group policy (GPO) depends on the Active Directory infrastructure, so Active Directory and DNS issues can cause significantly delays in finding the policies and GPO processing. Too many GPOs and client side extensions (CSEs) can delay this phase. Identifying the client side extensions and corresponding group policy is a challenging task once this phase has been identified as the source of the slow logon issue.

Logon Script Execution / Printer Mapping / Folder Redirection

Generally logon scripts are considered as outdated, but they are still being used to customize individual users in a multi-user environment.

Trouble spots: Insufficient loops in the script, long-running logon scripts, and many mapped client printers are a

few common issues that can delay this phase. Windows 2008/2012 support Group Policy preferences, which can be used to perform tasks like map network drives, change registry keys etc., previously performed by logon scripts.

Desktop / Application Launch

Backend tasks, file share accesses, etc. can be causes for slowness in launching specific applications. Application pre-launch can be considered to speed up the launching of these applications.

Monitoring Citrix Logon Performance

Given the complexity of the Citrix logon process, Citrix administrators need tools that can assist them in identifying logon issues, and when slowness occurs, in diagnosing the cause of slowness. Citrix XenApp and XenDesktop version 7 and higher provide greater visibility into the Citrix logon process. The Citrix Director console collects logon information from VDAs installed on the Citrix XenApp servers and XenDesktop VMs. Figure 3 shows the Citrix logon performance breakdown as seen in Citrix Director.

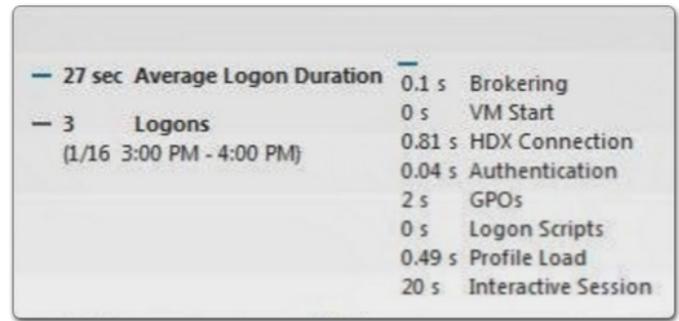


Figure 3: Breakdown of Citrix logon times as seen in Citrix Director

The Citrix logon time components highlighted by Citrix Director include:

- Brokering time: The time taken to complete the process of brokering the session.
- VM Start time: In case the session required a machine to be started, the time taken to start the VM.
- HDX Connection time: The time taken to complete the steps required in setting up the HDX connection from the client to the VM.
- Authentication time: The time taken to complete authentication to the remote session.

Server Startup Details		Cred	Cred	Program	Cred	Profile	Logon	Printer	Drive	Session	Total	
Start Time	End Time	CASD	CONSD	PNCOSD	PLSD	LSESD	PCSD	DMSD	SCSD	SSD	Server Side	
1/7 4:28:03 PM	1/7 4:28:17 PM	31			1375	1125		78	1250	7234		
Client Startup Details												
Start Time	CFDCD	BUCC	AECD	IFDCD	NRWD	TRWD	LPWD	SCCD	NRCD	SLCD	CSD	
1/7 4:28:16 PM					31	0	31	7626		0	14992	
Published Application:		Config File Download	Backup Url Count	Application Enumeration	ICA File Download	Name Resolution (Web Server)	Ticket Resolution (Web Server)	Launch Page (Web Server)	Session Creation (Client)	Name Resolution	Session Lookup	Total Client Side

Figure 4: In-depth visibility into the Citrix logon process, which Citrix EdgeSight provided in the past

- GPO time: In case any Group Policy settings have been enabled on the machines, the time taken for the GPOs to be applied.
- Logon Scripts time: When logon scripts are configured for the session, the time taken for the logon scripts to be executed.
- Profile Load time: When profile settings are configured for the user or the machine, the time taken for the profile to be loaded.
- Interactive Session time: The time taken to handoff keyboard and mouse control to the user.

The visibility that Citrix Director provides into the Citrix logon process is useful. At the same time, since it provides only eight metrics about the logon process, Citrix Director may not be sufficient to pinpoint the root-cause of Citrix logon slowness. For instance, often, the interactive session time is a significant component of Citrix logon time. In such a case, Citrix Director does not pin-point if the issue is because of a logon script and if so, which script.

How eG Enterprise Monitors Citrix Logon Performance

While Citrix Director’s insights into Citrix logon performance are useful, the detailed insights that Citrix EdgeSight provided in earlier versions of Citrix XenApp and XenDesktop are missing. See Figure 4 which illustrates the in-depth visibility

that Citrix EdgeSight provided into the Citrix logon process. At the same time, note that Citrix EdgeSight’s visibility is specific to the old Citrix IMA architecture and does not cover the brokering changes that are a part of the new Citrix FMA architecture in Citrix XenApp and XenDesktop 7.x.

eG Enterprise provides unparalleled visibility into the Citrix logon process by combining the capabilities of Citrix Director with the in-depth visibility that Citrix EdgeSight provided. The Citrix Delivery Controller is a central player in the Citrix logon process. Hence, the visibility provided by it into the logon process is fundamental to understanding how Citrix logon is performing. Using Citrix Delivery Controller’s web services interface, eG Enterprise collects Citrix logon performance information directly from the Citrix Delivery Controller (see Figure 5).

Limitations of Citrix Logon Monitoring with Citrix Director

- > The logon performance metrics provided are at a high level and do not provide the detailed visibility of all the phases of a Citrix logon that Citrix EdgeSight provided.
- > Actionable diagnostic information for fine-tuning the Citrix logon process is missing – for example, which client side extension (CSE) or group policy is taking time when being processed?

User Logon Performance - CITRIX\gptest		Last Measurement Time : Feb 19, 2016 18:17:57
✓ User connections (Number)	1	🔍 📈 🔄
✓ Average logon duration (Secs)	368.59	📈 🔄
✓ Brokering duration (Secs)	0.144	📈 🔄
✓ Time taken for starting VM (Secs)	0	📈 🔄
✓ HDX connection duration (Secs)	11.887	📈 🔄
✓ Authentication time (Secs)	0.087	📈 🔄
✓ GPOs duration (Secs)	0	📈 🔄
✓ Logon scripts duration (Secs)	0	📈 🔄
✓ Profile load time (Secs)	0.733	📈 🔄
✓ Interactive session duration (Secs)	350.357	📈 🔄

Figure 5: Citrix Logon performance metrics for a user gptest

Notice in Figure 5 that the Citrix logon for this user took over 6 mins (368 seconds!) and the time taken for the interactive session to be set up was the significant contributor to the Citrix logon time.

The interactive session time refers to the time taken to handoff keyboard and mouse control to the user. Some of typical activities happen in this stage are:

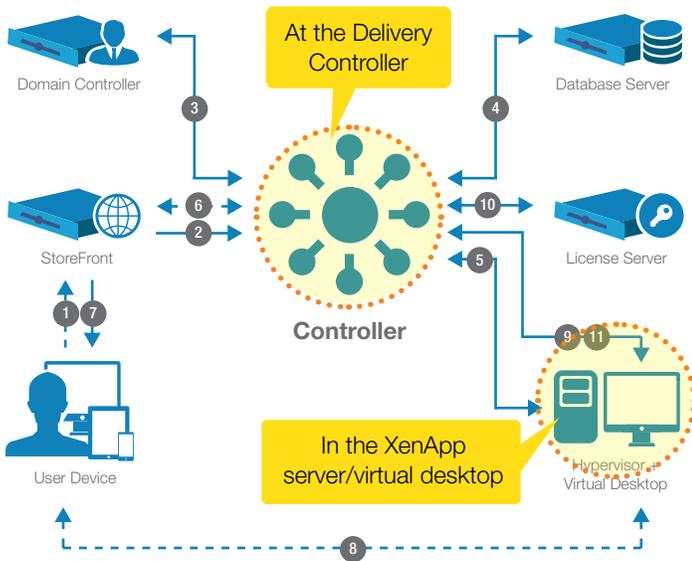


Figure 6: eG Enterprise's two-stage collection of Citrix logon information: from the Citrix Delivery Controller and from the XenApp servers/XenDesktop VMs.

- Folder redirection / printer mapping
- Group Policy processing
- AutoRuns programs
- Antivirus scanning
- Loading user profiles from UPM etc.

The Citrix Delivery Controller does not have the additional details about why interactive session time was high as the processing of the session at this point has been passed on to the VDA. To provide additional diagnosis, eG Enterprise collects detailed information from the VDA about the Citrix session establishment process. Figure 6 depicts the two stages of Citrix logon performance monitoring – from the Citrix Delivery Controller and from the Citrix VDAs of XenApp and XenDesktop.

Last Measurement Time: Feb 19, 2016 18:13:28

Citrix User Logon Experience - citrix\gptest

User Logons		
✓ Number of user logons (Number)	1	
✓ Logon duration (Secs)	324.729	
✓ Profile load duration (Secs)	0.733	
✓ Group policy processing duration (Secs)	307.661	
✓ Login script execution duration (Secs)	0	
Server Start-up		
✓ Session creation server duration (Secs)	1.172	
✓ Credentials obtention server duration (Secs)	0	
✓ Credentials obtention network server duration (Secs)	0	
✓ Program neighborhood credentials obtention server duration (Secs)	0	
✓ Credentials authentication server duration (Secs)	0.087	
✓ Profile load server duration (Secs)	0	
✓ Login script execution server duration (Secs)	0	
✓ Drive mapping server duration (Secs)	0.016	
✓ Printer creation server duration (Secs)	0	
✓ Session start-up server duration (secs)	312.766	
Client Start-up		
✓ Start-up client duration (Secs)	11.963	
✓ Back-up URL client count (Number)	0	
✓ Application enumeration client duration (Secs)	0	
✓ Configuration file download client duration (Secs)	0	
✓ Credentials obtention client duration (Secs)	0	
✓ ICA file download duration (Secs)	0	
✓ Launch page web server duration (Secs)	0.403	
✓ Name resolution client duration (Secs)	0	
✓ Name resolution web server duration (Secs)	0.353	
✓ Session look-up client duration (Secs)	0.001	
✓ Session creation client duration (Secs)	12.057	
✓ Ticket response web server duration (Secs)	0.001	
✓ Reconnect enumeration client duration (Secs)	0	
✓ Reconnect enumeration web server duration (Secs)	0	

Figure 7: Session start-up performance for user gptest as measured on the Citrix XenApp server

How to obtain 360° Citrix Logon Performance Visibility

- There has been significant interest regarding monitoring and reporting Citrix logon times.
- Tools that only look at the Citrix XenApp servers and virtual desktops will not suffice.
- Correlated visibility into the Citrix Delivery Controller's logon process and the VDA's session establishment process is critical for 360° Citrix logon performance visibility.

Details of client side extension					
CSE EXTENSION NAME	CSE ELAPSED TIME(SECS)	CSE EXTENSION ID	GROUP POLICY NAME	CSE STATUS	CSE ERROR CODE
Feb 19, 2016 18:13:28					
Scripts	0.2	{42B5FAAE-6536-11D2-AE5A-0000F87571E3}	Logoff Logon	Success	0
Internet Explorer Branding	0	{A2E30F80-D7DE-11D2-BBDE-00C04F86AE3B}	IE-Banner	Error	127
Citrix Group Policy	0	{0D0C7034-2EBD-4A87-A989-9015E3F2E6E0}	Local Group Policy	Success	0
Registry	0.1	{35378EAC-683F-11D2-A89A-00C04F8BCFA2}	Local Group Policy wallpaper_logon Logon	Success	0
Citrix Profile Management	0	{26F29E43-DA55-459D-A045-5FEB25F8AB15}	None	Success	0
Folder Redirection	0.1	{25537BA6-77A8-11D2-9B6C-0000F8080861}	disk fragmentation	Success	0
Group Policy Drive Maps	306.3	{5794DAFD-BE60-433F-88A2-1A31939AC01F}	Map-Drive	Success	0

Figure 8: Details of Group policy processing and CSE duration. Notice the error in the Internet Explorer Branding extension and the high latency for the group policy drive maps

See Figure 7 which shows details of the time taken for session establishment on the XenApp server/XenDesktop VM as seen by the VDA. These detailed metrics highlighting exactly where in the session establishment process time was spent.

For the group policy processing duration, eG Enterprise provides detailed diagnosis (as indicated by the magnifying glass next to the metric) highlighting the different group policies/CSEs that were processed and the time taken for each. Figure 7 provides the details of the group policy processing time in this case.

From the above figure, it is clear that most of the group policy processing time is being spent in drive mapping. Armed with this information, a Citrix admin can easily take action to speed up the Citrix logon process.

Reporting on Citrix Logon Performance

The wealth of Citrix logon metrics collected by eG Enterprise can also be used for reporting purposes.

Using eG's insightful User Logon Performance report, you can rapidly analyse user logons historically, accurately isolate users whose logon experience has been consistently poor, and understand from a quick glance, the factors that

have very often impacted the users' logon experience – a slow domain controller? a badly written login script? user profiles that are continuously growing in size?

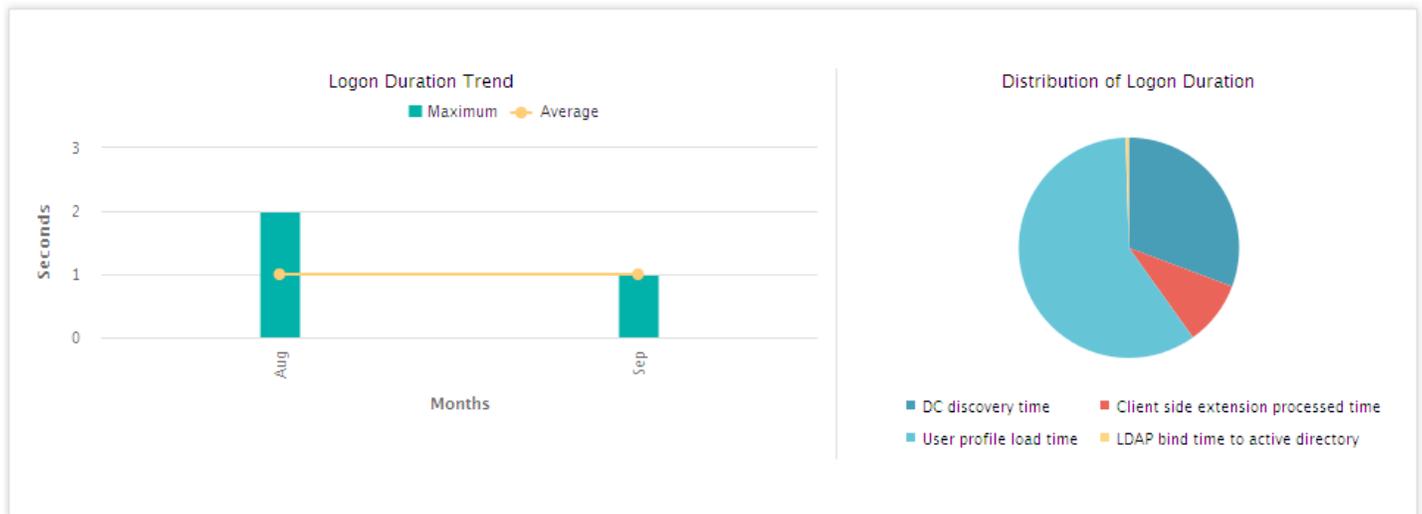
Logon reports can also be used to benchmark the workload on the server farm. Comparing logons across servers can also highlight load distribution issues. Logon reports also help with audit and compliance. From the report, administrators can report on who logged in, when, and how long each logon took.

Benefits of Citrix Logon Monitoring with eG Enterprise

- > Detailed insight into every aspect of the Citrix logon process
- > Drilldowns for instant diagnosis and resolution
- > Correlation with network, server, virtualization and storage performance
- > Breakdown by delivery group and server
- > Integrated reporting for audits, analysis and planning



Figure 9: A User Logon Performance report providing a quick summary of the logon experience of XenApp/virtual desktop users, and pointing you to those users whose logon is slow



User Logon Analysis (Secs)							
User Name	Logon duration	User account discovery	DC discovery time	LDAP bind time to active directory	Total group policy object file accessed time	Client side extension processed time	User profile load time
citrix\xauser2	2	0	0.515	0	0	0.203	1
citrix\xauser1	1	0	0.515	0.016	0	0.187	1
citrix\ctxuser	1	0	0.5225	0.0075	0	0.086	1

Figure 10: A User Logon Performance report providing historical insights into the complete logon experience of individual users, indicating precisely where the bottleneck lies

Appendix

Breakdown of the Citrix Start-up Session Establishment process by eG Enterprise

Metric Abbreviation	Meaning	Actions
Session start-up server duration	This is the high-level server-side connection start-up metric that encompasses the time XenApp/XenDesktop takes to perform the entire start-up operation.	When this metric is high, it indicates that there is a server-side issue increasing session start times.
Start-up client duration	When this metric is high, it indicates a client-side issue that is causing long start times.	Review subsequent metrics in this table to determine the probable root cause of the issue.
Credentials authentication server duration	The time the application server spends authenticating the user's credentials against the authentication provider, which may be Kerberos, Active Directory, or a Security Support Provider Interface (SSPI).	
Credentials obtention network server duration	The time spent by the server performing network operations to obtain credentials for the user.	This only applies to a Security Support Provider Interface login (a form of passthrough authentication where the client device is a member of the same domain as the server and Kerberos tickets are passed in place of manually entered credentials).
Credentials obtention server duration	The time taken for the server to obtain the user credentials.	This time is only likely to be a significant if manual login is being used and the server-side credentials dialog is displayed (or if a legal notice is displayed before login commences).
Program neighborhood credentials obtention server duration	The time needed for the server to cause the Program Neighborhood instance running on the client to obtain the user credentials.	Like the COSD metric, this metric is not included in the Session Startup Server Duration (SSD) because it may be artificially inflated if a user does not enter credentials efficiently.
Profile load server duration	The time required for the server to load the user's profile.	If this metric is high, consider your roaming profile configuration.
Login script execution server duration	The time the server needs to run the user's login scripts.	Consider if you can streamline this user or group's login scripts. Consider if you can optimize any application compatibility scripts or use environment variables instead.
Printer creation server duration	The time required for the server to synchronously map the user's client printers.	Excessive time spent mapping printers is often the result of the printer auto creation policy settings.
Drive mapping server duration	The time needed for the server to map the user's client drives, devices and ports.	Make sure that, when possible, your base policies include settings to disable unused virtual channels, such as audio or COM port mapping, to optimize the ICA protocol and improve overall session performance.

Session creation server duration	The time the server spends creating the session.	The session start times issue occurs between when client connection is established and authentication begins.
Application enumeration client duration	Application enumeration is one of the issues slowing down session start times.	Consider if the cause is an overloaded XML Broker or Web Interface server.
Back-up URL client count	If this metric has a value higher than 1, it indicates the Web Interface server is unavailable and the Citrix Receiver is attempting to connect to back-up Web Interface servers to launch the application.	A value of 2 means that the main Web Interface server was unavailable, but the Citrix Receiver managed to launch the application successfully using the first back-up server that it tried. A value higher than 2 means that multiple Web Interface servers are unavailable.
Configuration file download client duration	The time it takes to get the configuration file from the XML server.	
Credentials obtention client duration	The time it takes to obtain user credentials.	Subtract this metric from other clientside metrics
ICA file download duration	The time it takes for the plugin (client) to download the ICA file from the server.	If IFDCD is slow (but LPWD is normal), the server-side processing of the launch was successful, but there were communication issues between the client device and the Web server.
Launch page web server duration	Is only used when Web Interface is the application launch mechanism. If LPWD is slow, there is a bottleneck on the Web Interface server.	
Name resolution client duration	This metric is collected when a client device directly queries the XML Broker to retrieve published application information stored in IMA (for example, when using Program Neighborhood or a Custom ICA Connection).	When this metric is high, it indicates the XML Broker is taking a lot of time to resolve the name of a published application to an IP address.
Name resolution web server duration	When this metric is high, there could be an issue with the Web Interface server or the XenApp plugin site (formerly known as the Neighborhood Agent site), the XML Service, the network link between the two, or a problem in IMA.	Like NRCD, this metric indicates how long it takes the XML service to resolve the name of a published application to a XenApp IP address.
Session look-up client duration	The time it takes to query every session to host the requested published application.	
Ticket response web server duration	The time it takes to get a ticket (if required) from the STA server or XML service.	When this metric is high, it can indicate that the Secure Ticket Authority (STA) server or the XML Broker is overloaded.
Session creation client duration	The time it takes to create a new session, from the moment wfica32.exe is launched to when the connection is established.	
Reconnect enumeration client duration	The time it takes this user's client to get a list of reconnections.	Compare the value of this measure with that of other client start-up metrics for a user to know what is the actual cause for the client start-up delay.

Reconnect enumeration web server duration	The time it takes the Web Interface to get the list of reconnections for this user from the XML service.	Compare the value of this measure with that of other client start-up metrics for a user to know what is the actual cause for the client start-up delay.
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