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This article describes the most important Citrix environment and VuGen/LoadRunner configuration requirements and settings, which if checked prior to Citrix script development, will reduce LoadRunner Citrix script development time.

This paper has specific sections addressing the configuration requirements for LR11 and as well has some information specific to all LR versions (LR11 and LR 9.52). See the appropriate sections herein:

Basic things to check prior to Citrix script development (all LR versions)

Basic things to check prior to Citrix script development (LR11 with newer Citrix features)

As of the date of this document, the latest LR patch is Patch 3. HP support requires your VuGen is patched to this (or the latest patch) in order to obtain the most current Citrix protocol bug fixes and enhancements.

The LR11-specific sections in this document assume the LoadRunner user has applied Patch 3 for LR11. This patch is considered mandatory.

Some TERMS and DEFINITIONS

Citrix “NFuse” is a legacy Citrix term for the Citrix Web Interface (WI) which is the web interface to Citrix published applications and desktops. The term “NFuse” may be used interchangeably with the Citrix Web Interface in this and other documents to refer to the same thing.

Citrix “Client” is a term to describe the Citrix ICA client-side software. LR requires the “thick” Citrix client which utilizes the Citrix ICA/ICO APIs our Citrix protocol depends on. This is sometimes called the “Program Neighborhood Client”. Versions 11.2 of the Citrix client installer (and above) use a single wrapper around multiple client-side components, so only the single client installer packager is needed. Earlier versions of the client have separate installers, for the “thin” clients (“web client” and the “java client”), and yet another, for the “thick” ICA client. LR cannot work with the “thin” clients, as they do not support the full ICA API functionality. For versions 11.1 and below of the Citrix client, ensure only the full/thick Citrix client is used – for 11.2 and above it does not matter as the correct ICA client is installed automatically.

Citrix Client software is named to match the server-side software of the same release – which is currently Citrix XenApp Server (XA). Generally Citrix provides only the most recent Citrix Client available as a free download from Citrix; for previous versions, please check with your Citrix support team.

Citrix “Server” is the server-side Citrix application sharing/server software, which is an enhancement upon (and requires) Microsoft Terminal Server. Major product releases of the Citrix software have been named the Citrix Presentation Server (CPS) (Citrix 3.X and 4.X), and Citrix XenApp Server (Citrix 4.5, 5.X and 6.X).



Some TERMS and DEFINITIONS - Continued

The term “**Desktop**” in Citrix terminology may be confusing. It should be noted that Citrix has a product named “Citrix XenDesktop”. This is a Citrix virtualization solution, and is not compatible with the current LR Citrix Protocol implementation, however, it may be considered for a future version of LR. Citrix Server “Desktops” or Windows Applications can be “published” in Citrix, and made available to remote Citrix client machines. It is more common to load test Citrix published applications than it is to load test published Desktops. Additionally, load testing published Desktops is not as robust as testing Applications due to the background desktop activity frequently encountered, however, both are supported by LR.

The **Citrix Desktop Toolbar** is a Citrix add-on component, used in the newer XenApp and XenDesktop integrations – it interfaces the Citrix WI with Citrix XenDesktop – this toolbar can cause problems when recording multiprotocol Citrix ICA+Web scripts and can be disabled (see more information below).

The **LoadRunner Citrix Agent** refers to an optional but recommended HP LoadRunner software component designed to run on all Citrix server(s) in the Citrix enterprise hosting the applications/desktops under test by LoadRunner, and is designed to provide an additional level of object-oriented information to LoadRunner about the Citrix published application or desktop, so as to improve functionality and robustness, and as well it adds inbuilt synchronization allowing the state of the Citrix AUT to be more in-step with the LR script. The use of the LR Citrix Agent enables the script to recognize and synchronize with specific controls in the AUT and to get text (to get the value of text) and to provide text synchronization.

“**Seamless**” Citrix application/desktop presentation refers to a method where (by default) Citrix server-side applications/desktops are presented to the client “seamlessly” – to appear indistinguishable from an application or remote desktop presented locally on the client, like any other local application. LR does not support recording in “seamless” mode (see this document below for more information).

A “**Citrix Session**” is based on a RDP session which includes the ICA protocol, and is similar to Microsoft Remote Desktop sessions, in that they can be configured to either terminate, or to be kept “alive” on the server if the session should happen to be disconnected (by a network failure or intentionally). A Session consumes a Citrix connection license and requires Microsoft Terminal Server licensing is in place. In so far as load testing is concerned, HP does not recommend keeping Citrix sessions alive on the server (see below for more information on this).



Some TERMS and DEFINITIONS - Continued

A Citrix **“ICA file”** is a text file which fully specifies how to connect to and launch a specific published Citrix application or desktop. In modern Citrix implementations, where applications are accessed by the Citrix Web Interface, an ICA specification is dynamically downloaded from the Citrix service to the Citrix client and then is usually automatically deleted when the Citrix session is ended.

A **Single-protocol Citrix ICA script** refers to the most basic Citrix script type LR supports, whereby with the help of the Citrix ICA client, the application server is directly accessed, and applications/desktops identified and launched, either by “browsing” for them, or a specific Citrix Application or Desktop is accessed through the use of the “ICA file” described earlier. Citrix has designed the newer versions of Citrix to be fully Web-enabled, which is to use the Web Interface instead of the ICA method; however, there are many ICA applications in use globally, so it is not anticipated that support for the ICA protocol will be ended anytime soon – rather, the use of the ICA APIs may be hidden under the Web interface.

A **Multi-protocol Citrix ICA+Web script** refers to a Citrix script that is based on accessing the application from the Citrix Web Interface. This is the most common type of LR Citrix script; however there are a few more things to check to avoid recording problems (see below for more information).

The **LR Citrix Registry Patch (known hereafter as the “registry patch”)** is a Windows registry patch file that is required in v10 and above of the Citrix Client -- in order that the LR Citrix ICA protocol properly communicate with the Citrix server; it enables Citrix “Virtual Channels” for communication. This patch is not bundled with LR 9.5X, but is bundled and is automatically installed with LR 11 starting with LR11 Patch 1; however, in some cases, the registry patch may not be auto-installed (due to some environments where OS/system security policies are in effect preventing registry edits) – therefore it is recommended to manually install it prior to recording (installation is performed by double clicking the registry file).



Basic things to check prior to Citrix script development (all LR versions)

Ensure you **have a well defined business process** you will record in advance and have run through this outside of VuGen recording. As well, ensure you understand the salient characteristics of the AUT, including failure modes, average, minimum and maximum response time under all conditions.

Make friends with your Citrix administrators if possible as you will likely need to ask for their assistance, especially for installing and upgrading the LR Citrix Agent and for other Citrix load testing issues.

Try to load test Citrix applications which are **restricted (contained) to a few Citrix servers** in a Citrix development/test “farm” rather than to load test in a live Citrix production environment. The LR Citrix protocols can work with any supported Citrix implementation; however it’s always helpful to reduce the size of the test environment.

Confirm basic Citrix and LR compatibility. It will save time to in advance confirm the Citrix components in your environment are fully supported by the version of LR/VuGen you are using.

LR 11 Patch 3 currently supports:

Citrix Server on Microsoft Windows, up to XenApp version 6, Citrix ICA Client, versions 9.1 and up to 12.1 is supported. LR11 Patch 3 and above will more easily adapt to Citrix XenApp client changes above 12.1 due to LR improvements in LR11 Patch 2 and above.

LR 9.52 (9.5 + SP1, SP2) currently supports:

Citrix Server on Microsoft Windows, up to XenApp 5 with LR 9.5 (and Web Interface 5.1) and up to XenApp 11.0 full client (termed XenApp Plug-in for hosted applications) -- *however for load testing XenApp server and client technology, upgrading to LR/VuGen 11 Patch 3 is strongly advised.*

IMPORTANT NOTE ON COMPATIBILITY – See the *Product Availability Matrix (Product Support Matrix)* available in *Software Support Online* for the most current list of compatible components:

http://support.openview.hp.com/sc/support_matrices.jsp

When should the LR Citrix Agent be used? The most useful application for the LR Citrix Agent is the text getting (reading) function since it cannot be done without the agent. Installing and using the LR Citrix Agent requires that the Citrix server(s) the agent is being installed/used on has Microsoft DEP fully disabled. Additional benefits of the LR Citrix Agent include “object oriented” access to the AUT, and text synchronization, although the latter can be done by legacy LR Citrix API calls (for example the function `ctrx_sync_on_bitmap`).



Basic things to check prior to Citrix script development (all LR versions) - Continued

Will you be using the LR Citrix Agent to do text trapping/syncing? There is a limitation as of LR11 Patch 3, in that text trapping/syncing does not work for 64-bit based applications published in Citrix server running on Windows 2008 server (by default “R2” version of W2K8 server is 64-bit) – however, this should not be a problem for 32-bit Citrix published applications running on 64 bit W2K8 (in 32-bit emulation mode) or for 32-bit native applications on 32-bit W2K8 Citrix server. Note that many applications are not 64-bit native Windows applications so this may not be a problem (check with your Citrix administrators to be sure).

If something proves difficult recording Citrix app as it is launch from the Citrix Web Interface, **can you fall back to using a single protocol ICA script to loadtest the Citrix ICA part**, avoiding the web part, either for a solution or at least for a workaround? It is a good idea to think about this contingency at least until you have characterized your Citrix testing environment.

Do not leave disconnected Citrix sessions on the Citrix server – terminate them after a short timeout interval instead. Ask your Citrix administrators to confirm that the Citrix ICA sessions are configured to not remain alive on the Citrix servers if they are disconnected, rather, that they **configure the sessions such that they are “terminated” (exited) when the session disconnects**, either intentionally or by network failure, etc. It is wise to set the timeout for disconnected sessions short, such that they are terminated after a minimum amount of time rather than kept alive for minutes. Following the above will help insure your Citrix loadtest starts with a new Citrix session each time, and that you are not re-connecting to a disconnected session, where the state of the application is in whatever previous state it was when it was disconnected (as it is nearly impossible to synchronize back to a disconnected session – it will most likely fail).

A simple test for disconnected sessions is to launch a Citrix app outside of VuGen, let’s say Word. Open a document, do something in it. Click “X” on the session container window, to close the session (without saving the document and exiting normally). Now, launch the same application again – are you reconnected to the same application in the same state as you disconnected from before? This should be avoided.



Basic things to check prior to Citrix script development (all LR versions) - Continued

Multiple sessions per user/client -- ensure if you are going to run more than one Citrix VUser on a generator (which is usually the case) that your Citrix administrators have not restricted the Citrix server to restrict each user to have only one Citrix session available. A simple test for this is to launch the application outside of VuGen a second and third time, to confirm it is possible.

For Web Interface launched scripts, confirm Microsoft DEP is fully disabled on the VuGen machine prior to recording. This is accomplished a variety of ways depending on the OS version, but in summary, for Windows XP/2003 server, you must have "NoExecute=AlwaysOff" in C:\boot.ini (you can use the System applet – Advanced – Startup and Shutdown, "Edit" function to change this file. Then reboot.

For Vista, Windows 7 and W2K8, you can run the following from the cmd shell:

```
bcdedit.exe/set nx AlwaysOff (REBOOT NOW)
```

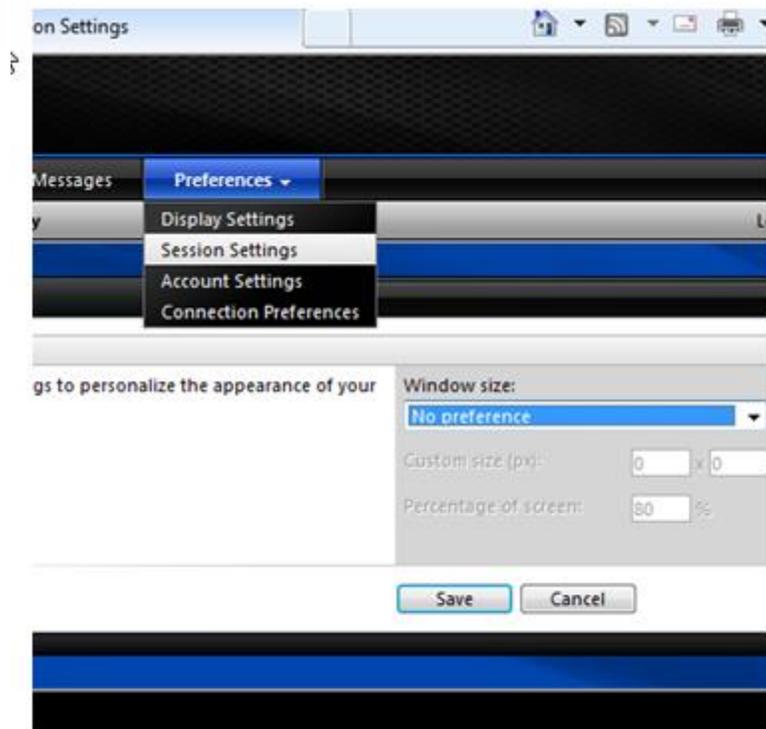
If at all possible, disable Anti-Malware and security software, as it may think LR's Web recording engine is compromising IE or the system security and block our recording of the web part of the script. At a minimum, see if an exception rule can be added to ignore vugen.exe, runcitrixclient.exe (LR processes), and wfica32.exe (Citrix's client process) or better yet, a rule to ignore blocking LR* files altogether.



Basic things to check prior to Citrix script development (all LR versions) - Continued

Confirm the Citrix application can launch outside of VuGen recording (and prior to recording) -- and that it appears in non-Seamless mode.

Prior to the recording, and after logging into the Citrix Web Interface (for a Citrix + Web multi script), configure the Session settings to “no preference” per the screen shot below. This setting should persist across Citrix sessions for the same user.



To confirm seamless is disabled, when you then launch the Citrix application, it should not appear without a Citrix “container” window – that is it should appear within a Citrix ICA window, not like a local application would appear on your desktop. ***If your Citrix AUT cannot launch in non-seamless mode, due to company security policies, LR cannot be used to loadtest this application.***

NOTE: For a single-protocol ICA script or for multi-protocol Citrix ICA + Web scripts, setting the Window size to “no preference” is mandatory.



Basic things to check prior to Citrix script development (all LR versions) - Continued

Confirm the LR Citrix Registry Patch is installed just prior to recording

After either the Citrix Client is installed or upgraded (Citrix Clients 10.X and above), or after LR/VuGen is installed or a LR/VuGen patch is added, re-install the LR Citrix Registry patch by double clicking on it.

LR 9.5 -- Citrix Registry Patch LR_00671 is available by a patch:

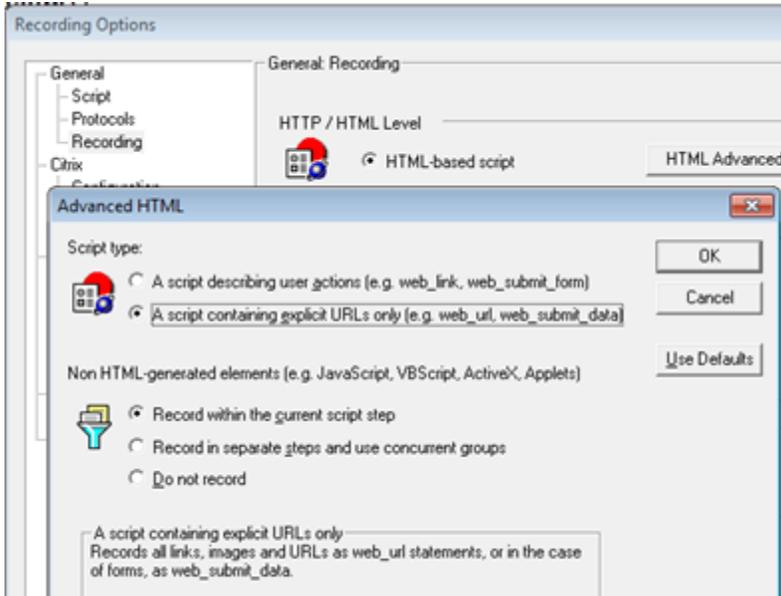
<http://support.openview.hp.com/selfsolve/document/KM104660>

LR 11 – The Citrix Registry Patch specific to LR11, is in the product folder, in LR\dat\Enable_Citrix_API.reg.

NOTE: it is suggested in a new or dynamic environment where product patches and Citrix clients are being upgraded/installed, to (re)install the Citrix registry patch right before initially recording; to be sure it's installed as this is a very common reason for Citrix script recording issues.

NOTE: also note that the Citrix Registry patch must be applied on the generators which will run the Citrix VUsers as well!

When recording against XenApp 5 (9.52 LR) or XenApp 5 or 6 (LR 11 Patch 3), prior to recording, in the recording options, enable “explicit URLs only” option in an HTML level script, to help the correlation rules:



Note: LR11 Patch 3 is the recommended version to use for XenApp technology, however as previously mentioned, LR 9.52 should work for up to XenApp 5.0. The above helps with the SessionToken correlation rule we provide with LR11. If you are using LR 9.52 with XenApp 5, see the following KB for a manual correlation:

<http://support.openview.hp.com/selfsolve/document/KM891396>



Basic things to check prior to Citrix script development (all LR versions) - Continued

ICA Client File Security

The dialog below may be presented in certain conditions and should be acknowledged after setting the checkboxes below in order that it does not re-appear during a loadtest:



The above modal dialog can lead to VUsers being blocked prior to the Citrix application launch. You can check if this is a problem by looking into LG console session running on the Load Generator machine where the VUser runs (see HP KB <http://support.openview.hp.com/selfsolve/document/KM817459> which describes how to enable the display of the Citrix Session in a LR or Performance Center loadtest

This also can be worked around with custom WebICA.ini (see <http://support.citrix.com/article/CTX568194>)

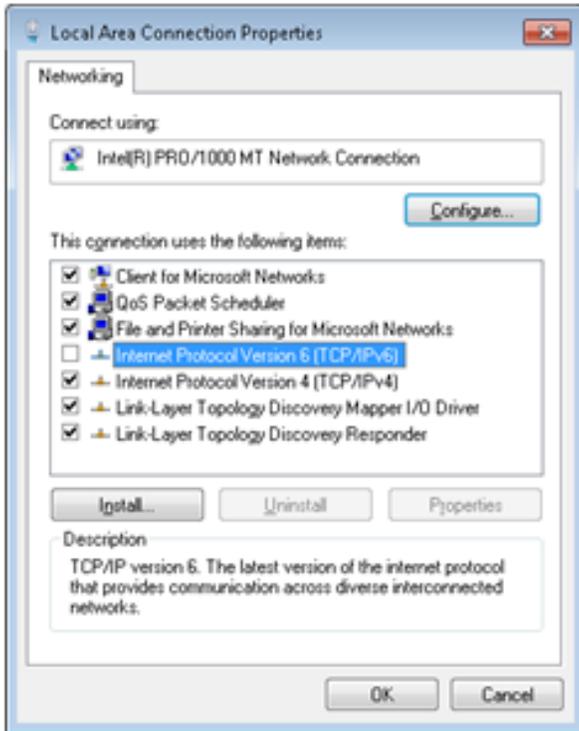
Application doesn't launch during recording in a multi-protocol Web+Citrix ICA script whereas it does with a single-protocol ICA script and it launches outside of VuGen recording.

This may be caused by a third party security software or some other local issue blocking the Web portion of the recording. See the HP KB <http://support.openview.hp.com/selfsolve/document/KM816317>



Basic things to check prior to Citrix script development (LR11 with newer Citrix features)

IPv6 is not supported and must be disabled:



A symptom of IPv6 being enabled may be the following recording log message:

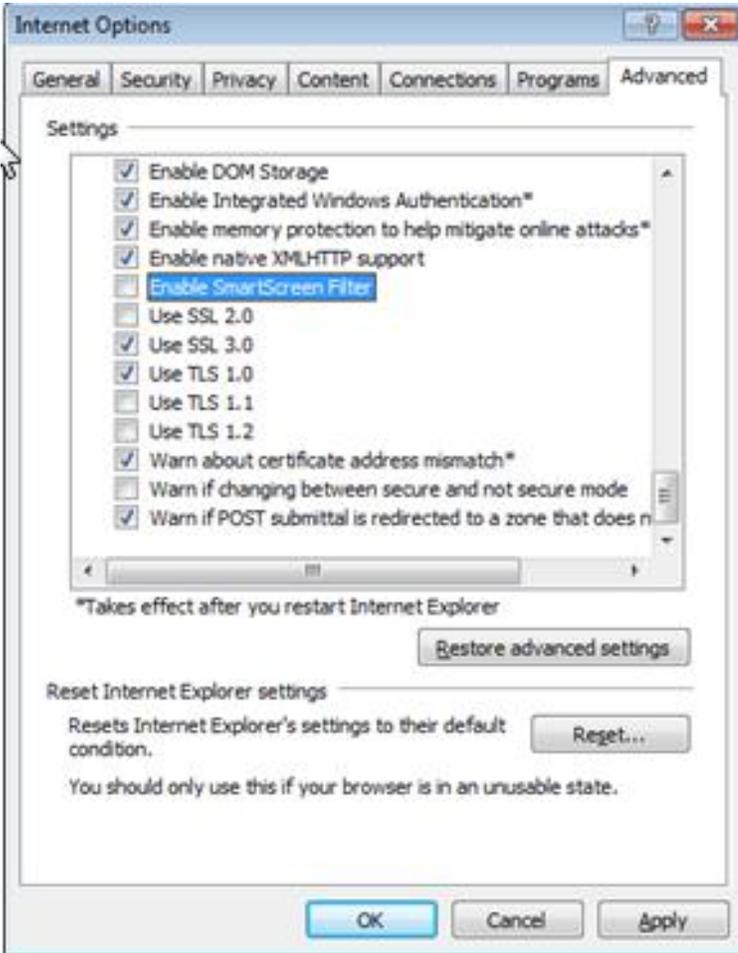
```
[Network Analyzer ( 204:1700)] Address lookup for VMLRRND171 = 16.59.124.44
[Net An. Warning ( 204:1700)] Request Connection: Remote Server @ 0.0.0.0:80 (Service=?) Failed attempt #1. Unable to connect to remote server: rc = -1 , le = 0)
[Net An. Warning ( 204:1700)] Request Connection: Remote Server @ 0.0.0.0:80 (Service=?) Failed attempt #2. Unable to connect to remote server: rc = -1 , le = 0)
[Net An. Warning ( 204:1700)] Request Connection: Remote Server @ 0.0.0.0:80 (Service=?) Failed attempt #3. Unable to connect to remote server: rc = -1 , le = 0)
[Net An. Error ( 204:1700)] Request Connection: Remote Server @ 0.0.0.0:80 (Service=?) NOT PROXIED! (REASON: Unable to connect to remote server: rc = -1 , le = 0)
```

If you still see errors after disabling IPv6, try disabling the "IP Helper" Windows Service.



Basic things to check prior to Citrix script development (LR11 with newer Citrix features) (continued)

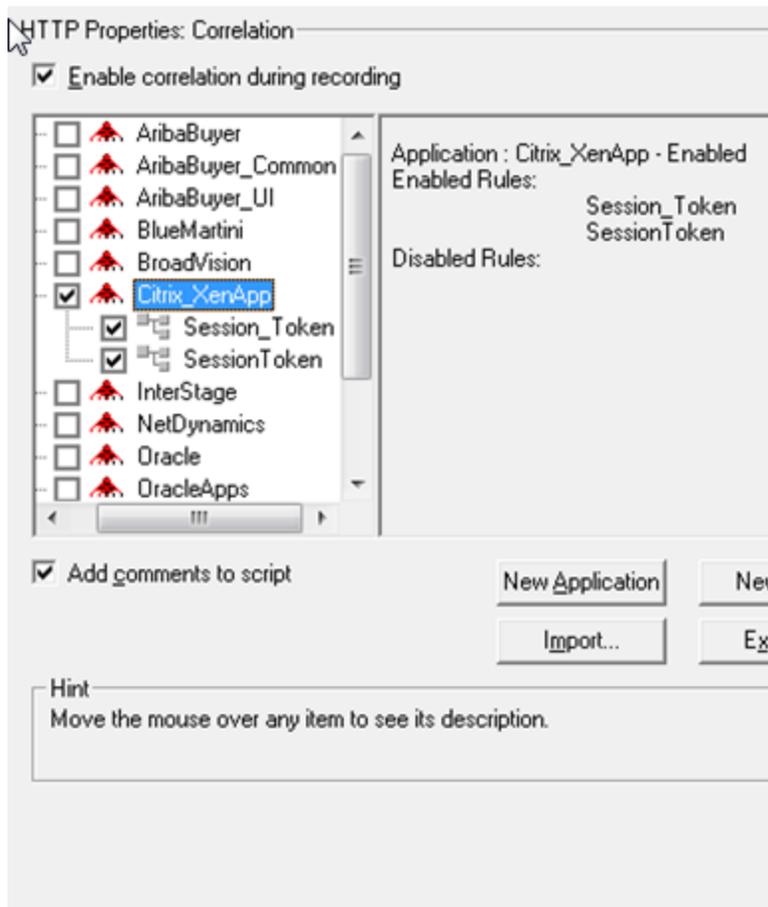
For recording Citrix Web Interface based apps (multi protocol Citrix +Web) and using IE8, the IE SmartScreen Filter must be disabled prior to recording:





Basic things to check prior to Citrix script development (LR11 with newer Citrix features) (continued)

Enable the XenApp correlation rules for multi-protocol Citrix Web Interface-based applications prior to recording, to capture and correlate the dynamic variable SessionToken which comes with the Citrix Web Interface bundled with XenApp. Note that with LR11 Patch 2 you will have two Citrix XenApp correlation rules; these should both be enabled for XenApp:

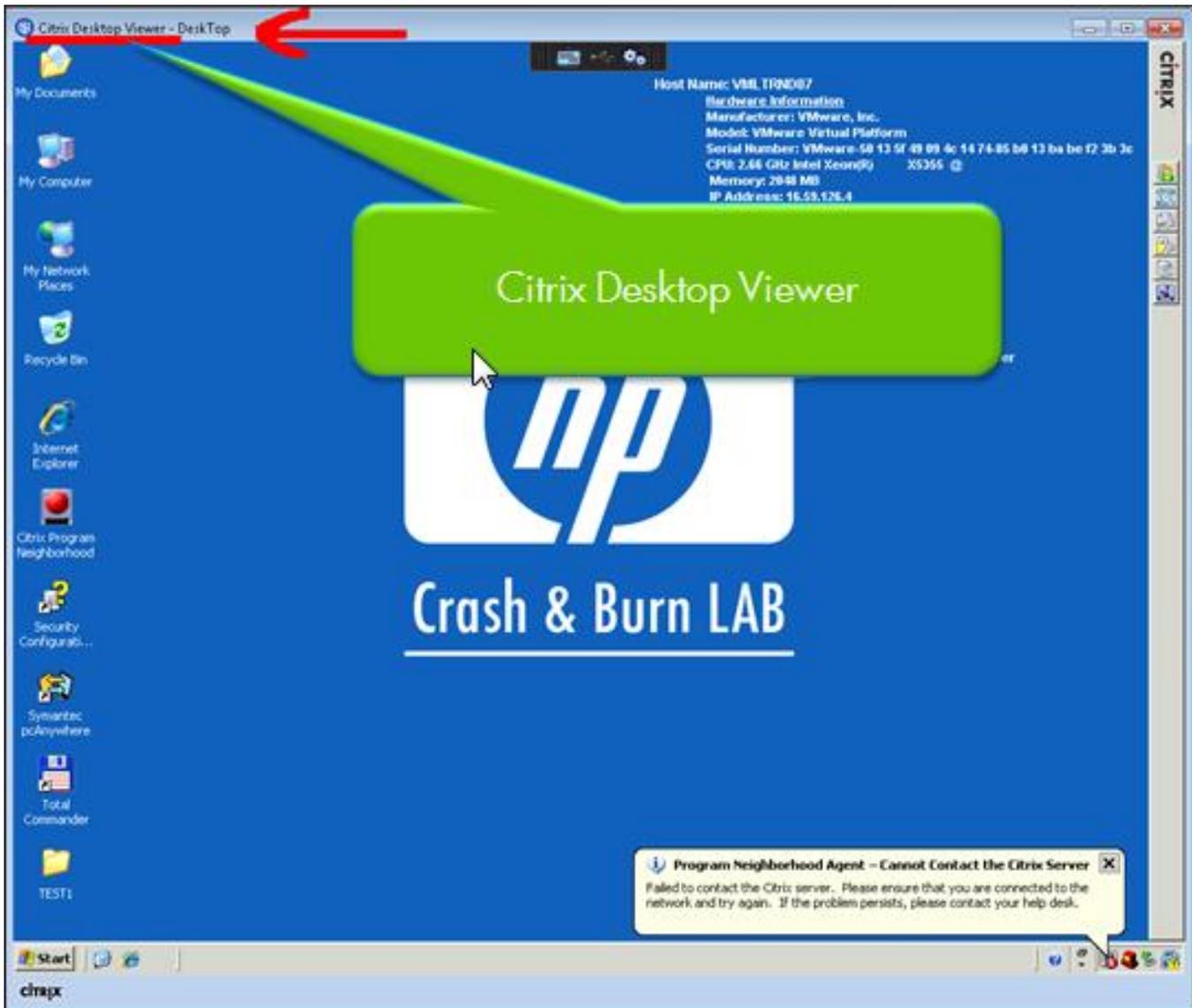


NOTE on Citrix Web Interface-based scripts and correlation: Correlation issues will not be detected until replay. Even though the LR11 provided XenApp correlation rule should work in most cases, you may need to manually correlate the web portion of some Citrix multi-protocol scripts, especially if the Citrix Web Interface is customized. Correlation is a general subject and is not specific to the Citrix protocol – the topic is covered in LR/VuGen documentation and in the HP software support knowledgebase.



Basic things to check prior to Citrix script development (LR11 with newer Citrix features) (continued)

Ensure the Citrix XenDesktop toolbar is disabled prior to recording a Citrix XenApp Web Interface based published Citrix desktop, where the toolbar is enabled:



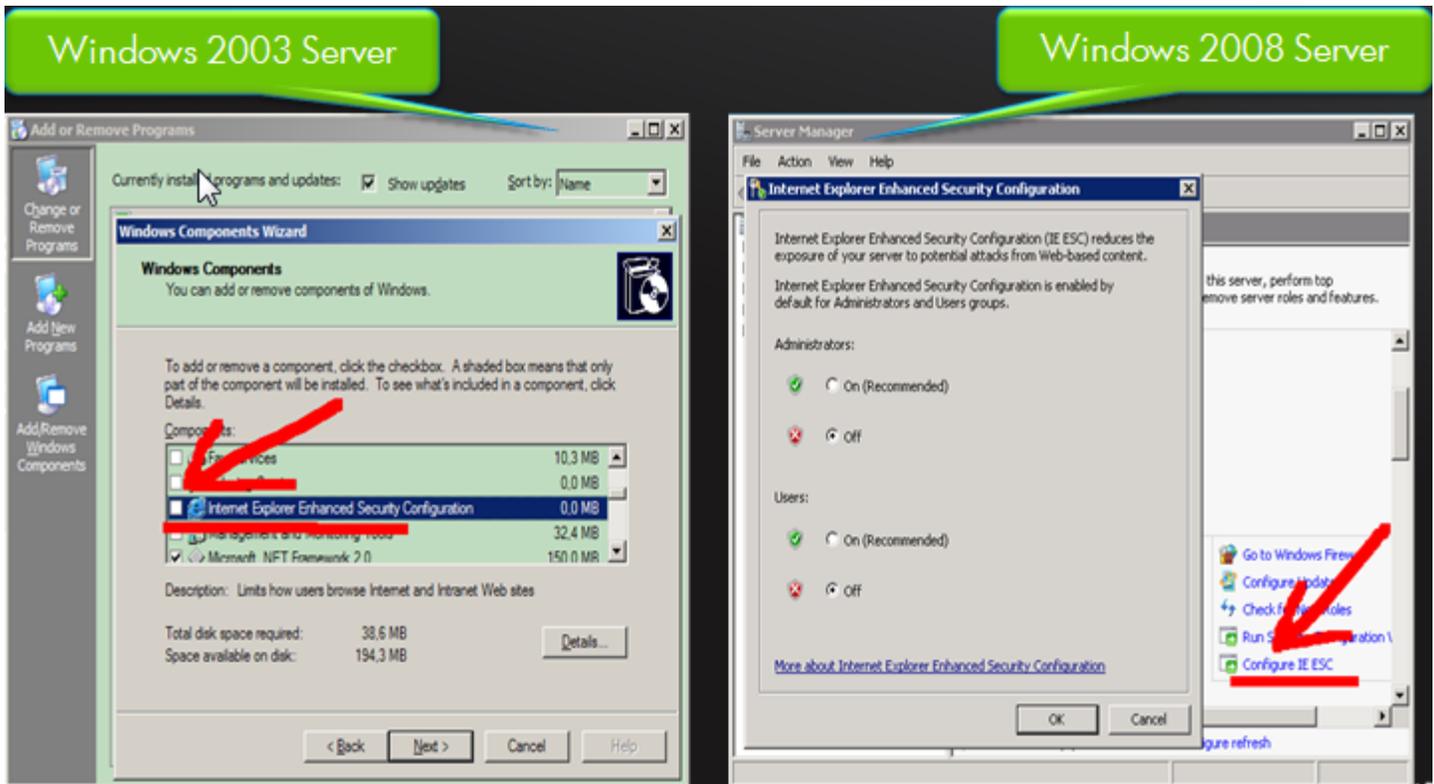
Note that this applies only to Citrix published Desktops, not to published Applications.

How this can be proved -- if you launch your Citrix published desktop outside of VuGen and see the above in your Citrix application, ask your Citrix administrators to disable the toolbar (there are a couple ways to do it. For at least one method see: <http://support.citrix.com/article/CTX122544>



Basic things to check prior to Citrix script development (LR11 with newer Citrix features) (continued)

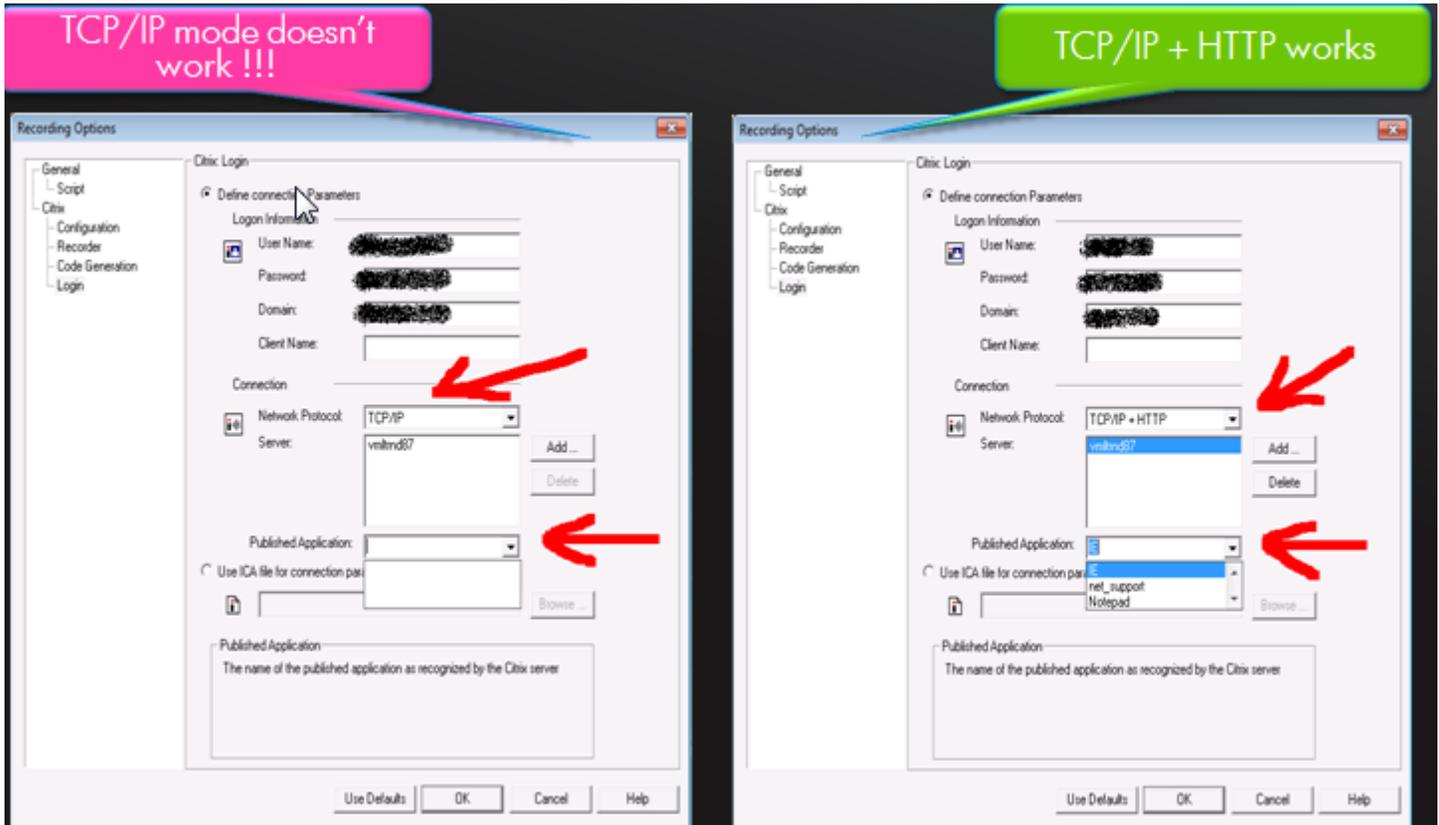
IE “Advanced Security” must be disabled prior to recording a Citrix Web Interface (NFuse) script. It applies only to Windows Server OS, and is disabled differently depending on the OS version:





Basic things to check prior to Citrix script development (LR11 with newer Citrix features) (continued)

For single-protocol ICA scripts using the Citrix client version 11.2, TCP/IP+HTTP mode should first be configured – TCP/IP alone does not work with 11.2 (note that this may not be a problem for higher XenApp clients):



Note: See the Citrix KB which describes that this has changed: <http://support.citrix.com/article/CTX122858>



Basic things to check prior to Citrix script development (LR11 with newer Citrix features) (continued)

There is a limitation of the Citrix Client version 11.2 requiring that the LR agent run as a process on LR Load Generators – it cannot run Citrix scripts as a service. Citrix client versions other than 11.2 do not have this limitation.

NOTE: See the LoadRunner documentation on how to configure the LR agent to run as a process rather than as a service.



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Please take a moment to add a comment to the HP Software Support Online about the applicability of this and other knowledge documents, to indicate if it is useful, or if you believe it is incorrect and needs updating.

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