

Citrix Systems, Inc.

Citrix Presentation Server 4™

Enterprise Edition

Performance and Scalability Value-Add to Microsoft Windows Server 2003 Terminal Services



Premise: With server hardware and IT support costs a non-trivial factor, it is vital for organizations to optimize server utilization. In addition, users demand the highest level of performance from their applications. Citrix Presentation Server can augment Windows Terminal Services to scale up the number of users supported by each server, thereby reducing hardware and management costs of Terminal Services deployments. Furthermore, Presentation Server provides a significant performance value-add to Terminal Services.

Citrix Systems, Inc. commissioned The Tolly Group to measure the performance and scalability boost that Citrix Presentation Server 4.0 brings to a Windows Server 2003 Terminal Services server deployment.

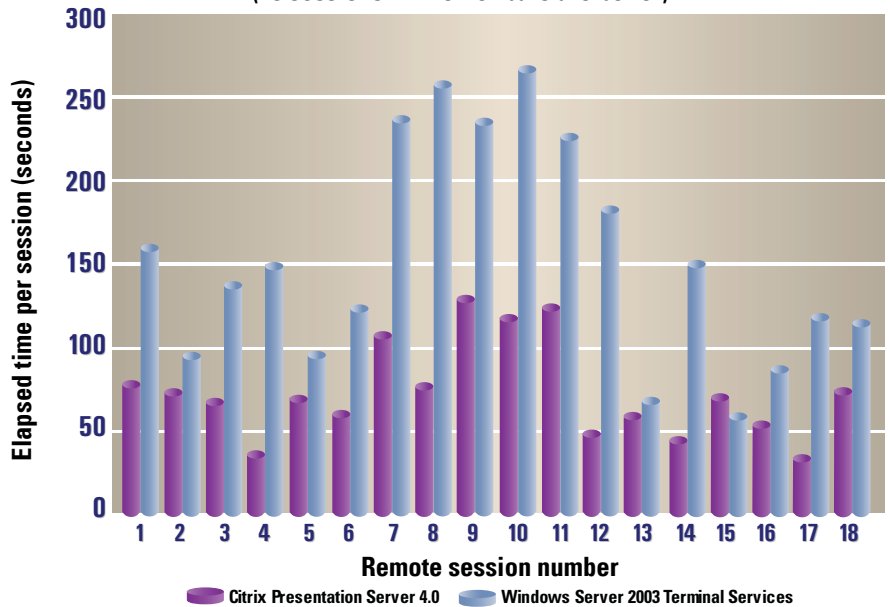
Tolly Group engineers measured the time taken to execute a specific task across 9 and then 18 simultaneous, simulated users on both Citrix Presentation Server and Microsoft Windows Server 2003 Terminal Services environments. Citrix Presentation Server is a value-add software suite that runs on the base of Microsoft Windows Server 2003 Terminal Services.

The test scenarios for 9 and 18 simultaneous users consisted of measuring the elapsed time (in seconds) needed to complete a simulated user task on both Citrix Presentation Server and Windows Server 2003 Terminal Services under three different scenarios: (1) the time with no additional processor load on the server, (2) the time with 50% processor load on the server and (3) the time with 80% processor load on the server. The relative effective-

Test Highlights

- Offers a significant performance boost to Windows Server 2003 Terminal Services
- Augmenting Windows Server 2003 Terminal Services with Citrix Presentation Server 4 can improve a specific application's performance by up to 2x
- Demonstrates significantly greater effectiveness in utilizing server resources than Terminal Services
- Increases the number of users that can be supported on each server by 25% or more

Elapsed Time for Citrix Presentation Server™ 4.0 and Microsoft® Windows Server 2003 Terminal Services to Complete Microsoft Word Test Script (18 sessions — Lower bars are better)



Note: The test script involved opening a 13-MB Word file with Notepad and then closing the file.

Source: The Tolly Group, July 2006

Figure 1

ness of each solution in securing CPU cycles for its users could be imputed by evaluating how quickly the simulated tasks completed when an artificial load — representing other server activity — was placed on the server CPU.

Tests were performed in July 2006.

EXECUTIVE SUMMARY

Citrix Presentation Server runs on top of the Terminal Services subsystem of Windows Server 2003. In typical deployments, dozens or even hundreds of users are supported on an individual server — thereby competing for the shared processor resources. Ideally, a deployment will use all of the available processor resources in order to maximize efficiency and minimize hardware and management costs.

In the current test, engineers simulated a typically loaded server and benchmarked the response time — effectively the time to complete a task — of a sample application. Multiple instances of this application were run in each test environment with varying levels of additional load being placed on the CPU of the subject server system.

Tests show that as the competing load increases on the CPU, Citrix Presentation Server is able to command processor time and thus keep the average task time of the 80% server load scenario within 4% of the average recorded with no competing load. Terminal Services, on the other hand, competes less successfully for the processor power it needs and thus its task completion is delayed significantly resulting in poorer scores and a degraded user experience.

Tests also show that well-designed third-party software, such as Citrix Presentation Server, working in concert with Terminal Services, can help to preserve the response times for user sessions, even with a server CPU operating at 80% load.

What is important to note is that the standard deviation for Presentation Server 4.0 is 52.3% less than the 153

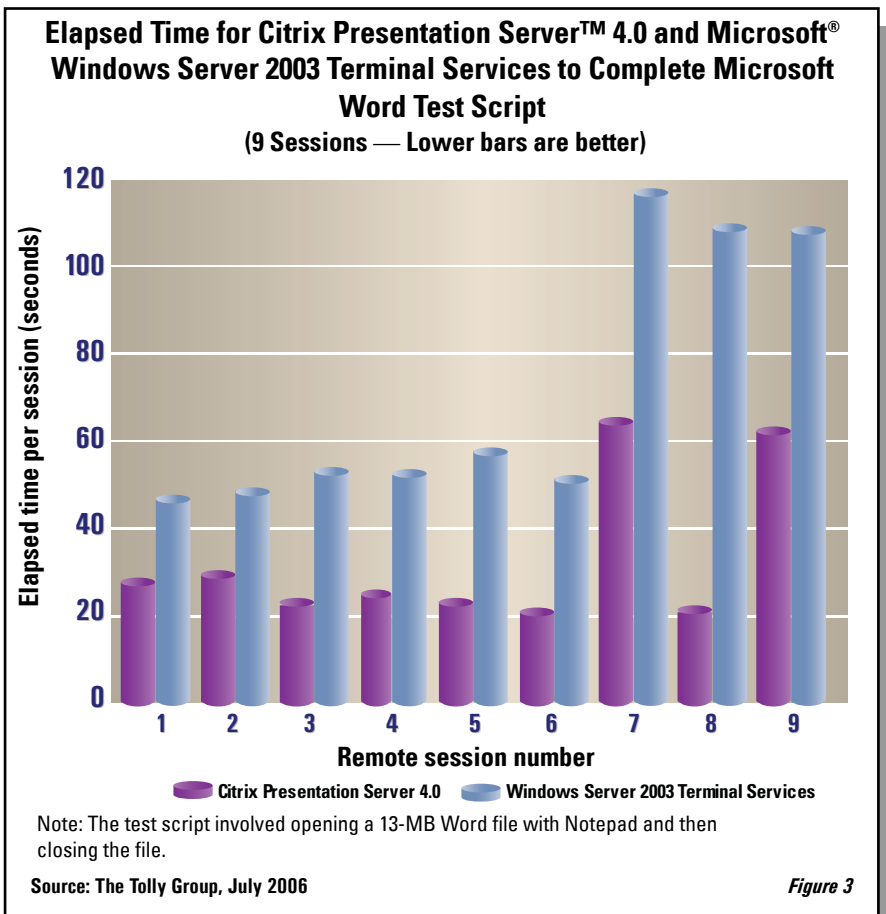
Elapsed Time (Seconds) of 18 Simultaneous Sessions with 80% Server Load (Lower numbers are better)			
Device under test	Mean	Median	Standard deviation
Citrix Presentation Server™ 4.0	73	68.5	27.4
Microsoft® Windows Server 2003 Terminal Services	153.3	140.8	62.9

Source: The Tolly Group, July 2006 Figure 2

seconds recorded for the 18 user scenario with 80% server load. This demonstrates that response times are more uniform and fluctuate less than when running with just Terminal Services alone.

Citrix attributes the relative stability of application response times under the variable load scenarios to its CPU Utilization Management feature within its Presentation Server software.

Presentation Server utilizes this round robin-type feature for processor utilization that ensures each session is allocated an equal share of the server CPU even when it is being taxed by background tasks. By contrast, Terminal Services does not release the server CPU right away, according to Citrix, so a user session may commandeer the CPU for extended periods, which adversely impacts the performance of other user sessions.



RESPONSE TIME UNDER VARYING SERVER CPU LOADS

The main focus of this test was to measure the effectiveness of the Citrix CPU Utilization Management feature over Windows 2003 Terminal Services. The test consisted of measuring the time required for 9 and 18 simultaneous users to open, process, and close a 13-MB Word document using Notepad under three different load scenarios: (1) no additional load, (2) 50% load and (3) 80% load.

In order to scale the number of users automatically and efficiently from a single user up to 9 or 18 remote users, engineers utilized a freeware scripting tool named AutoIT (version 3.1). With AutoIT, engineers generated a script to launch 9 and 18 users for each workload scenario, initiated the Notepad application, opened a 13-MB Word document located on each user local profile folder, closed the Notepad application and recorded the elapsed time to complete the task. In order to record the time, engineers utilized a Microsoft tool found on the Windows Server 2003 CD called TIMETHIS.EXE that runs from the command prompt.

Tests show that with 18 user sessions and no load on the server, the application response time was 70 seconds with Presentation Server and 84 seconds with Terminal Services — 17% faster with the Citrix software running. (See Figure 1.) Moreover, the standard deviation for Presentation Server was 16 seconds, versus 24 seconds for Terminal Services — meaning that there was less fluctuation with the Presentation Server response times.

As the server load changed to 50% and then 80%, the application response time with Presentation Server running alongside Terminal Services wavered by about 4%, on average. However, with just Terminal Services running alone and handling the 50% and 80% server loads, application response time shot up by 82%. What this demonstrates is that even as server CPU loads approach 80%

— considered by many to be heavy processor utilization — Presentation Server continues to support application response times that parallel those of lightly loaded systems. The results show there is still plenty of headroom for additional users to be added to the server and supported without adversely impacting the performance of applications. Terminal Services, by contrast, allows application performance to degrade as the server utilization increases, thereby limiting the number of user sessions supported per server. Because Citrix Presentation Server can support good performance with high processor utilization, single server scalability is improved by 25% or more over a Terminal Services deployment.

In the 9-user session scenario with 80% server load, the application response time was 36 seconds with Presentation Server and 75 seconds with Terminal Services — a 52% delta showing that Citrix Presentation Server delivered the application in less than half the time of Terminal Services. (See Figure 3.) The standard deviation for Presentation Server was 17 seconds, versus 29 seconds for Terminal Services.

TEST CONFIGURATION & METHODOLOGY

The test environment consisted of a single Citrix Presentation Server 4.0 Enterprise Edition (Build 2198) installed on top of Microsoft Windows Server 2003 Terminal Services server and an additional Microsoft Windows Server 2003 Terminal Services server. Both systems were configured on two identical HP ProLiant DL380 servers with two dual-core Intel Xeon processors each one running at 3.4-GHz with 3.5 GB of RAM and Windows Server 2003 Enterprise Edition (SP1).

Engineers utilized a Dell Latitude D600 laptop with Microsoft Windows XP Professional (SP2) that recreated 9 and 18 simultaneous users for both Citrix (ICA) and Windows (RDP) remote users. The users were generated individually by

**Citrix Systems,
Inc.**

**Presentation
Server 4.0**

**Scalability and
Performance**



Citrix Systems, Inc.

**Presentation Server 4.0 Enterprise Edition
Product Specifications***

Value-Add Features to Windows Terminal Services

- Broad device and application compatibility
- Centralized and streamlined management
- Optimized end-user experience
- Enhanced security and control
- Increased scalability and performance
 - CPU utilization management
 - Virtual memory optimization
 - SpeedScreen™

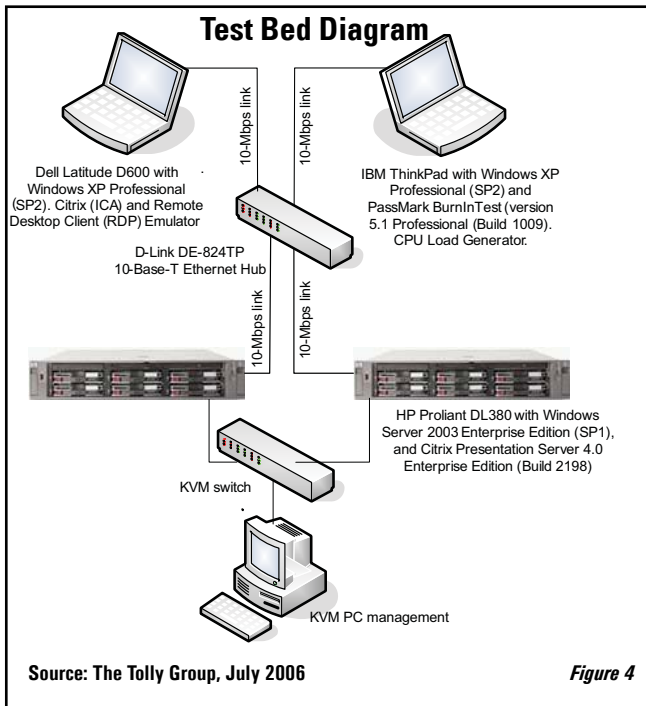
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using a script program. The script tool used to create the automated program was AutoIT (version 3.1.1). In addition, engineers used a Microsoft tool called TIMETHIS.EXE from the Windows Server 2003 CD to be able to record the elapsed time to execute the task. The task consisted of initiating a Notepad application from each session, then opening a 13-MB Word document, reading the content and closing the application.

In order to generate additional processor load on both Citrix Presentation Server and Windows Server 2003 Terminal Services for the 50% and 80% load scenarios, engineers utilized a load generator from PassMark Software named



BurnInTest Professional (version 5.1 — Build 1009) installed and configured on both HP ProLiant servers. A second laptop — an IBM ThinkPad T42 with Microsoft Windows XP Professional (SP2) — was utilized to create one more remote session in order to launch the CPU load generator. Engineers made sure that the CPU load generator created the load on all CPU cores for both HP ProLiant servers.

For network connectivity, engineers utilized a D-Link DE-824TP 10Base-T Ethernet Hub to connect Citrix Presentation and Windows Server 2003 Terminal Services servers with the Dell client laptop and the IBM laptop.

Citrix Presentation Server 4.0 was tested using most of the default settings with the addition that engineers enabled Citrix's CPU Utilization Management through the Citrix Management Console. From the client perspective, engineers downloaded and installed Citrix MetaFrame Program Neighborhood (version 9.150.39151) in order to create the Citrix sessions. For the Windows remote users, engineers used Microsoft Remote Desktop client (mstsc.exe) version 5.1.2600.2180 that comes available by default with Windows XP Professional.

The Tolly Group gratefully acknowledges the providers of test equipment used in this project.

Vendor	Product	Web address
PassMark™ Software Public domain	BurnInTest Pro (Ver 5.1, Build 1009) AutoIT (Version 3.1)	http://www.passmark.com http://www.autoitscript.com/

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PROJECT PROFILE

Sponsor: Citrix Systems, Inc.

Document number: 206146

Product class: Application virtualization software

Products under test:

- Citrix Presentation Server 4.0 Enterprise Edition (Build 2198)

Software status:

- Generally available

Testing window: July 2006

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