

Citrix Systems, Inc.

Citrix Presentation Server™ 4.5

Platinum Edition



Test Summary

Performance Evaluation of Citrix Presentation Server and Windows Server 2003 Terminal Services

Premise: Performance and user experience are key considerations when selecting an application delivery solution. Citrix Presentation Server 4.5 extends the value of Windows Terminal Services by enhancing performance and user experience, as well as minimizing the impact on the network.

Citrix Systems, Inc. commissioned The Tolly Group to evaluate the performance boost that Citrix Presentation Server 4.5 delivers to Windows Server 2003 Terminal Services.

Test focused on the network impact and user experience when executing different tasks from a Windows XP client in a Microsoft Office 2007 suite of applications.

Engineers executed multiple tasks such as: Launch an application, file printing, viewing and editing a presentation across different network connections on both Windows Server 2003 Terminal Services and Presentation Server 4.5 systems. Engineers also objectively described the user experience observed when using the Microsoft Office applications on all network scenarios.

Tests were conducted in August 2007.

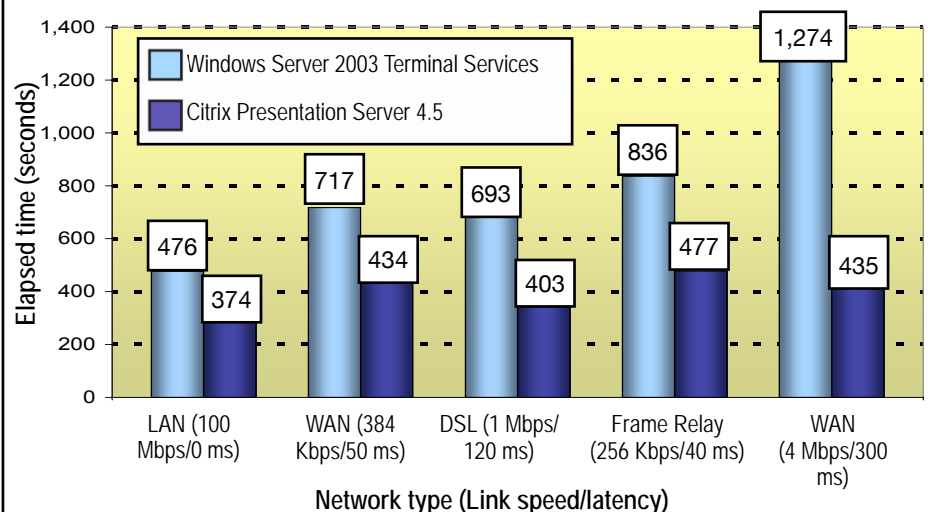
Test Highlights

Citrix Presentation Server extends the value of Windows Terminal Services by delivering:

- ▶ Nearly 3x faster application performance
- ▶ Up to 4x faster printing
- ▶ Up to 73% lower bandwidth consumption

Elapsed Time When Running Various Tasks in PowerPoint 2007, Word 2007 and Excel 2007 over Simulated Network Types

(Lower bars are better)



Note: The user tasks performed on the Microsoft Office 2007 applications were launch an application, edit, print and view a presentation.

Source: The Tolly Group, August 2007

Figure 1

Executive Summary

Citrix Presentation Server 4.5 enhances performance and reduces bandwidth consumption when executing typical user actions in the Microsoft Office 2007 application suite.

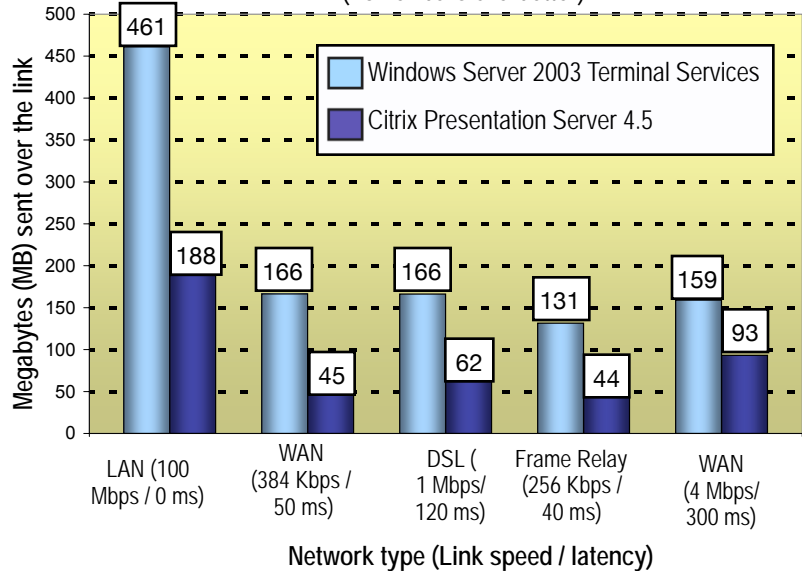
When remote users utilize business applications installed on a distant or a nearby Windows Terminal Server, chances are high that their user experience will be affected by sometimes unmanageable factors such as network latency. Additionally, IT administrators that publish applications on Windows Terminal Server must ensure that those applications make the most efficient usage of available bandwidth to deliver acceptable response times.

With the introduction of Presentation Server 4.5, Citrix Systems provides a performance kicker to existing Windows Server 2003 Terminal Services environments by managing bandwidth consumption which ultimately provides better user responsiveness across different networks.

Tolly Group tests show that Citrix Presentation Server 4.5 reduces bandwidth consumption by as much as 73% when compared to a Windows Server 2003 Terminal Services system in executing various Microsoft

Total Bytes Transferred When Running Various Tasks in PowerPoint 2007, Word 2007 and Excel 2007 over Multiple Simulated Network Types

(Lower bars are better)



Note: User tasks performed on the Microsoft Office 2007 applications were: Launch an application, edit a file, view and print a presentation.

Source: The Tolly Group, August 2007

Figure 2

Office 2007 application tasks across a simulated 384-Kbps WAN link with 50 milliseconds (ms) of roundtrip latency. (See Figure 1.)

Moreover, tests demonstrated that with Presentation Server 4.5, the server reduces the execution time of user tasks by as much as 66% across different simulated network links compared to a Windows Server 2003 Terminal Services system. (See Figure 2.)

RESULTS

POWERPOINT 2007

Tolly Group engineers conducted a series of tests from a Windows XP client over the new Microsoft PowerPoint 2007 that consisted of launching the application, editing a PowerPoint file, running a

20-page slideshow and printing a 10-page presentation.

Engineers measured the number of bytes transmitted across the link and the amount of time (in seconds) between a back-end server and a remote client laptop over various network types supporting a Citrix Presentation Server session or a Microsoft Windows Server 2003 Terminal Services session.

Results show that Presentation Server 4.5 transmitted PowerPoint data in 66% fewer bytes than just using Windows Server 2003 Terminal Services alone, and also sent data 7X faster in execution time over high latency WAN and Frame Relay connections, respectively (See Figure 4.). Tests also revealed that Presentation Server 4.5 is beneficial when editing a PowerPoint presentation over a Fast Ethernet link, sending 67%

less data over the network and thereby freeing up the connection for other data. Additionally, when testing a high latency WAN connection, engineers were able to edit the PowerPoint file 3X faster — 25 seconds with Presentation Server 4.5 versus 80 seconds with Windows Server 2003 Terminal Services.

Moreover, a 20-slide Powerpoint presentation improved significantly when running remotely via Presentation Sever 4.5 which sent 75% fewer bytes than Windows Server 2003 Terminal Services over a low latency WAN. (See Figure 4.) In terms of elapsed time, engineers were able to run the entire PowerPoint presentation 3X faster — 106.5 seconds versus 284.5 seconds — than running the same presentation over a Windows Server 2003 Terminal Services session.

Over a high-latency WAN link, Presentation Server 4.5 consumed 64% less bandwidth and 4X faster — with 196 seconds or almost 4 minutes compared to almost 12 minutes or 708 seconds — than Windows Server 2003 Terminal Services when printing a complete 10-slide PowerPoint presentation. (See Figure 4.)

EXCEL 2007

Tolly Group engineers measured the amount of bytes sent over the link and the amount of time used when a remote Windows XP client is working on a Microsoft Excel 2007 chart over various simulated connections.

Results show that Presentation Server 4.5 sent 88% fewer bytes — 4 MB versus 32 MB — over a Fast Ethernet connection than Windows Server 2003 Terminal Services. (See Figure 3).

In addition, Tolly Group engineers were able to work and complete the Excel chart 2X faster over a high-latency WAN — 54 seconds or less than 1 minute versus 97 seconds or over 1.5 minutes — than Windows Server 2003 Terminal Services. (See Figure 4.)

WORD 2007

Tolly Group engineers measured the elapsed time and the amount of bytes sent over the link when a Windows XP client remotely edited and worked on a Microsoft Word 2007 document across multiple network types.

Over a simulated Frame Relay connection, results show that Presentation Server 4.5 reduces bandwidth consumption by as much as 82%, sending only 3 MB of data compared to 16 MB when using Windows Server 2003 Terminal Services. (See Figure 4.)

Furthermore, Tolly Group engineers were able to edit and complete the work on the Word document 2X faster over a Frame Relay connection taking only 36.5 seconds compared to 75.5 seconds when using Windows Server 2003 Terminal Services.

ICA PROTOCOL IMPROVEMENT

In order to address network bottlenecks over high-latency networks, Citrix improved the Independent Computing Architecture (ICA) protocol in Presentation Server 4.5; ICA controls the traffic between the remote

Citrix Systems,
Inc.

Citrix
Presentation
Server 4.5



Performance Study of
Presentation Server and
Windows Terminal Services

Product Specifications

** Vendor-supplied information not necessarily verified by The Tolly Group*

Citrix Systems, Inc.
Citrix Presentation Server 4.5
Product Specifications*

Key Functionality:

- 👤 Application virtualization
- 👤 Application streaming
- 👤 Application performance monitoring
- 👤 Single sign-on
- 👤 SmartAccess
- 👤 SpeedScreen Progressive Display
- 👤 Health Assistant
- 👤 64-bit platform support
- 👤 Windows Vista support
- 👤 Isolation 2.0
- 👤 Application hub

Product URL:

👤 <http://citrix.com/presentationserver>

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user and the Presentation Server — to adjust the bandwidth consumption efficiently depending on the type of network being used.

(Note: For more details on the new compression technologies implemented in Presentation Server 4.5, refer to Tolly Group report #207207 at <http://www.tolly.com>)

TEST SETUP & METHODOLOGY

Tolly Group engineers tested Citrix Presentation Server 4.5 Platinum Edition (Service Pack 2006.10) installed on top of a Windows Server 2003 Terminal Services system, as well as a separate Windows Server 2003 Terminal Services system. Both server systems

were identical: two Hewlett Packard ProLiant DL380 G5 servers equipped with dual-core/dual processors running at 3.20 GHz, 12 GB of RAM and Windows Server 2003 R2 Enterprise Edition (SP2) with Terminal Services enabled. No policies or features were enabled on both systems. Default settings were left unchanged.

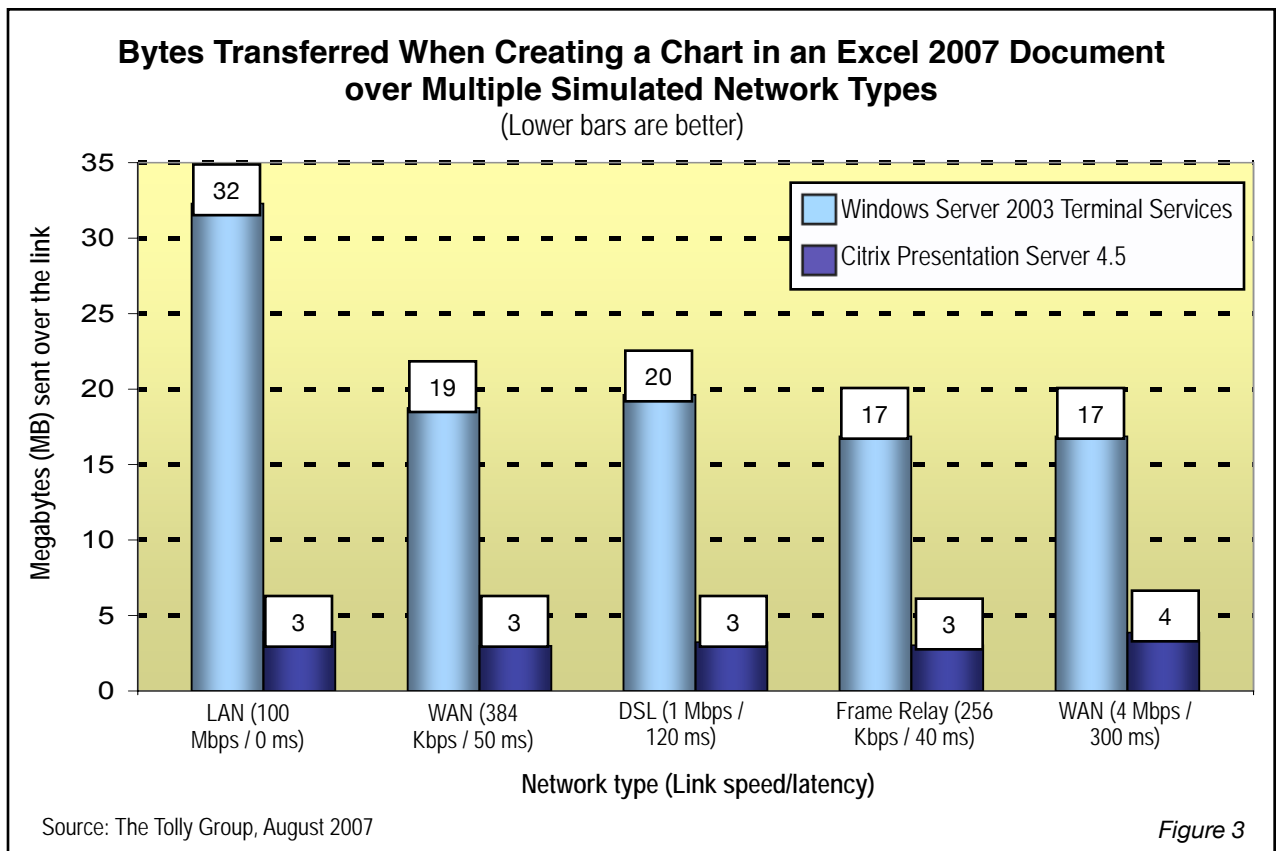
From the client side, engineers set up and configured two identical IBM/Lenovo ThinkPad T41 laptops equipped with a Pentium M processor running at 1.6 GHz, 2 GB of RAM, Windows XP Professional (SP2). One of the laptops had installed Citrix Presentation Server Clients (version 10.1), while for the other, engineers used the Remote Desktop Connection (mstsc.exe) provided by default on Windows XP Professional. For this testing, bitmap caching was

disabled for both Citrix and Windows solutions.

In order to emulate the different network types, engineers set up and configured the software-based Shunra WAN emulator called Shunra VE Desktop (version 3.0 build 2000.011) connected between two standard Layer 2 switches from Cisco (Catalyst 3750 series) and NETGEAR 24-port Fast Ethernet switch. (See Figure 5.)

The Shunra VE Desktop WAN emulator was installed and configured on a Compaq/HP ProLiant DL320 server equipped with a Pentium III processor running at 933 MHz, 2 GB of RAM and Windows Server 2003 R2 Enterprise Edition (SP2).

The network types emulated were the following:



- LAN (100 Mbps with 0 ms roundtrip latency)
- Low-latency WAN (384 Kbps with 50 ms of roundtrip latency)
- DSL (1 Mbps with 120 ms of roundtrip latency)
- Frame Relay (256 Kbps with 40 ms of roundtrip latency)
- High-latency WAN (4 Mbps with 300 ms of roundtrip latency)

On each network scenario, engineers executed different user tasks when using Microsoft Office 2007 applications such as Word, Excel and PowerPoint. Engineers installed Microsoft Office 2007 Ultimate Edition on both Citrix Presentation Server 4.5 and Windows Server 2003 Terminal Services systems.

POWERPOINT 2007

Tolly Group engineers executed a series of tests involving PowerPoint operating in various scenarios with different document sizes:

- Launch PowerPoint 2007 application
- Edit a PowerPoint 2007 presentation by adding five slides — File size of extra slides equaled 1.42 MB
- Run a slideshow of a 20-slide PowerPoint 2007 presentation — File size equaled 2.82 MB
- Print a 10-slide PowerPoint 2007 presentation — File size equaled 1.91 MB

The PowerPoint 2007 documents used included text, bitmap images and animations.

EXCEL 2007

Tolly Group engineers executed one test that consisted of opening a Microsoft Excel 2007 spreadsheet and created a 3D column chart. The spreadsheet had two columns with numerical data. The file size of the Excel document was 12 KB.

WORD 2007 TEST

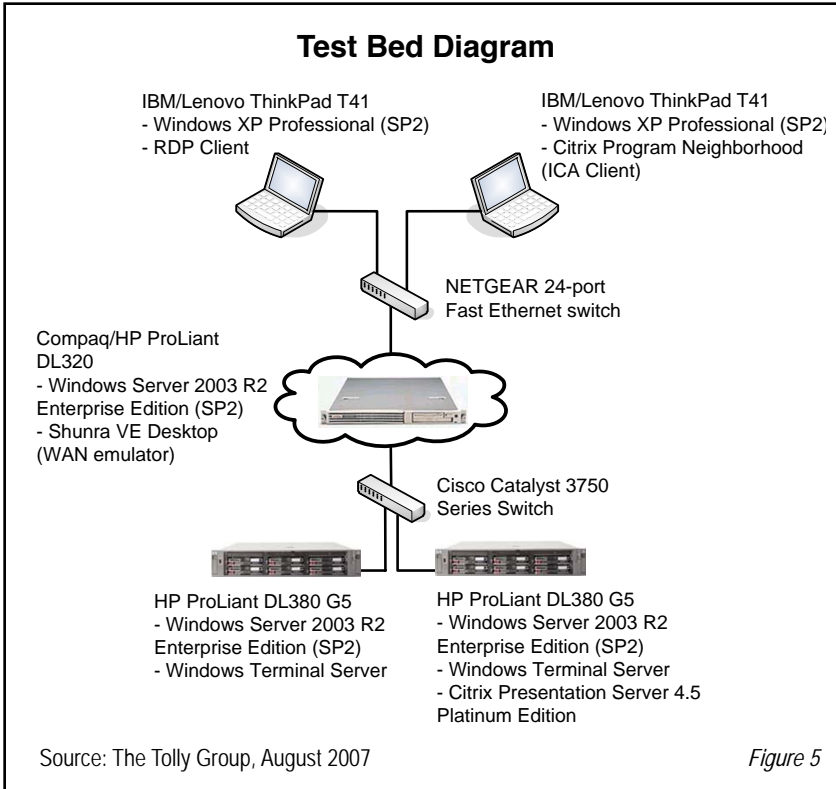
Tolly Group engineers executed one test that consisted of opening a Microsoft Word 2007 document, inserted a bitmap image and changed the first letter of the opening paragraph to a “drop-capped” letter. The document had pre-written text information with no images; its file size was 28 KB.

Bandwidth consumption and time elapsed parameters were recorded on all scenarios using Bandwidth Monitor test tool. Engineers ran the tests two times per networking scenario and averaged the results.

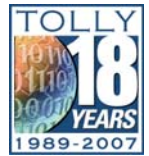
		Test Results Summary														
		LAN (100 Mbps - 0 ms Latency)			WAN (384 Kbps - 50 ms Latency)			DSL (1 Mbps - 120 ms Latency)			Frame Relay (256 Kbps - 40 ms Latency)			WAN (4 Mbps - 300 ms Latency)		
		Microsoft	Citrix	% Gain	Microsoft	Citrix	% Gain	Microsoft	Citrix	% Gain	Microsoft	Citrix	% Gain	Microsoft	Citrix	% Gain
PowerPoint Tests	Application Launch Time	11.0	6.5	41%	17.0	7.0	59%	16.0	7.0	56%	17.5	7.0	60%	23.0	11.5	50%
	Total Bytes (MB)	2.7	1.3	52%	2.6	1.2	54%	2.3	1.2	47%	2.6	1.2	56%	2.2	0.7	66%
	Edit Presentation (seconds)	21.5	20.0	7%	47.0	30.5	35%	45.5	24.5	46%	58.5	37.0	37%	80.0	25.0	69%
	Total Bytes (MB)	26.8	8.8	67%	14.9	5.8	61%	14.4	6.2	57%	12.8	5.6	57%	13.8	7.9	43%
	20-Slide SlideShow Presentation (seconds)	87.0	88.5	-2%	245.5	107.5	56%	179.5	99.5	45%	317.5	123.5	61%	284.5	106.5	63%
	Total Bytes (MB)	355.1	156.9	56%	83.6	20.6	75%	84.9	35.9	58%	53.8	19.7	63%	77.6	63.3	18%
Excel Test	Print 10-Slide Presentation (seconds)	275.0	186.5	32%	277.5	212.0	24%	338.0	195.5	42%	283.5	226.0	20%	708.0	196.0	72%
	Total Bytes (MB)	28.9	11.7	60%	29.4	11.5	61%	29.2	11.7	60%	29.4	11.2	62%	32.5	11.8	64%
Word Test	Excel Chart (seconds)	48.5	41.5	14%	68.5	41.5	39%	63.5	43.5	31%	83.5	47.5	43%	97.0	54.0	44%
	Total Bytes (MB)	32.3	3.9	88%	18.8	3.0	84%	19.6	3.2	84%	16.9	3.0	82%	16.9	3.9	77%
Word Test	Word Doc Graphic	33.5	31.0	7%	62.0	35.5	43%	51.0	33.0	35%	75.5	36.5	52%	81.5	42.0	48%
	Total Bytes (MB)	15.2	5.7	62%	17.1	3.4	80%	15.9	3.5	78%	16.0	2.9	82%	16.1	5.6	65%
	Total (seconds)	476.5	374.0	22%	717.5	434.0	40%	693.5	403.0	42%	836.0	477.5	43%	1,274.0	435.0	66%
	Total Bytes (MB)	461.0	188.3	59%	166.4	45.5	73%	166.3	61.8	63%	131.5	43.6	67%	159.1	93.2	41%

Source: The Tolly Group, August 2007

Figure 4



The Tolly Group is a leading global provider of third-party validation services for vendors of IT products, components and services.



The company is based in Boca Raton, FL and can be reached by phone at (561) 391-5610, or via the Internet at:
 Web: <http://www.tolly.com>,
 E-mail: sales@tolly.com

Test Equipment Summary

Vendor	Product	Web URL:
BWMonitor.com	Bandwidth Monitor Ver. 3.1 Build 671	http://www.bwmonitor.com
Shunra	Shunra VE Desktop Ver. 3.0 Build 2000.011	http://www.shunra.com

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