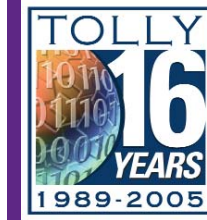


NetScaler, Inc.

NetScaler 9950 Series Application Delivery System

Performance Evaluation of AppCompress Extreme (Differential Compression Technology)



Test Summary

***Premise:** The development and deployment of Web-based applications is rapidly driving the need for reliable and performance-optimized delivery of HTTP content to end users. When confronting Web performance challenges, enterprises typically deploy one or more traditional acceleration technologies, such as standards-based HTTP compression. Although providing meaningful performance improvements, basic HTTP compression utilizing the GZIP algorithm offers limited efficiency gains due to its inability to recognize and reduce redundancy in application content across multiple transmissions. Differ-ential compression can accelerate the delivery of applications beyond what is possible with standards-based HTTP compression by eliminating the transmission of redundant application data and sending the user only data that has recently changed.*

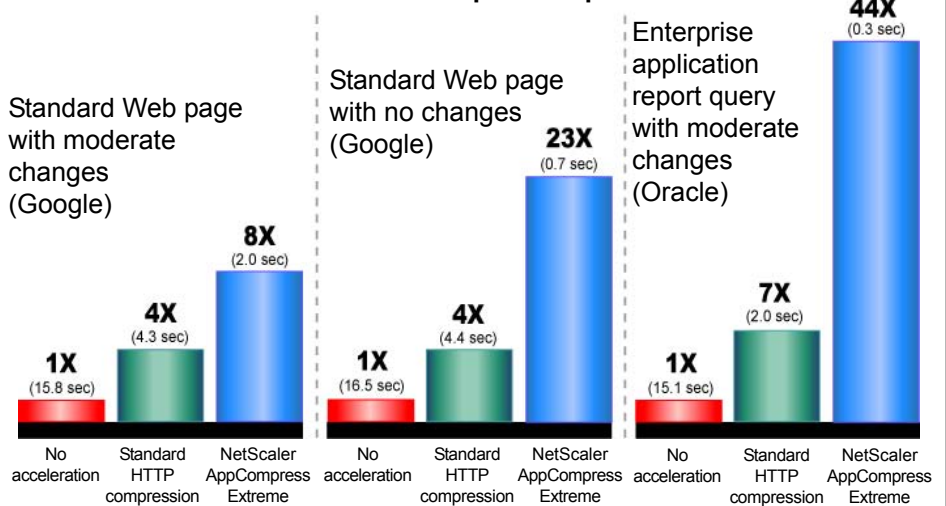
NetScaler, Inc. commissioned The Tolly Group to evaluate its NetScaler 9950 Series Application Delivery System, one of a family of purpose-built appliances incorporating a number of application performance and optimization technologies, including advanced HTTP compression, content caching, SSL offload, TCP connection optimization, and more.

The objective of this evaluation was to measure application performance improvements yielded by NetScaler's new AppCompress Extreme technology. Tolly Group engineers tested application acceleration benefits by measuring the total round trip time (in seconds) for an actual client requesting and receiving application data from both a popular public Web site and a commonly-used enterprise application. The tests were performed using a live Internet connection whose connection speed was throttled to precise levels so the end-user experience with various link speeds could be assessed.

Test Highlights

- Can accelerate the delivery of enterprise application data by as much as 44X
- Can improve the download times for public Web pages by up to 23X
- Can reduce user response times by more than 97.7% and lower bandwidth consumption by 98%
- Speeds application performance more than standards-based HTTP compression
- Enhances application performance with no modification to application code or changes to browser configurations

Application Acceleration Improvements Over a Simulated 56-Kbps Dial-up Connection



Note: Application data was hosted in NetScaler's San Jose, California facilities and accessed via the Internet by a Microsoft IE version 6.0 client at The Tolly Group's testing facilities in Boca Raton, Florida.

Source: The Tolly Group, June 2005

Figure 1

For each test scenario, the client first sent an initial request for the target application data. Once the response was received, the client then issued another request for the same application data. Changes were introduced to the application data in order to simulate the dynamic nature of most modern Web sites and enterprise applications. The total response time of this subsequent request was measured to determine if the compression technology under test could reduce the amount of data transmitted to the client and improve application response times and ultimately shorten perceived client response time.

All performance measurements were made at Tolly Group facilities in Boca Raton, Florida and all content was hosted at NetScaler's facilities in San Jose, California where Tolly Group personnel oversaw testing. Tolly Group engineers tested AppCompress Extreme in a variety of customer scenarios using both 56 Kbps and 256 Kbps simulated connection speeds.

RESULTS

APPLICATION ACCELERATION OVER A SIMULATED 56-KBPS "DIAL-UP" LINK

In a test scenario using a standard Web page with moderate changes to application content occurring between client requests, Tolly Group engineers reported that the Google News page downloaded in 15.8 seconds with no acceleration. (See Figure 1.)

Next, in a test scenario of a Google News page download with standard HTTP compression enabled and moderate page changes, the re-requested page loaded in 4.3 seconds – a 4X improvement. Finally, when engineers enabled NetScaler's App-Compress Extreme, the same Google News page downloaded in a mere 2 seconds – an 8X improvement over the standard page download with no acceleration. (For a complete list of test scenarios, see Figure 2.)

Engineers next examined the effect of compression when downloading a standard Web page with no content change between client requests. First, with no acceleration (Test case 4) the page download took a full 16.5 seconds.

Test case	Application content	Acceleration type	Content changes between requests
1	Google News	None (Baseline) compression	Moderate
2	Google News	Standard HTTP compression	Moderate
3	Google News	AppCompress Extreme	Moderate
4	Google News	None (Baseline)	None
5	Google News	Standard HTTP compression	None
6	Google News	AppCompress Extreme	None
7	Oracle Discover 4i (customer sales report)	None (Baseline)	Moderate
8	Oracle Discover 4i	Standard HTTP compression	Moderate
9	Oracle Discover 4i	AppCompress Extreme	Moderate

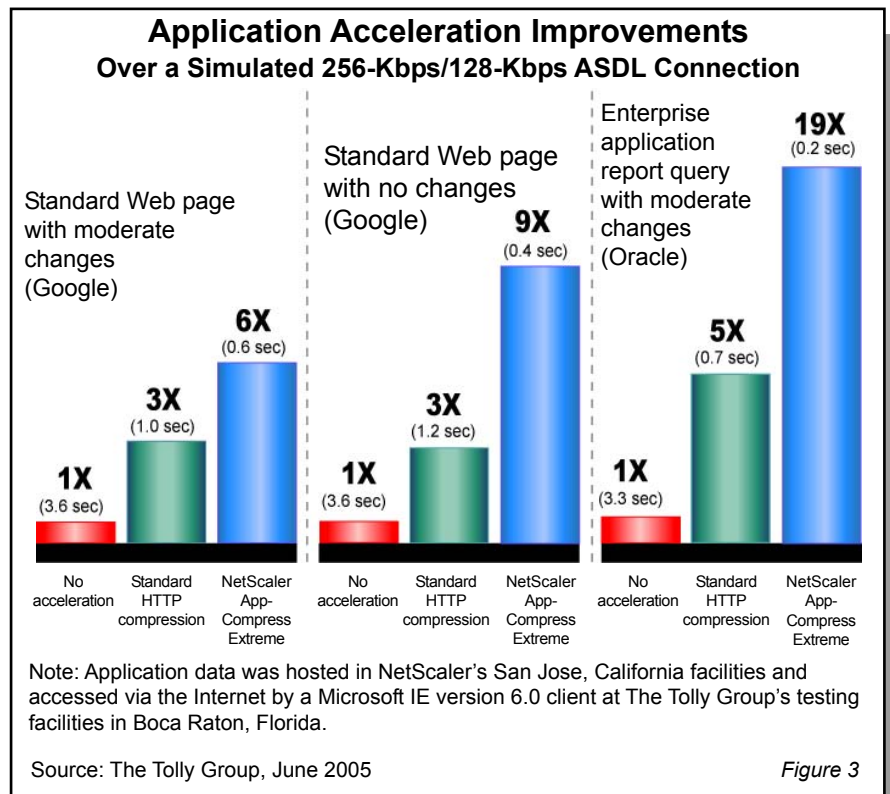
Source: The Tolly Group, June 2005

Figure 2

When standard HTTP compression was applied the page downloaded in 4.4 seconds – a 4X improvement. Finally, when AppCompress Extreme was enabled the page downloaded in only 0.7 seconds – a

23X improvement over the baseline case with no acceleration.

With the Google News Web page downloads complete, engineers tested the deliv-



Note: Application data was hosted in NetScaler's San Jose, California facilities and accessed via the Internet by a Microsoft IE version 6.0 client at The Tolly Group's testing facilities in Boca Raton, Florida.

Source: The Tolly Group, June 2005

Figure 3

ery time for an Oracle Enterprise database application report. For the baseline case with no acceleration, the Oracle report downloaded in 15.1 seconds. With standard HTTP compression applied, the download time was reduced to 2.0 seconds – a 7X improvement. But with NetScaler AppCompress Extreme, the same Oracle report data was sent to the client in just 0.3 seconds – a 44X improvement.

In all test cases, NetScaler's AppCompress Extreme differential compression technology substantially improved application response times compared with the non-accelerated baseline case and against cases where standard HTTP compression was applied.

APPLICATION ACCELERATION OVER A SIMULATED 256- KBPS/128-KBPS ADSL LINK

The same test methodology outlined in the previous sub-section ("Application Acceleration over a Simulated 56 Kbps Link") was repeated with a simulated ADSL client connection. The results of this testing are shown in Figure 3.

ANALYSIS

Tolly Group testing determined that NetScaler's AppCompress Extreme differential compression technology improved the performance of standard Web page downloads by as much as 23X, and speeded the delivery of enterprise application data by 44X. AppCompress Extreme not only reduced response times for the application client, but also lowered overall bandwidth consumption by as much as 90%.

AppCompress Extreme delivered improved performance through the use of differential compression technology which computes the differences in application data occurring between an initial client request and all subsequent requests. Once the differential is computed by the NetScaler appliance, only changed data is sent to the client. By eliminating the transmission of redundant data over multiple requests, NetScaler's Application Delivery System improves overall application response times by transmitting far fewer

bytes than is required with traditional HTTP compression techniques.

Tolly Group testing has demonstrated that NetScaler's differential compression technology can accelerate the delivery of standard HTML-based Web pages, as well as tabular report data common in enterprise applications. Substantial acceleration benefits were observed using different Internet connection speeds. Performance gains were realized with no modification to either the application code or to the client (Internet Explorer v. 6.0) configuration.

TEST CONFIGURATION AND METHODOLOGY

For performance tests, The Tolly Group tested a NetScaler 9950 Series Application Delivery System, running software version NS6.1 build 68. The NetScaler system was connected to a Microsoft IIS Web Server version 5.0 on one side, and to a simulated Internet cloud on the other. Simulated 56 Kbps and 256/128 Kbps download/upload links were implemented using a Spirent Communications IP Wave ver. 3.0.0.0 test tool running on a Dell PowerEdge 1400SC server (Pentium III 1.1-GHz CPU, 512MB of RAM with Microsoft Windows 2000 Advanced Server), and was connected to a pair of switches Extreme Networks Summit48 and 3Com Baseline Switch 2816. The end-user device was a clone PC (500 MHz Pentium III with 128 MB RAM) with Windows XP Professional (with the latest service pack available installed). Engineers captured the traffic using Ethereal throughout the test and measured the loading time for each HTML site.

The client was connected to the switch on the "downstream" side of the WAN simulator. On the "upstream" side, the IP Wave adapter connected to a switch which was, in turn, connected to the Internet via a Juniper NetScreen-100 firewall and an Adtran NetVanta 3305 WAN router outfitted with a T1 connection to a Qwest point of presence.

For the non-accelerated baseline measurements, engineers measured the time to load two application content types – Oracle and Google – in a common client/server environment. Engineers used Microsoft Internet Explorer 6.0 (with the latest ser-

NetScaler, Inc.

NetScaler 9950
Series
Application
Delivery System



Application Acceleration
Certification

NetScaler, Inc.
NetScaler 9950 Series Application
Delivery System
Product Specifications*

Application Optimization and Acceleration

- Application compression with AppCompress
- Application content caching with AppCache
- TCP connection offload
- TCP buffering
- TCP client persistence

AppCompress (Application Compression Capabilities)

- AppCompress Extreme – Differential compression accelerating the delivery of HTTP-based applications
- AppCompress for HTTP – Standard GZIP-based data compression for Web applications
- AppCompress MP – Multi-protocol compression improving the bidirectional performance of any TCP-based enterprise application

Intelligent Application Switching

- Full Layer 4 load balancing
- Layer 7 content switching
- Global server load balancing
- Cache redirection

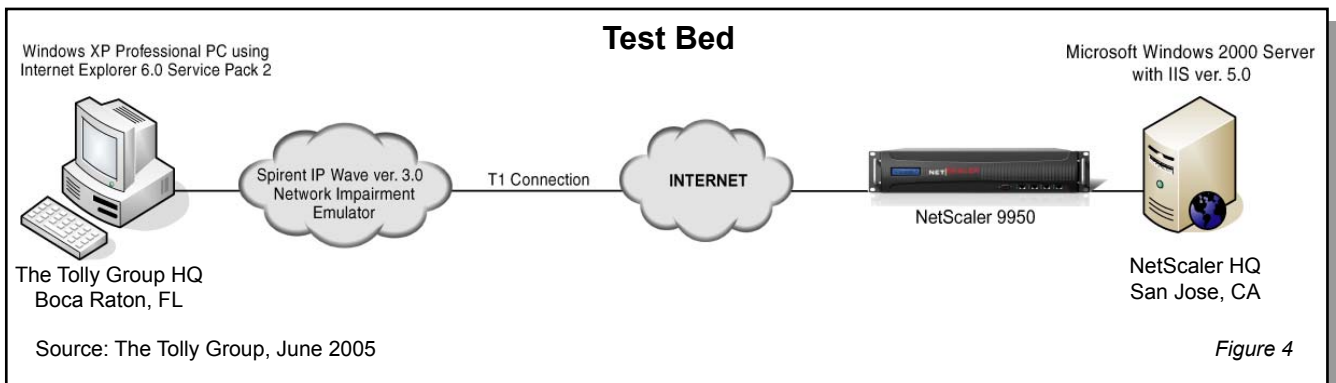
Secure Application Access and Application Protection

- Secure remote access with SSL VPN
- High-performance SSL offload
- DDoS defenses (Layer 3-7)
- Surge protection
- Priority queuing
- Intrusion filtering

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*Vendor-supplied information not verified by
The Tolly Group



vice pack available installed) to load report data generated by Oracle Discoverer and to download sample Google News Web pages.

Following the baseline tests, engineers measured the time to load the two application content types (Oracle and Google) in a common client/server environment, but now with standard HTTP compression

enabled on the NetScaler device under test. Engineers used Microsoft Internet Explorer 6.0 (with the latest service pack available installed) to load the same application data as in the baseline test. Measurements were taken across simulated connections of 56 Kbps (dial-up), 256/128 Kbps (ADSL). Engineers captured the traffic (ie. Ethereal) throughout the test and measured the load-

ing time for each application data set.

Finally, engineers measured the time to load the two content types (Oracle and Google) in a common client/server environment, but now with NetScaler's AppCompress Extreme feature enabled. This test followed the same routine as the two prior tests, and measurements again were taken across

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

Vendor	Product	Web address
Spirent Communications	IP Wave ver. 3.0.0.0	http://www.spirentcom.com



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PROJECT PROFILE

Sponsor: NetScaler, Inc.

Document number: 205124

Product class: Application Delivery System

Products under test:

- NetScaler 9950 Series

Testing window: June 2005

Software versions tested:

- Build Level: NS6.1 build 68 June 2, 2005

Software status:

- Generally available

For more information on this document, or other services offered by The Tolly Group, visit our World Wide Web site at <http://www.tolly.com>, send E-mail to sales@tolly.com, call (561) 391-5610.

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