

# TOLLY Benchmarks™

Volume 2, Issue 9

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Switch outperforms the F5 BIG-IP 1500, delivering more than 2X greater performance at less than 40% of the price



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## ABOUT

**Tolly Benchmarks** is a regular advertising supplement that highlights innovative and compelling technology research conducted by The Tolly Group, the industry's leading independent testing and strategic consulting organization based in Boca Raton, FL. **For more information** on any of the products or technologies covered here, visit The Tolly Group's Web site at <http://www.tolly.com>.

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# Coyote Point traffic mgmt. switch surpasses F5 gear on performance and price

Coyote Point Systems, Inc. commissioned The Tolly Group to evaluate the Equalizer E350si, a Layer 4/7 load-balancing switch designed to serve up Enterprise-class throughput in a cost effective fashion. Furthermore, Coyote Point asked The Tolly Group to evaluate the Equalizer E350si solution alongside several comparable offerings from F5 Networks.

Tolly Group engineers tested the Equalizer E350si, measuring its Layer 4 connection rate, Layer 7 transaction rate and aggregate throughput (Mbps) at both Layer 4 and Layer 7. Engineers benchmarked the performance of the Equalizer E350si against an F5 Networks BIG-IP 1500 and a BIG-IP 3400, two devices that cost 2.5X to almost 4X more than the Equalizer E350si. Coyote Point intended to demonstrate that its Equalizer E350si offers more attractive price/performance than the F5 Networks products.



Results show that the Equalizer E350si outperformed the F5 Networks BIG-IP 1500 in every test, offered near-comparable performance to the much more expensive BIG-IP 3400, and offered compelling price/performance advantages.

The Coyote Point Equalizer E350si achieved 469 Mbps of throughput with 64-byte objects, which was more than twice the

The Equalizer E350si delivered Layer 7 throughput of 199 Mbps when tested with 64-byte objects, 633 Mbps with 2K-byte objects, and 729 Mbps when tested with 16K-byte objects. Those throughput results ranged from 30 to 51% higher than the throughput delivered by the BIG-IP 1500.

The Equalizer E350si offers an average Layer 4 throughput of 520 Mbps across the three object sizes tested at Layer 4; that equates to a cost-per-Mbps of \$9.70, nearly five times less than the BIG-IP 1500. (\$47.61) Analysis shows that the Equalizer E350si offers a Layer 7 cost-per-Mbps ranging from \$8.22 to \$30.13, which is four times less than either the BIG-IP 1500 or BIG-IP 3400.

Layer 4 throughput offered by the BIG-IP 1500 (210.5 Mbps). With 2K-byte objects, throughput of the Equalizer E350si jumped to 702 Mbps, or about 32% more than the BIG-IP 1500's 475 Mbps. Further, the Equalizer E350si throughput with 2K-byte objects is just 21% less than the BIG-IP 3400.

In the end, the Equalizer E350si delivers greater value, delivering greater performance at less cost than either of the F5 BIG-IP products tested.

View the full white paper at: <http://www.tolly.com/DocDetail.aspx?DocNumber=205131>

- Outperforms BIG-IP 1500 in every test, offers near-comparable performance to the more expensive BIG-IP 3400, and offers compelling price/performance advantages
- Achieves more than twice the connection rate supported by the F5 Networks BIG-IP 1500 with 64-byte objects, at almost one-sixth the cost-per-connection than F5's BIG-IP 1500
- Supports 40% more Layer 7 transactions-per-second with 64-byte objects than the BIG-IP 1500 (44,375 tps vs. 34,199 tps) and 30% greater throughput (199 Mbps vs. 151 Mbps)
- Costs three to four times less on a cost-per-transaction basis, and 30% to 50% less in terms of the cost-per-Mbps of throughput served than the BIG-IP 3400

## Layer 4 Price/Performance Analysis of Equalizer E350si vs. BIG-IP 1500/3400

Model (MSRP)	Object size	Connections/sec	Cost per cps (US\$)	Throughput (Mbps)	Cost per Mbps (US\$)
<b>Coyote Point Equalizer E350si</b> (US\$5,995)	64	78,885	0.08	468.6	12.79
	2K	31,996	0.19	701.7	8.54
	16K	5,518	1.09	777.8	7.71
F5 Networks BIG-IP 1500 (US\$15,995)	64	34,156	0.47	210.5	75.99
	2K	21,460	0.75	475.1	33.67
F5 Networks BIG-IP 3400 (US\$25,995)	16K	3,413	4.69	481.9	33.19
	64	137,398	0.19	811.5	32.03
	2K	40,753	0.64	893.5	29.09
	16K	6,599	3.94	930.4	27.94

Note: All BIG-IP prices are MSRP supplied by F5 during acquisition of the F5 gear by Coyote Point.

### Sponsor: Coyote Point Systems, Inc.

Document number: 205131 Product Class: Layer 4-7 load-balancing switch

Products under test:

- **Coyote Point Equalizer E350si SW Ver 7.2.0d**
- **F5 Networks BIG-IP 1500 SW Ver 9.1.0 Build 6.2**
- **F5 Networks BIG-IP 3400 SW Ver 9.1.0 Build 6.2**

Testing window: **September 2005**

For more info on this test, visit: <http://www.coyotepoint.com>

# Tests reveal high performance, low latency of Nortel Ethernet Routing Switches

Nortel commissioned The Tolly Group in September 2005 to measure the Layer 2 switching performance, average latency and standard deviation of latency of the vendor's stackable Ethernet Routing Switch 5510/5520/5530.

Engineers measured the amount of usable throughput as experienced by users. In addition, they reported the stackable switching capacity, or the total switching throughput "external" to users and "internal" between switch stack elements. The "internal" portion of this is not directly usable by end-user applications.

In a dual-switch stack configuration (24 GbE ports, two stacking ports), the Ethernet Routing Switch 5510-48T in the bottom of the stack provided 160 Gbps of stackable switching capacity, that translates into zero-loss, Layer 2 throughput of 80 Gbps using 40 Gigabit Ethernet ports and two stacking ports for the Ethernet frame sizes of 64, 128, 256, 512, 1024, 1280 and 1,518 bytes.

In the next throughput scenario, consisting of an Ethernet Routing Switch 5510-48T in an eight-switch stack configuration (320 GbE ports, 40 ports per switch), the stackable switching capacity was 640 Gbps, which translates into zero-loss, Layer 2 throughput of 320 Gbps when tested with Ethernet frame sizes of 64, 128, 256, 512, 1024, 1280 and 1,518 bytes.

- Delivers 640 Gbps of stackable switching capacity and 320 Gbps of aggregate Layer 2, zero-loss throughput in a configuration of eight Ethernet Routing Switch 5510-48Ts with 320 GbE ports
- Introduces extremely low average latency of 6 ~ 23 microseconds with 0 ~ 9.7 microseconds of standard deviation in the stack configuration
- Achieves 160 Gbps of stackable switching capacity and 80 Gbps of aggregate Layer 2, zero-loss throughput in a configuration of two Ethernet Routing Switch 5510-48Ts (40 GbE ports and two stacking ports)
- Provides 128 Gbps of stackable switching capacity and 64 Gbps of Layer 2, zero-loss throughput in a three-switch configuration of Ethernet Routing Switch 5510-48Ts (24 GbE ports and two stacking ports)

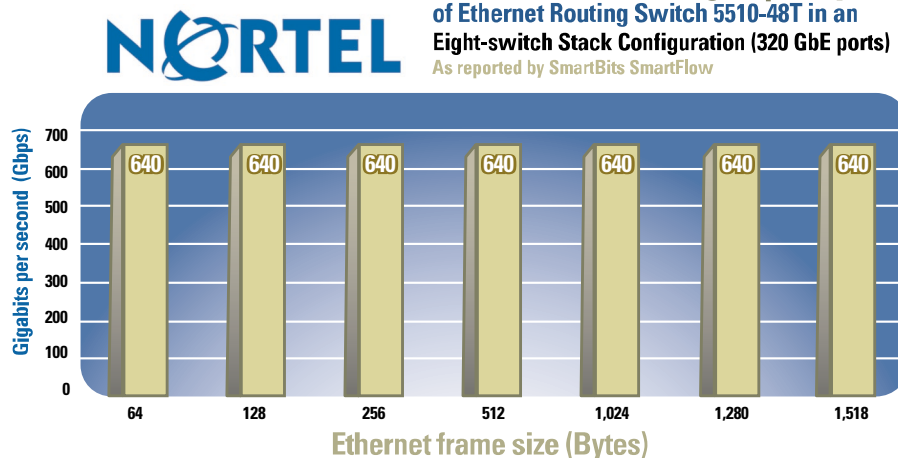
The Nortel Ethernet Routing Switch 5510s in the stack configuration demonstrated very low latency and standard deviation by recording 6 ~ 23 microseconds of average latency with 0 ~ 9.7 microseconds of standard deviation. "Standard deviation of latency" is a measure of how much the latency of a set of received packets varies from the mean. It is similar to jitter.

The Tolly Group also tested the Ethernet Routing Switch 5510-24T in a special three-switch stack configuration. The Tolly Group verified that the Ethernet Routing Switch 5510-24T in the middle of the stack provided 128 Gbps of stackable switching capacity, or 64 Gbps of zero-loss Layer 2 throughput using 24 Gigabit Ethernet ports and two stacking ports for the Ethernet frame sizes of 64, 128, 256, 512, 1024, 1280 and 1,518 bytes.

Finally, Tolly Group engineers measured the zero-loss Layer 2 throughput of the Ethernet Routing Switch 5510-48T in a stand-alone switch configuration. The Tolly Group verified that the Ethernet

## Stackable Switching Capacity of Ethernet Routing Switch 5510-48T in an Eight-switch Stack Configuration (320 GbE ports)

As reported by SmartBits SmartFlow



Routing Switch 5510-48T provides wire-speed throughput for all ports by recording 48 Gbps of zero-loss Layer 2 throughput using 48 Gigabit Ethernet ports for the Ethernet frame sizes of 64, 128, 256, 512, 1024, 1280 and 1,518 bytes.

Engineers also evaluated an Intelligent Auto Unit Replacement resiliency feature, examined the switches' ease of use and their management facilities.

View the full report at: <http://www.tolly.com/DocDetail.aspx?DocNumber=205137>

### Sponsor: Nortel

Document number: 205137

Product Class: Stackable switch

Product under test:

- Ethernet Routing Switch 5510
- Ethernet Routing Switch 5520
- Ethernet Routing Switch 5530

Testing window: September 2005

For more info on this test, visit: <http://www.nortel.com>



# Citrix NetScaler Application Switch speeds response times, lowers bandwidth consumption

Citrix Systems, Inc. commissioned The Tolly Group to examine the effectiveness of the Citrix® NetScaler® Application Switch, a purpose-built appliance that provides real-time compression for application data, including the ability to compress encrypted and unencrypted data for Web and client/server applications.

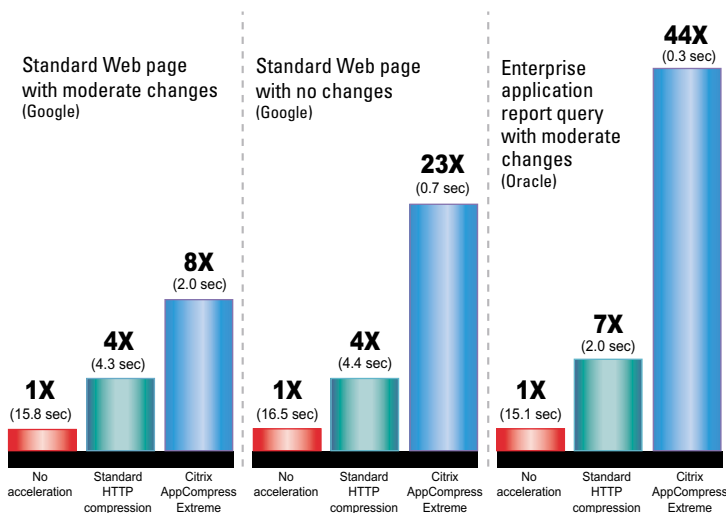
The objective of this evaluation was to measure application performance improvements yielded by Citrix's new AppCompress Extreme™ technology. Tolly Group engineers tested application acceleration benefits by measuring the total round trip time (in seconds) for an actual client requesting and receiving 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 simulate a true end-user experience.

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

Tolly Group testing determined that Citrix's AppCompress Extreme differential compression technology improved the performance of standard Web page downloads by as much as 44X, and sped the delivery of enterprise application data by 23X. AppCompress Extreme not only reduced response times for the application client,

- 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 modifications 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 Citrix'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.

but also lowered overall bandwidth consumption by as much as 90%.

The Citrix NetScaler Application Switch with 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 Citrix appliance, only changed data is sent to the client. By eliminating the transmission of redundant data over multiple requests, the Citrix NetScaler Application Switch improves overall application response times by transmitting far fewer bytes than is required with traditional HTTP compression techniques.

View the full white paper at:  
<http://www.tolly.com/DocDetail.aspx?DocNumber=205138>

Sponsor: **Citrix Systems, Inc.**

Document number: 205138

Product Class: Application Acceleration

Products under test:

• **NetScaler Application Switch -- Model 9950**

Testing window: June 2005

For more info on this test, visit:

<http://www.citrix.com/netscaler>

# Reflex Security intrusion prevention appliance blocks net attacks and delivers high performance, reliability and ease of use

Reflex Security, Inc. commissioned The Tolly Group to test the Reflex IPS 100 network intrusion prevention appliance. The Reflex IPS blocks a comprehensive range of malicious traffic, including HTTP attacks, Denial-of-Service attempts, scans, backdoor exploits, floods, viruses, and worms.

The Tolly Group validated the performance of the Reflex IPS 100, as well as the appliance's effectiveness at detecting and preventing a

**Sponsor:**  
**Reflex Security, Inc.**

Document number: **205136**

Product Class:  
Intrusion prevention appliance

Products under test:  
• **Reflex IPS 100 ver. 4.4**

Testing window:  
**September/October 2005**

For more info on this test, visit:  
<http://www.reflexsecurity.com>

variety of attacks. The Tolly Group also evaluated the system's reliability, reporting and ease of use.

The Tolly Group measured the maximum mixed-object size HTTP throughput across the Reflex IPS 100 with the Avalanche test tool that emulates complete HTTP transactions (TCP open – HTTP data transfer – TCP close). Each client requested 15 different HTTP data sizes ranging from 43 to 64 Kbps.

Tests show the Reflex IPS 100 delivered more than 100 Mbps of HTTP throughput under normal conditions. When Tolly Group engineers introduced attack traffic in the form of more than 500 various security events, the Reflex IPS 100 maintained more than 100 Mbps HTTP throughput. In both scenarios, the

Reflex appliance exceeded its rated 100-Mbps bidirectional throughput capability.

Next, Tolly Group tests confirmed the Reflex IPS 100 successfully blocked attack structures generated by the BLADE Software IDS Informer testing tool. The Reflex device continued to block attacks while sustaining more than 100 Mbps of background traffic. (Please check out the Test Summary #205136 for full details at <http://www.tolly.com>.)

The Tolly Group also tested the reliability of the Reflex IPS appliance, which uses the Sentrion™ disk-on-chip architecture. Sentrion eliminates the need for a hard disk within the appliance and the related performance and failure concerns. Tolly Group tests confirmed the appliance's ability to consistently fail-open or fail-closed as configured. As a result, administrators can set

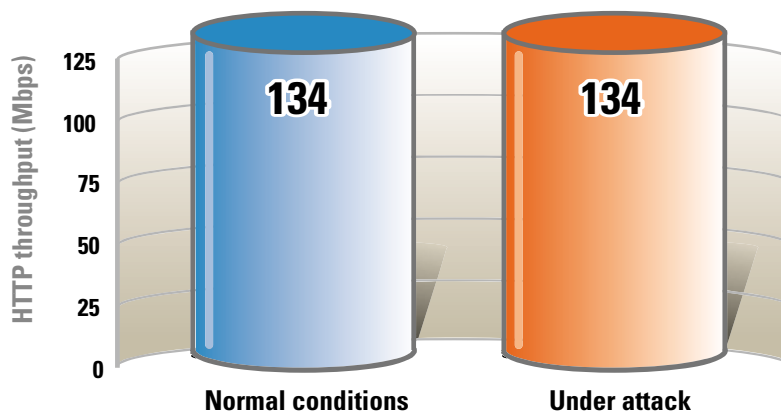
policy to allow traffic to pass or be denied in the event of a device malfunction.

Tolly Group engineers also noted that the Reflex IPS 100 offers a powerful, fully-customizable reporting capability with event aggregation/correlation, robust centralized management, and rapid installation. Engineers verified an initial install required just 30 minutes.

Overall, Tolly Group tests confirmed the Reflex IPS 100 was able to meet or exceed its stated capabilities for performance, comprehensive security, reliability, ease-of-use and management.

View the full report at:  
<http://www.tolly.com/DocDetail.aspx?DocNumber=205136>

## Reflex IPS 100 Mixed-Object Size HTTP Throughput



Note: Reflex IPS 100 maintains 134 Mbps throughput rate even while handling attack traffic load.

# Nortel gateway shines in SSL/IPSec evaluation

The emergence of SSL VPNs is forcing users to determine how best to integrate the nascent technology alongside installed IPSec VPN gateways. The vast majority of SSL VPN providers offer point-specific solutions, meaning their gateways support SSL VPNs only. This has enormous implications for management and for TCO.

Nortel has designed its Nortel VPN Gateway Portfolio with the installed base of IPSec VPNs in mind. Nortel's solution provides blended support for both Web-based SSL VPN access and IPSec VPN users which vastly simplifies the access requirements of highly mobile users needing access from many locations and device types.

Nortel commissioned The Tolly Group to evaluate the Nortel VPN Gateway 3070. Tolly Group engineers benchmarked the throughput of the Nortel VPN Gateway 3070, examined the limits of the device's scalability

and identified the extent of voice quality supported by the gateway. Testing was performed at The Tolly Group's Boca Raton, FL, facilities in March 2005.

Tests show that the Nortel VPN Gateway 3070 delivers consistent throughput when tested across workgroups scaling from 10 users, to 5,000 users. Scalability tests show that even as the number of users scales to 5,000, the device does not sacrifice significant throughput. Finally the Nortel VPN Gateway 3070 proved it can secure VoIP communications and SIP applications without impacting voice quality.

Tolly Group engineers also examined the SSL VPN functionality of the Nortel VPN Gateway 3070 and came away impressed with the application access, end-point security, access controls, overall VPN scalability and Nortel's ability to support secure real-time multimedia and VoIP services over SSL VPN.

The integrated support for IPSec and SSL VPNs in a single box ensures users that they deploy one box instead of two, and that box is configured and managed more easily than rival offerings that require a box dedicated to SSL VPNs and another dedicated to IPSec VPNs. Such solutions do not scale well, and present significant cost implications for widespread deployment.

Nortel's approach to SSL VPNs shows that it respects the investments enterprises have made in IPSec, and the company understands that IPSec VPNs will be around for quite some time.

Check out the full white paper on The Tolly Group's Web site at:

<http://www.tolly.com/DocDetail.aspx?DocNumber=205103>



- Provides steady-state SSL throughput of 600 Mbps, 422 Mbps and 294 Mbps for no encryption, RC4-MD5 and DES-CBC3-SHA encryption respectively during the 25-user test
- Demonstrates secure toll-quality VoIP call performance even with the VoIP traffic protected by SSL VPN
- Delivers consistently high 3DES VPN throughput even under heavily loaded conditions (5,000 user tunnels)
- Exhibits VPN technology integration coupled with high scalability and performance to yield lower deployment TCO

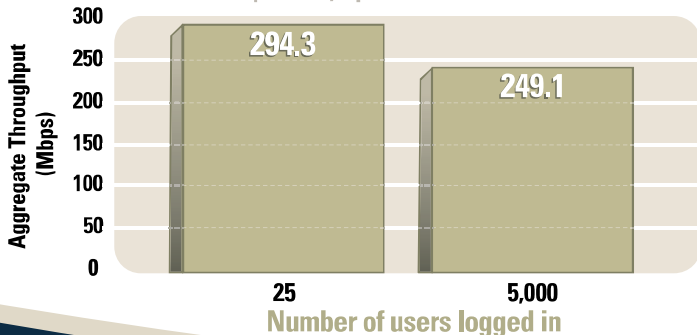
**Sponsor: Nortel**  
 Document number: 205103  
 Product Class: SSL/IPSec VPN Gateway

Products under test:

- Nortel VPN Gateway 3070 version SSL-5.0.3

Testing window: **March 2005**  
 For more info on this test, visit: <http://www.nortel.com>

Steady-state SSL Throughput with 25 and 5,000 Users  
 (Front-end encrypted using Triple DES, back-end unencrypted)  
 As reported by Spirent Avalance Commander



# Netreo OmniCenter vastly simplifies network management integration

Netreo, Inc. commissioned The Tolly Group in August 2005 to conduct an extensive hands-on evaluation of the company's OmniCenter™, a family of self-contained, fully integrated IT monitoring, alerting and reporting tools that provide easy-to-deploy and, ultimately, cost-effective network management.

Tolly Group engineers examining OmniCenter found that the offering provides extensive visibility into systems, network components and applications anchored on an enterprise network. OmniCenter is based

and simplicity for joining an existing enterprise network and configuring OmniCenter to collect data from network resources.

Device configuration itself required just about 15 minutes, and configuring OmniCenter to monitor and collect data for a number of test bed devices required about two hours. Obviously, users with large numbers of

OmniCenter, by contrast, offers near zero administration. OmniCenter also cuts down drastically on the report generation that must be handled by personnel, automating the process instead. All of this adds up to significant cost savings and rapid ROI. In short, the payback time for OmniCenter is just a few months, versus an entire year of costs created by complex management infrastructures.

Beyond costs, users need to consider the soft benefits of the OmniCenter service. The ability of the service to reduce annual high latency minutes, and reductions in downtime minutes, equally translate to sizable hard dollar savings. Users need to consider the simplicity of

OmniCenter and how it enables cost savings versus complex network management infrastructures and the army of specialists they demand.

View the full white paper at:  
<http://www.tolly.com/DocDetail.aspx?DocNumber=205129>

Sponsor: **Netreo, Inc.**

Document number: **205134**

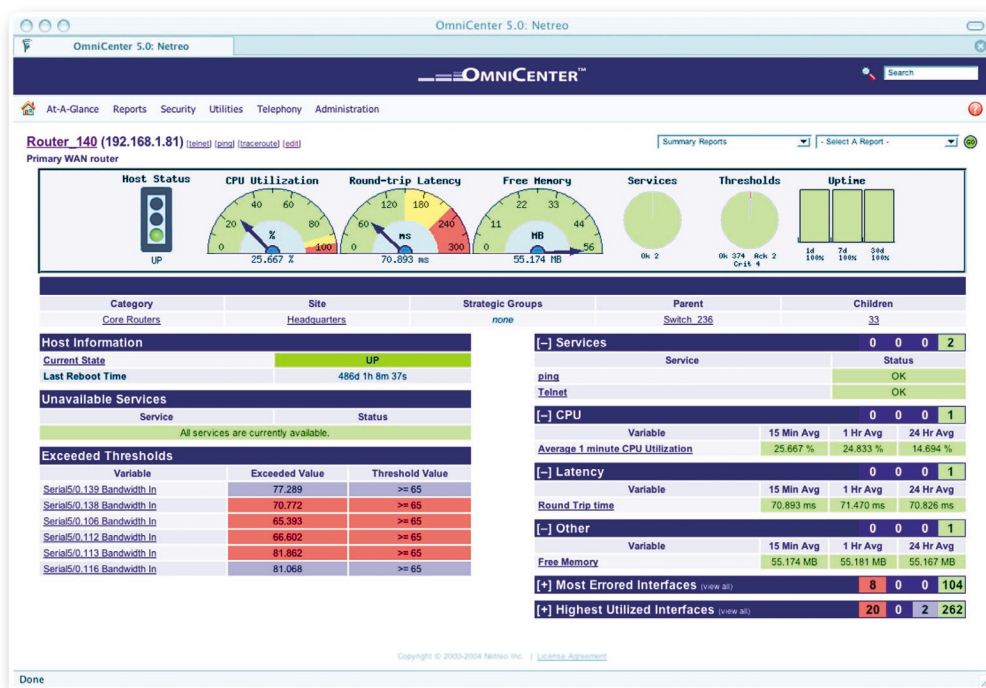
Product Class: **Integrated network management suite**

Products under test:

- **OmniCenter**

Testing window: **August 2005**

For more info on this test, visit: <http://www.netreo.net>



upon a clientless architecture that forgoes software agents in favor of using common protocols to collect management data. This support for a range of standards-based protocols ensures rapid deployment, painless integration and minimal administration overhead.

In our hands-on assessment during configuration and deployment, we encountered a product that offers flexibility

devices would require additional time, although OmniCenter's support for device templates will help reduce installation effort.

Many network management tools require extensive time and expertise to make them run in the most fundamental way. Consequently, users often must deploy a small army of expensive engineers and administrators dedicated to the network management tools.

# Level 5 Networks EtherFabric Gigabit Ethernet NIC outperforms conventional Ethernet for accelerated application performance

Level 5 Networks, Inc. commissioned The Tolly Group to evaluate its EtherFabric EF1-21022T, a dual-port Gigabit Ethernet (GbE) network interface that is designed to replace a traditional GbE interface seamlessly and accelerate application performance by speeding network I/O operations and improving host CPU efficiency by streamlining network processing.

The Tolly Group conducted a battery of three tests on the EtherFabric EF1-21022T and compared its performance against two leading conventional Ethernet LAN-on-Motherboard (LoM) chipsets, a Broadcom BCM 5721 NetXtreme Gigabit Ethernet Controller chipset (integrated in an IBM eServer xSeries 336) and an Intel Corp. 82541EI Gigabit Ethernet Controller chipset (integrated in a Dell PowerEdge 1850 server).

Tests showed conclusively that the EtherFabric EF1-21022T enabled a molecular dynamics high performance computer simulation application called GROMACS to scale significantly, over conventional Ethernet. EtherFabric delivered as much as 167% more simulation runs per day (equal to 419.17 thousands of picoseconds of simulation per day) than the conventional Ethernet LoM solution. The test involved running the simulation on 16 processors connected using both Gigabit ports on the EtherFabric NIC bonded into a single channel, called EtherFabric striped-mode.

## Sponsor: Level 5 Networks, Inc.

Document number: 205125  
Product Class: PCI-based Gigabit Ethernet NIC

### Products under test:

- **EtherFabric EF1-21022T**
- **Broadcom BCM5721 NetXtreme Gigabit Ethernet Controller chipset**
- **Intel Corp. 82541EI Gigabit Ethernet Controller**

Testing window: June 2005

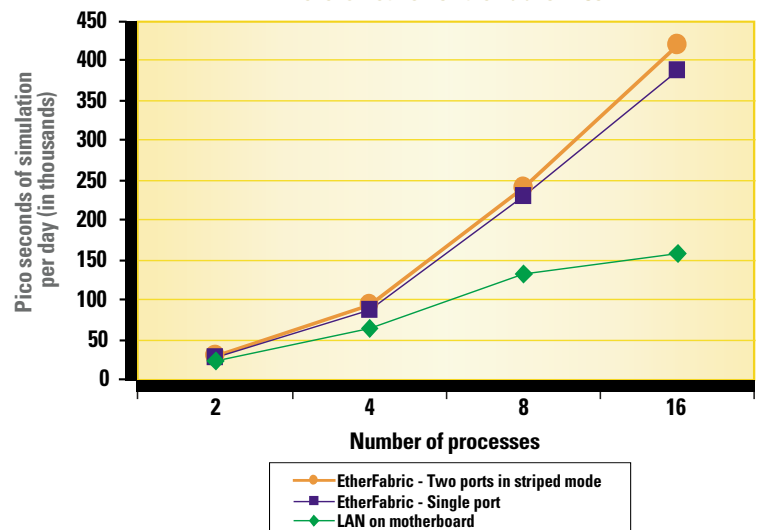
For more info on this test, visit:  
<http://www.level5networks.com>

In EtherFabric striped mode with only eight processes active, the EtherFabric EF1-21022T delivered 81% more simulation time per day than the LoM solution, 45% more with four processes active and 23% with two processes active.

Engineers also measured the latency between applications and EtherFabric's ability to increase the available bandwidth using the NetPerf performance tool. Netperf is a benchmark that provides tests for both unidirectional throughput, and end-to-end latency. The EtherFabric EF1-21022T delivered more than double the unidirectional TCP throughput when tested with smaller, more taxing message sizes of 64 bytes, in single-port mode versus both an Intel

## Scalability Comparison of Level 5 Networks EtherFabric versus LAN-on-Motherboard

GROMACS Molecular Simulation over SCALI MPI 8-node Cluster of dual Xeon-based Dell PowerEdge 1850 Servers populated with Level 5 Networks EtherFabric NICs



82541 chipset (residing in a Dell PowerEdge 1850) and Broadcom BCM5721 chipset (embedded in an IBM eServer xSeries 336). The EtherFabric EF1-21022T delivered up to 33% more throughput at 128-byte message sizes in single-port mode.

The Tolly Group also used the PingPong test of the PALLAS PMB MPI-1 benchmark to measure the one-way latency for various message sizes. The EtherFabric EF1-21022T introduced about one-fourth the one-way latency of the LoM technology, for 0-byte messages.

View the full white paper at:  
<http://www.tolly.com/DocDetail.aspx?DocNumber=205125>