THE TOLLY GROUP

Vyatta

Vyatta™ 1.1.2

Competitive Gigabit Ethernet LAN Routing
Throughput Evaluation versus Cisco 2821 Integrated Services Router

TOLLY Up to Spec CERTIFIED

Test Summary

Premise: *Many network professionals believe that proprietary hardware products are always better choices over standard x86-based systems for enterprises and small- to-medium-sized business (SMB) networking needs. As networks become more complex and diverse, IT managers have to pay more attention to upfront investments, ongoing maintenance costs and costs to scale for future growth. For the majority of SMB and enterprise branch office managers, open software on standard hardware is a viable answer to performance and cost-effective growth needs.*

V yatta commissioned The Tolly Group to evaluate the Vyatta software-based routing and security solution on an x86 processor -based system (Dell PowerEdge 860) for this test.

Tolly Group engineers measured the Layer 3 bidirectional and unidirectional zero-loss (≤ 0.001) throughput and the frame-loss rate of the device operating in a Gigabit Ethernet-to-Gigabit Ethernet scenario against a Cisco 2821 Integrated Services Router.

Testing was conducted in February 2007.

Test Highlights

▶ Outperforms the Cisco 2821 router consistently in Layer 3 Ethernet bidirectional zero-loss throughput, achieving up to twice the performance at half the price

▶ Operates at Layer 3 wire-speed across two onboard Gigabit Ethernet ports when forwarding 1,024-byte frames or higher

▶ Delivers lower frame-loss than the Cisco 2821 for all packet sizes and achieves zero frame loss with 1,024-byte packets and higher

▶ Leverages standard hardware and the structural cost benefits of the x86 ecosystem to offer a flexible, extensible and faster solution at attractive price points

Zero-Loss (≤ 0.001) Bidirectional Routing Throughput Across Two Gigabit Ethernet Ports (100 Flows)
as Reported by Spirent SmartFlow 5.5

Packet size	Vyatta	Cisco 2821
64	14	7
128	22	12
256	37	22
512	67	41
1,024	100	74
1,280	100	89
1,518	100	99

Percent of theoretical maximum (%)
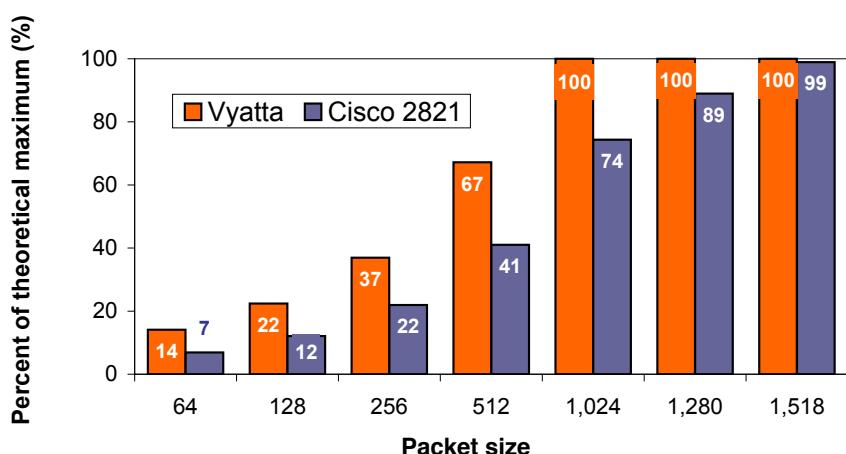
Source: The Tolly Group, February 2007

Figure 1

Executive Summary

Vyatta software running on a standard x86-based system achieves up to twice the throughput of a Cisco 2821 at half the price. In addition to impressive performance, Vyatta puts users on a structurally lower cost curve than proprietary products due to the superior economics associated with standard x86 hardware and related components.

Open software solutions that leverage standard x86 hardware can be viable alternatives to expensive proprietary solutions.

Vyatta's open solution demonstrates that standard hardware at attractive price points can not only perform better than a purpose-built box from a leading vendor, but it also provides enough processing headroom for expansion. The structural economics of the open model provides users with a cost-effective way to scale performance.

Another important benefit of Vyatta's open solution is that it decouples software from the underlying hardware and allows users to achieve software feature and service extensibility by leveraging thousands of Linux-compatible application packages that can integrate with the Vyatta software.

Tolly Group tests show that the Vyatta software delivered up to twice the Layer 3

Bidirectional Frame-Loss Rate at 100% of Line-rate Across Two Gigabit Ethernet Ports (100 Flows)
Lower bars represent better performance
as Reported by Spirent SmartFlow 5.5
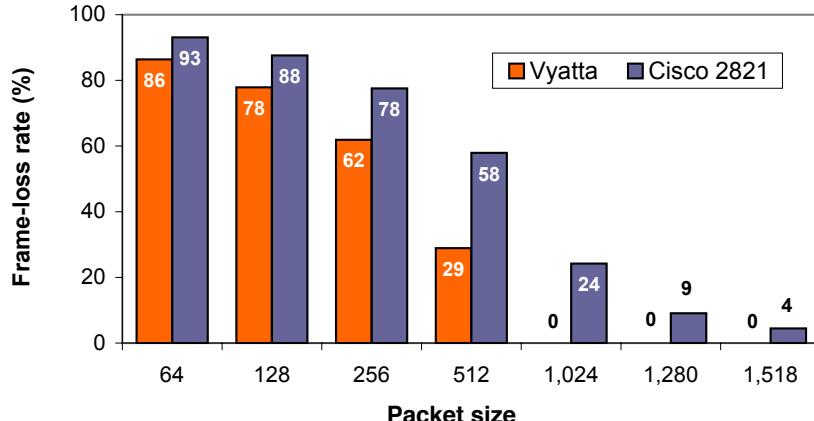
Source: The Tolly Group, February 2007   *Figure 2*

zero-loss throughput than a competing router tested from Cisco during a Gigabit Ethernet-to-Gigabit Ethernet (GbE) scenario with all packet sizes tested.

Engineers also tested the frame-loss rate which showed that the Vyatta software consistently outperformed the Cisco 2821 even at 100% of line-rate by recording from 4% to 29% lower frame loss than the Cisco 2821 for all the packet sizes tested. As shown in Figure 2, the Vyatta software did not drop any packets when handling the packet size of 1,024 bytes or higher but the Cisco 2821 dropped packets even for the larger packet sizes.

Tolly Group engineers also computed a cost per throughput or cost-per-Mbps value to assess the the price/routing throughput performance. Analysis shows that the Vyatta software offers a cost-per-Mbps ranging from $0.9 to $6.37, which is two to four times less than the Cisco 2821.

Zero-loss Throughput

Tolly Group engineers tested the Vyatta software running on a Dell PowerEdge 860 against the Cisco 2821 Integrated Services Router to measure the zero-loss ($\leq 0.001\%$) bidirectional and uni-directional routing throughput across two GbE ports inside the router. This is one of the popular tests to measure the router's packet processing power.

Engineers tested seven different packet sizes ranging from 64 to 1,518 bytes. For all tests of different packets, the Vyatta software outperformed the throughput offered by the Cisco 2821.

The Vyatta software achieved Layer 3 wire-speed throughput (2 Gbps of aggregate throughput) for 1,024 bytes or higher, while the Cisco 2821 never achieved wire-speed performance in any tests. For the 64-byte bidirectional throughput test, Vyatta offered double the throughput of the Cisco device — 282 Mbps

(419,689 frames per second), while the Cisco 2821 attained 138 Mbps (205,542 fps).

Frame-Loss Rate

Tolly Group engineers measured the frame loss rate of the Vyatta software and the Cisco 2821 at 100% of line rate. The results were consistent with the throughput test. The Vyatta software consistently outperformed the Cisco 2821, which dropped packets across all packet sizes tested.

Price/ Performance

Pricing for the products tested included the base system, as well as a one-year extended service plan. With a retail price of $1,797 for bundled hardware/software/support, Vyatta delivers price/ performance from a low of 90 cents per Mbps (1,024 byte packets or higher) to a high of $6.37 (64-byte packets). The base system Cisco 2821, with a retail price of $3,334.98, has a cost-per-Mbps ranging from a low of $1.69 (1,518-byte packets) to a high of $24.17 (64-byte packets). WAN interfaces were not factored into pricing.

When users want to add an additional Layer 3 Fast Ethernet routing port, Cisco users pay $1,009.99 (CDW.COM) to add one Fast Ethernet Layer 3 port (Cisco 1-port HWIC, MFG# HWIC-1FE). Vyatta users, by contrast, pay only $65 for a GbE port since

they can leverage the structural cost benefits of the x86 system.

Test Setup and Methodology

Tolly Group engineers tested Vyatta software version 1.1.2 running on a Dell PowerEdge 860 Server system (Single Celeron D 2.80 GHz, 256K cache, 512 MB DDR-2 SDRAM, OS: Linux Kernel Ver. 2.6.16). The server was outfitted with two on-board GbE ports. Engineers tested the router versus a Cisco 2821 Integrated Services Router, running software version 12.3(14) T4 and outfitted with two GbE ports.

Engineers used Spirent SmartBits and SmartFlow 5.5 software to measure the zero-loss throughput and frame loss rate at line-rate across two GbE ports. The SmartBits generated seven packet sizes: 64, 128, 256, 512, 1,024, 1,280 and 1,518 bytes.

The two GbE ports of each router were connected to a SmartBits test tool directly. The routers were configured for basic IP forwarding across two ports.

For zero-loss bidirectional routing throughput test, engineers configured the SmartBits to generate 50 UDP flows for one direction across two GbE ports and 50 UDP flows for the opposite direction. That is, 100 flows traveled across the device under test.

For zero-loss unidirectional test, engineers generated 50 UDP flows from one direction only.

For the frame-loss test, engineers set the SmartBits to generate the load at 100% of line-rate and measured the frame loss rate for the different packet sizes.

All tests were run for three iterations and the results were averaged.

Product Specifications
Vendor-supplied information not necessarily verified by The Tolly Group

Vyatta Software Features

- IP and Routing Protocols: IPv4, OSPFv2, BGPv4, RIPv2 Static routes
- IP Address Management: Static, DHCP server, DHCP relay
- Encapsulations: Ethernet, 802.1Q VLANs, PPP, Frame Relay, HDLC
- Logging and monitoring: Syslog, SNMPv2c
- Security: IPSec VPN, stateful inspection firewall, Network Address Translation, RADIUS authentication, User accounts and passwords
- High availability: VRRP, protocol fault isolation, redundant power supply (hardware system dependent)
- Administration: Integrated CLI, single configuration file for all protocols and subsystems, Web GUI, Telnet, SSHv2
- Debugging and Packet Sniffing: Tcpdump, Ethereal packet capture
- Interfaces: PCI and motherboard Ethernet , Sangoma A101 T1/E1 cards, Sangoma A301 T3/E3 cards

For more information contact:
VYATTA
1 Waters Park Drive, Suite 160
San mateo, CA 94403
Phone: (650) 350-3140
URL: http://www.vyatta.com

Bidirectional Gigabit Ethernet LAN Routing Price/ Performance Analysis of Vyatta vs. Cisco 2821

Bidirectional Routing Price/Performance Analysis of Vyatta vs. Cisco 2821			
Model (Price)	Packet size (Bytes)	Aggregate Throughput (Mbps)	Cost per Mbps (US$)
Vyatta (US$1,797)	64	282	6.37
	128	448	4.01
	256	739	2.43
	512	1,343	1.34
	1,024	2,000	0.90
	1,280	2,000	0.90
	1,518	2,000	0.90
Cisco 2821 (US$3,334.98)	64	138	24.17
	128	242	13.78
	256	439	7.60
	512	821	4.06
	1,024	1,487	2.24
	1,280	1,780	1.87
	1,518	1,979	1.69

Note: The product prices cover the base system (with two Gigabit Ethernet ports) plus 1-year extended service plan. The price information for Vyatta and Cisco 2821 was acquired from Vyatta's on-line retail store and CDW, respectively

Source: The Tolly Group, February 2007   *Figure 3*

The Tolly Group is a leading global provider of third-party validation services for vendors of IT products, components and services.
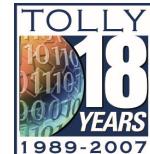
The company is based in Boca Raton, FL and can be reached by phone at (561) 391-5610, or via the Internet at: Web: http://www.tolly.com, E-mail: sales@tolly.com

TOLLY **18** YEARS 1989-2007

TESTED *with* SPIRENT.

Test Equipment Summary		
The Tolly Group gratefully acknowledges the providers of test equipment used in this project.		
Vendor	**Product**	**Web**
Spirent Communications	• SmartBits 6000B • SmartBits LAN-3327A • SmartFlow 5.5	www.spirent.com

207190-wbsftf1-cdb-07Mar07