

Avaya Data Network Solutions

Performance, Resiliency and TCO Comparison to Cisco/HP ProCurve Across Network Classes

Premise

The perceived myth among IT staffs is that the safe network investment is to side with the market leader. In today's networks, though, three factors emerge as the key to successful implementations — performance, resiliency and total cost of ownership. The vendor that delivers the greatest combination of those factors is positioned best to serve the needs of enterprise networks. Frequently, the market leader is not the best choice at delivering a rounded offering with optimal performance, resiliency and competitive TCO.

Avaya commissioned The Tolly Group over the last two years to benchmark the performance, and evaluate the features/functions, of products that serve every facet of the enterprise network, from the data center to the remote branch office.

The aim was to measure, objectively, the performance, and evaluate the resiliency and TCO, of Avaya products versus products from Cisco Systems, Inc. and HP ProCurve. Tolly Group engineers examined products for the data center, for campus LANs, for wide area networks, branch offices, and also for application acceleration products to speed the performance of business applications.

This report provides a retrospective of Avaya-focused reports dating back to 2005, with emphasis on showing how Avaya addresses these factors to offer products that surpass competitors. Tests were conducted from 2005 to 2007.

Test Highlights

- 1 Outpaces Cisco and ProCurve switches consistently in throughput, delivering the maximum Layer 2, zero-loss throughput on tested switches
- 2 Enables rapid recovery from link, switch and server failures via Avaya's Split MLT, load balancing and other innovations
- 3 Recovers from switch failures 7X faster and from link failures 4X faster than Cisco and ProCurve devices tested
- 4 Combines performance gains and resiliency with lowest cost/gigabit of tested products, at 3X to 5X less cost than Cisco

Comparison of Avaya vs. Cisco/HP Across Network Classes

Network Class	Performance & Resiliency	TCO
Data Center	Sub-second failover with Split MLT, uninterrupted service due to load balancing	Application acceleration reduces bandwidth consumption by up to 99%, lowering circuit usage
Campus/LAN	Throughput gains of up to 4X over rival products tested 4X to 7X faster recovery from link or switch failures	Avaya ERS switches are 3X to 5X less costly than Cisco gear
WAN/Branch Office	4.5X faster with superior voice quality High availability for branch offices	50% less equipment costs, plus reduced circuit usage

Source: The Tolly Group, 2005-2007

Figure 1



Executive Summary

Avaya consistently demonstrated superior switching performance compared to Cisco and HP ProCurve products tested, while also delivering resiliency to rapidly rebound from failures. Avaya products offered the most aggressive TCO of all products tested.

Performance + Resiliency + TCO. If there is a formula to guarantee the success of enterprise networks, that would be it.

High performance is a given. Real-time communications require it; poor throughput over costly wide area network (WAN) circuits results in wasted bandwidth.

Resiliency now is just as vital. The ability to bounce back, instantaneously, from a network outage or device failure is critical to real-time applications such as voice over IP (VoIP), video and other applications.

Sub-second recovery time is crucial in today's networks.

Finally, companies mandate that IT must be smart about spending budget dollars. Investments need to be justified and ROI needs to be measured. Network product purchases have to yield cost savings that justify the TCO over the life of the product.

In each of these areas Avaya products emerged as the leader during Tolly Group tests benchmarking performance, measuring resiliency and calculating TCO.

Campus/LAN Performance

In a September 2007 test of the Avaya ERS 4548GT-PWR versus a Cisco Catalyst 3750G-PS and a Catalyst 3560G-PS, Avaya outperformed the Cisco switch.

The ERS 4548GT-PWR demonstrated Layer 2, zero-loss throughput in a standalone, full-mesh configuration with 48 ports. The Cisco devices achieved only 55% to 62% of wire-speed throughput. (See Figure 2.)

Avaya Inc.

Data Network Solutions

Performance, Resiliency and TCO Across Network Classes

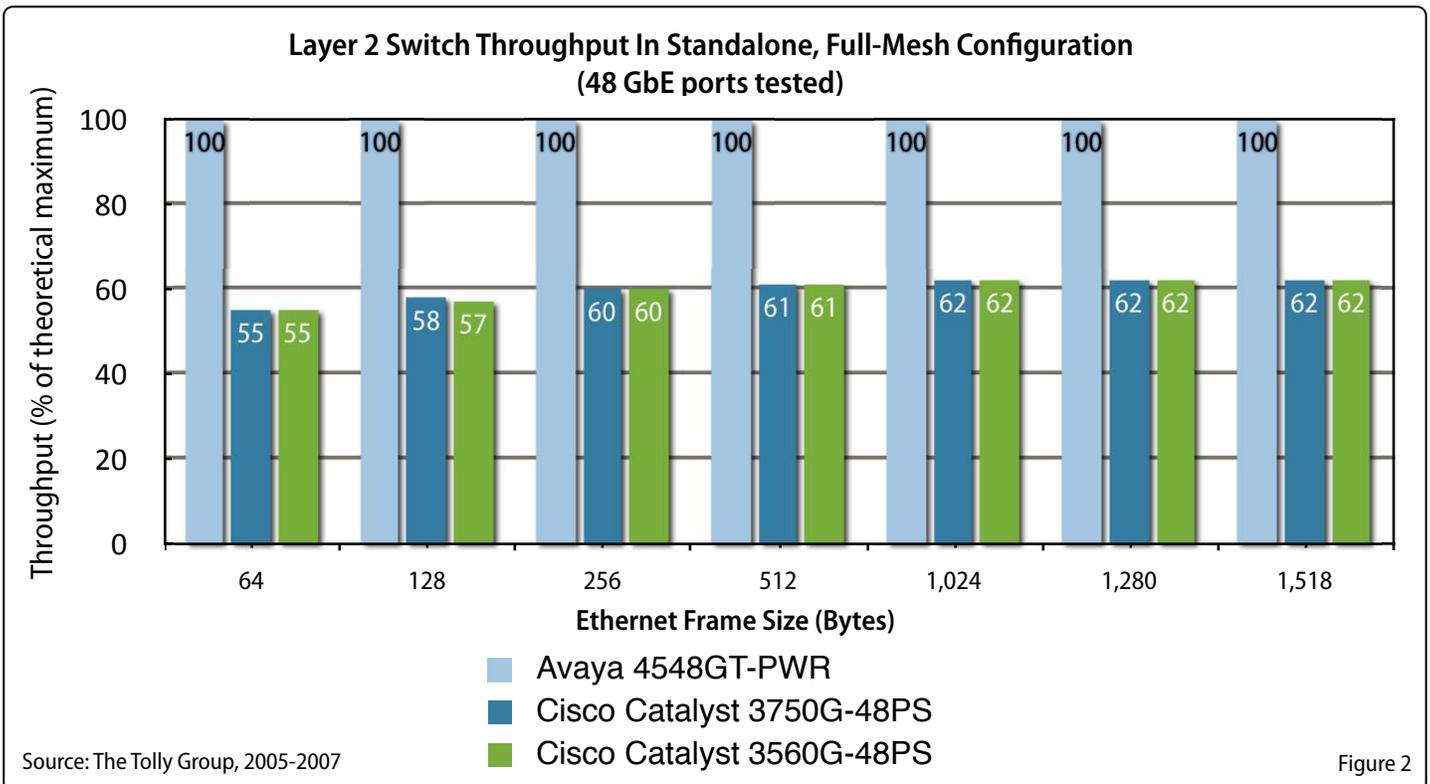


Tested 2005 through 2007

Note that Avaya delivered superior performance at about one-third the cost per gigabit of throughput when compared to Cisco devices tested.

Stacking Throughput

A July 2007 report on the ERS 4500 (Tolly Group document 210116) shows that the





Avaya switches deliver Layer 2 zero-loss throughput across all Fast Ethernet and Gigabit Ethernet ports. Tests further verified that the ERS 4548GT-PWR delivered 160 Gbps of zero-loss throughput in an eight-unit stack.

Branch Office Switch Performance

In a May 2007 Tolly Group test of branch office switches (Tolly Group document 210117), Avaya's ERS 2526T and 2550T delivered superior performance to Cisco Catalyst 2960-24T and ProCurve Networking 2626 and 2650 devices.

The Avaya ERS 2526T and ERS 2550T delivered up to 30% greater frame forwarding than the Cisco and ProCurve devices tested, and also achieved Layer 2 wire-speed, zero-loss throughput across seven frame sizes ranging from 64 bytes to 1,518 bytes.

Avaya Goes "Green;" Tests Reveal Savings

A Tolly Group test examining Avaya's commitment to make its products energy efficient reveals that ERS 2500/4500 Series switches cost 56% less than Cisco and 41% less than HP ProCurve to power over a three-year period.

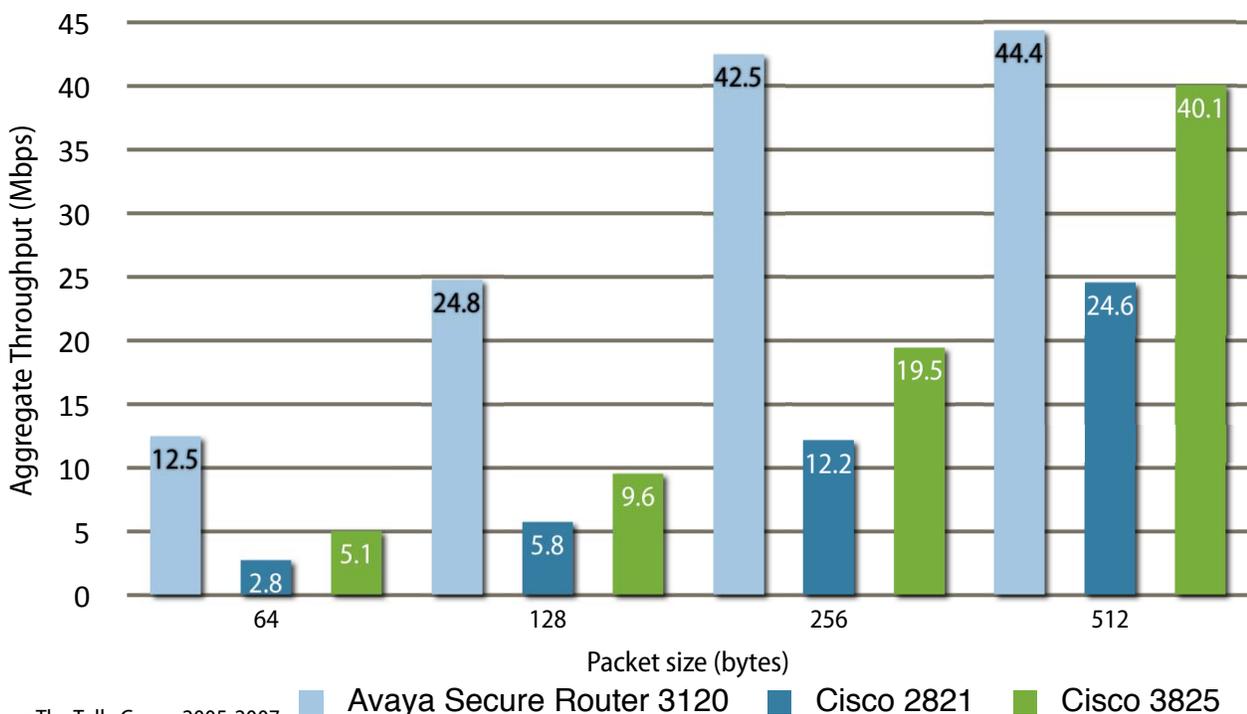
The Tolly Group report (Document 210110) shows that the Avaya ERS 4550T-PWR with RPS 15 yields a cost/gigabit of US\$146, or 3X less than the US\$458 cost/gigabit for a Cisco Catalyst 3750E-48PD.

The report shows that the Avaya switches tested achieved an average power consumption of 31 to 37 kilowatt hours (kWh) for 24-port models and 39 kWh to 45 kWh for 48-port models. The Cisco products tested consumed an average of 84 kWh to 104 kWh for 48-port Catalyst models.

The report finds that the ERS switches tested would cost between US\$77 to US\$112 to power over a three-year period; Cisco products tested would cost from US\$209 to US\$254 to power over the same period.

Calculations were based on the national average retail price of commercial electricity: US\$0.0946 cents per kilowatt hour (1995 to 2006).

DS-3 PPP WAN Bidirectional Throughput Zero-loss Performance with QoS/ACL/NAT Enabled



Source: The Tolly Group 2005-2007

Figure 3



WAN Router Performance

Tolly Group testing also shows that Avaya's Secure Router 1002/1004 delivers up to 6X the performance of Cisco Integrated Service Routers tested.

In other tests, the Avaya Secure Router 3120 delivered zero-loss throughput across a group of eight simulated T-1s even with the overhead imposed by services such as QoS, ACL and NAT being active. In the same set of tests, the Secure Router 3120 delivered more than double the throughput of a Cisco 3825 ISR and up to 4X the throughput of a Cisco 2821 ISR when tested over a simulated point-to-point DS-3. (See Fig. 3.)

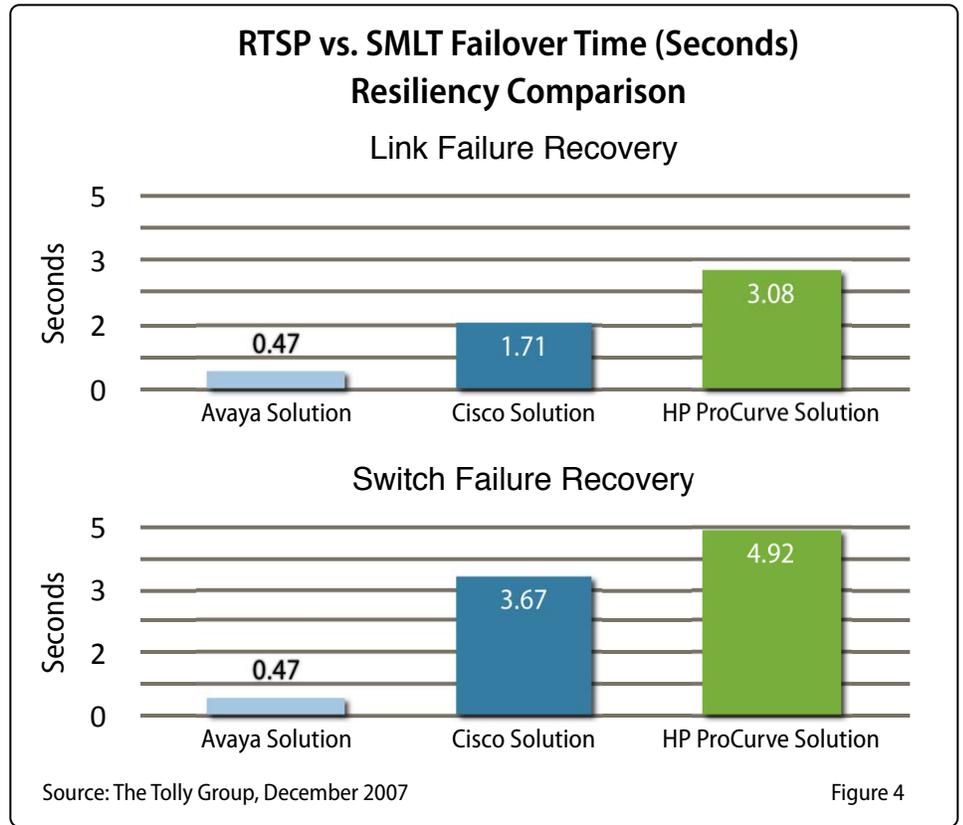
Resiliency

Hand in hand with throughput, Avaya consistently demonstrated that it delivers considerable resiliency to recover from link and device failures with sub-second response times.

Campus/LAN Resiliency

The September 2007 test of the Avaya ERS 4548GT-PWR versus a Cisco Catalyst 3750G-PS and a Catalyst 3560G-PS underscores the differences between each vendor's resiliency.

When Tolly Group engineers failed a switch in a five-stack scenario (by removing a cable) the Avaya switch stack continued to deliver



the normal 60 Gbps of throughput across a VLAN, but Cisco responded by offering only 14 Gbps across its stack.

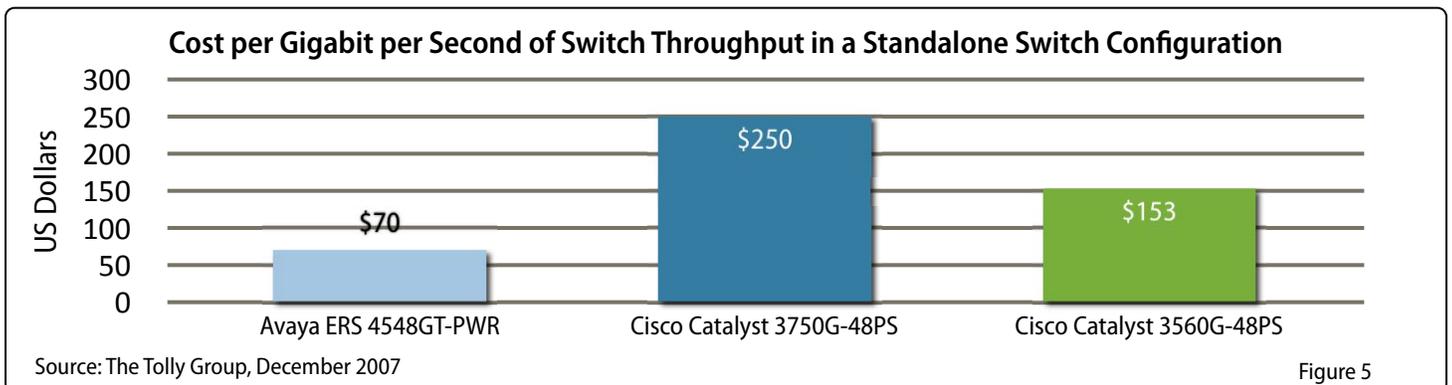
WAN/Branch Office Resiliency

Buyers should look closely at Avaya's Secure Router Series. In addition to supporting typical router high availability features such as VRRP, BGP multihoming, MPLS Fast Reroute and how-swappable modules, the Secure Router's multilink capabilities offer a

resiliency boost. Multilink guards against individual WAN circuit failures and restores bandwidth once a connection has been repaired.

Protection in the Data Center

Tolly Group tests showed that critical VoIP traffic was delivered, uninterrupted, even when engineers introduced critical uplink and core switch failures over a Avaya ERS 8600 backbone supporting Split Multi-Link





Trunking. Recovery times were a half second or less, on average. (See Figure 4.)

The Tolly Group tested the ERS 8600 and Split MLT, along with Avaya ERS LAN switches, in February 2007 (Tolly Group document 207171) to gauge its performance in supporting critical multimedia traffic for Microsoft Live Communications Server 2005 and Avaya's MCS 5100.

The ERS switches delivered exceptionally high voice quality and 100% call setup and completion even when outages were introduced.

Rapid Failover

In a September 2006 report on converged networks, The Tolly Group evaluated the resilience of Avaya ERS 8600 core switches and ERS 8300 and ERS 5520 PoE devices operating at the network edge.

When the link between core switches was deliberately failed, traffic resumed on an alternate link in just 240 milliseconds. Further, the Avaya converged data network provided auto recovery of link, switch and

site failures while still achieving toll-quality voice and 100% call setup and completion.

TCO Considerations

Avaya has demonstrated consistently that it delivers better switch performance and resiliency in the network data center, LAN/campus and across wide area connections and at remote branch sites than competitors such as Cisco and HP ProCurve.

What really begins to make the case compelling for Avaya is when buyers look at the performance and resiliency gains in context of equipment cost.

When The Tolly Group examines TCO, it does so from the perspective of the cost per gigabit of throughput. Basically, cost/gigabit is the cost of a switch or router divided by the throughput achieved, to obtain a cost for delivering a single gigabit of traffic

Upside in Campus LANs

The Avaya ERS 4548GT-PWR achieved an average cost/gigabit of throughput of US \$70, which was 4X less than the Catalyst 3750G-48PS (US\$250) and 2X less than the

Catalyst 3560G-48PS (US\$153). (See Figure 5.)

Keep in mind that TCO should be factored in with performance and resiliency to obtain the total picture. The Avaya ERS 4548GT-PWR achieved wire-speed 48 Gbps, which was between 40% to 50% greater than the performance delivered by the Catalyst switches tested. Resiliency tests showed that when a link to a five-switch stack was failed, the Avaya stack retained its 60 Gbps throughput, but the Cisco stack cut back to 14 Gbps.

Avaya Holds Branch Office TCO Advantage

The Tolly Group tested the 24-port ERS 2526T and the 48-port 2550T versus comparable Cisco Catalyst models. Tests show that the Catalyst 2960-24TC costs 5X more than the ERS switches, and the 48-port Avaya switch is 4.3X less than the comparable Cisco device. Coupled with wire-speed throughput this makes the ERS models a value versus Cisco products that offered lower frame processing rates.

Avaya Data Networking Reports Available at Tolly.com

Document Number	Title
210110	Converged Data Network Solution: Evaluation of Energy Consumption and Projected Costs for a Converged LAN Campus, Data Center and WAN
210111	Avaya Secure Router 4134 vs. Cisco ISR 3845: WAN Router Performance, Power Consumption and TCO
210112	Ethernet Routing Switch 8300 Series: Competitive Performance Evaluation versus Cisco Catalyst 4500 Series with Supervisor Engine V-10GE
210114	Avaya Ethernet Routing Switch 5510, 5520 & 5530: Layer 2 Performance, Resiliency and Ease of Use
210115	Avaya Ethernet Routing Switch 4548GT-PWR: Layer 2 Switch Performance Evaluation versus Cisco Catalyst 3560G-48PS and 3750G-48PS
210116	Avaya Ethernet Routing Switch 4500 Series: Layer 2 Performance and Resiliency
210117	Avaya Ethernet Routing Switch 2526T & 2550T: Competitive Performance Evaluation vs. Cisco Catalyst 2960-24T & 48T, and HP ProCurve Networking 2626 & 2650
210118	Avaya Ethernet Routing Switch 5000 Series: Competitive Performance Evaluation versus Cisco Catalyst 3750G and HP ProCurve 3400cl



About Tolly

The Tolly Group companies have been delivering world-class IT services for more than 20 years. Tolly is a leading global provider of third-party validation services for vendors of IT products, components and services.

You can reach the company via E-mail at sales@tolly.com, or via telephone at +1 561.391.5610.

Visit Tolly on the Internet at:

<http://www.tolly.com>

Competitive Interaction

This report is a compilation of previous reports. Please see the individual reports, listed elsewhere in this document, for details of competitive interaction.



For more information on the Tolly Fair Testing Charter, visit:

<http://www.tolly.com/FTC.aspx>

Terms of Usage

This document is provided, free-of-charge, to help you understand whether a given product, technology or service merits additional investigation for your particular needs. Any decision to purchase a product must be based on your own assessment of suitability based on your needs. The document should never be used as a substitute for advice from a qualified IT or business professional. This evaluation was focused on illustrating specific features and/or performance of the product(s) and was conducted under controlled, laboratory conditions. Certain tests may have been tailored to reflect performance under ideal conditions; performance may vary under real-world conditions. Users should run tests based on their own real-world scenarios to validate performance for their own networks. Testing conducted by The Tolly Group, Inc. Used by permission.

Reasonable efforts were made to ensure the accuracy of the data contained herein but errors and/or oversights can occur. The test/audit documented herein may also rely on various test tools the accuracy of which is beyond our control. Furthermore, the document relies on certain representations by the sponsor that are beyond our control to verify. Among these is that the software/hardware tested is production or production track and is, or will be, available in equivalent or better form to commercial customers. Accordingly, this document is provided "as is", and Tolly Enterprises, LLC (Tolly) gives no warranty, representation or undertaking, whether express or implied, and accepts no legal responsibility, whether direct or indirect, for the accuracy, completeness, usefulness or suitability of any information contained herein. By reviewing this document, you agree that your use of any information contained herein is at your own risk, and you accept all risks and responsibility for losses, damages, costs and other consequences resulting directly or indirectly from any information or material available on it. Tolly is not responsible for, and you agree to hold Tolly and its related affiliates harmless from any loss, harm, injury or damage resulting from or arising out of your use of or reliance on any of the information provided herein.

Tolly makes no claim as to whether any product or company described herein is suitable for investment. You should obtain your own independent professional advice, whether legal, accounting or otherwise, before proceeding with any investment or project related to any information, products or companies described herein. When foreign translations exist, the English document is considered authoritative. To assure accuracy, only use documents downloaded directly from Tolly.com. No part of any document may be reproduced, in whole or in part, without the specific written permission of Tolly. All trademarks used in the document are owned by their respective owners. You agree not to use any trademark in or as the whole or part of your own trademarks in connection with any activities, products or services which are not ours, or in a manner which may be confusing, misleading or deceptive or in a manner that disparages us or our information, projects or developments.