

Nortel

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



Test Summary

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, unflappable resiliency and competitive TCO.

Nortel 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 Nortel 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 Nortel-focused reports dating back to 2005, with emphasis on showing how Nortel addresses these factors to offer products that surpass competitors.

Test Highlights

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

Comparison of Nortel vs. Cisco/HP Across Network Classes

| Network class | Performance | Resiliency | TCO |
|-------------------|---|---|---|
| Data Center | Application acceleration reduces download times by 34X | 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 | Nortel 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, December 2007

Figure 1

Executive Summary

Nortel consistently demonstrated superior switching performance compared to Cisco and HP ProCurve products tested, while also delivering resiliency to rapidly rebound from failures. Nortel 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 Nortel 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 Nortel ERS 4548GT-PWR versus a Cisco Catalyst 3750G-PS and a Catalyst 3560G-PS, Nortel 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.)

Note that Nortel 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 207220) shows that the Nortel 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.

WAN/BRANCH OFFICE PERFORMANCE

In a May 2007 Tolly Group test of branch office switches (Tolly Group document 207178),

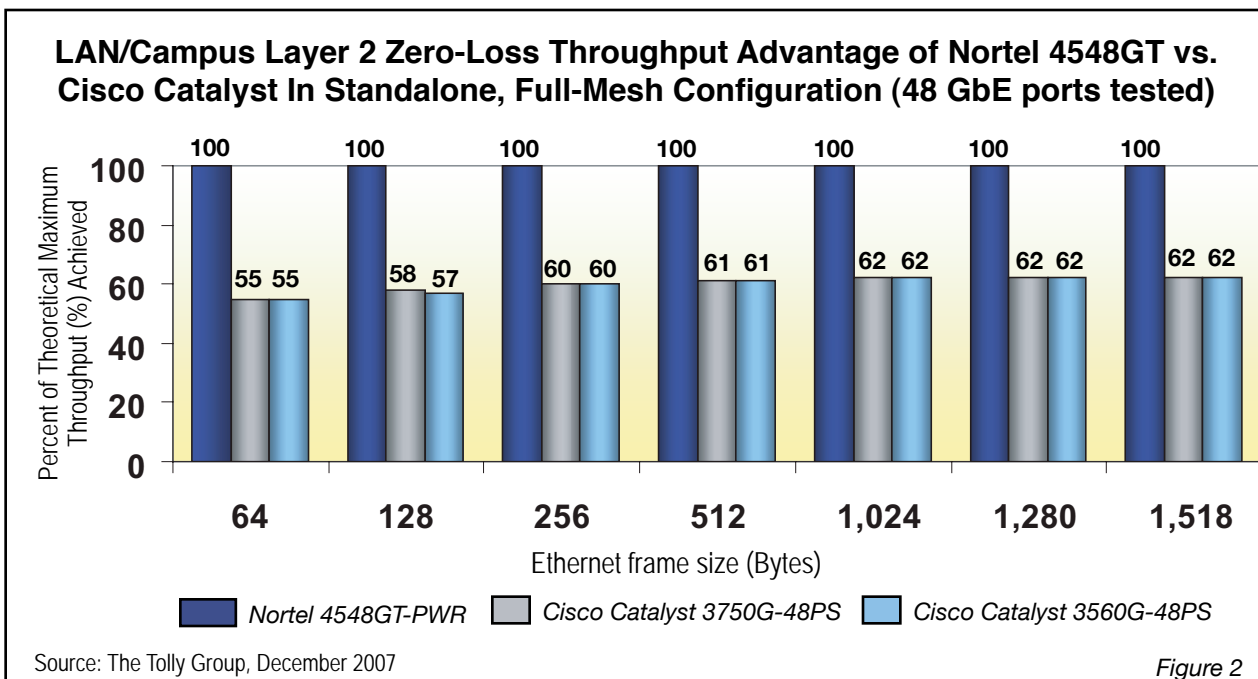


Figure 2

Nortel's ERS 2526T and 2550T delivered superior performance to Cisco Catalyst 2960-24T and ProCurve Networking 2626 and 2650 devices.

The Nortel 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.

SECURE ROUTER ADVANTAGE

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

In other tests, the Nortel 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.)

DEVICE PERFORMANCE IN THE DATA CENTER

Companies intent on guaranteeing application performance to remote teleworkers may deploy the Nortel Application Accelerator 510. Commonly deployed in the data center, the NAA 510 delivered a 99% improvement in bandwidth savings to users of three common business applications — Share-

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Nortel Goes "Green;" Tests Reveal Savings

A Tolly Group test examining Nortel'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.

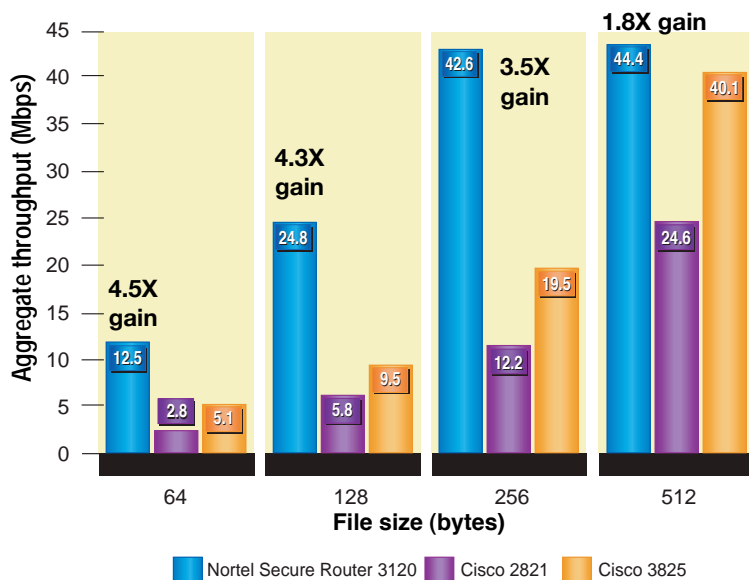
The Tolly Group report (Document 208269) shows that the Nortel ERS 4550T-PWR with RPS 15 yields a cost/gigabit of US\$146, or 3X less than the US\$458 cost/gigabit for a Cisco Catalyst 3750E-48PD.

The January 2008 report (Document 208269) shows that the Nortel 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).

**Nortel Secure Router 3120 vs. Cisco 2821/Cisco 3825 Full-Duplex 1xDS-3 PPP WAN Throughput
Zero-loss Performance with QoS/ACL/NAT Enabled**



Source: The Tolly Group, December 2007

Figure 3

point Server 2003, Microsoft Outlook Web Access 2003 and Internet Information Server. In fact, NAA 510 delivered Microsoft Outlook Web Access application data up to 10X faster than without any compression.

Tests showed that Sharepoint users could experience up to a 34X improvement in application response times due to NAA 510.

RESILIENCY

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

CAMPUS/LAN RESILIENCY

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

When Tolly Group engineers failed a switch in a five-stack scenario (by removing a cable) the Nortel 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 Nortel’s Secure Router Series.

In addition to supporting typical router high availabil-

ity 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 Nortel 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 Nortel 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 Nortel’s MCS 5100.

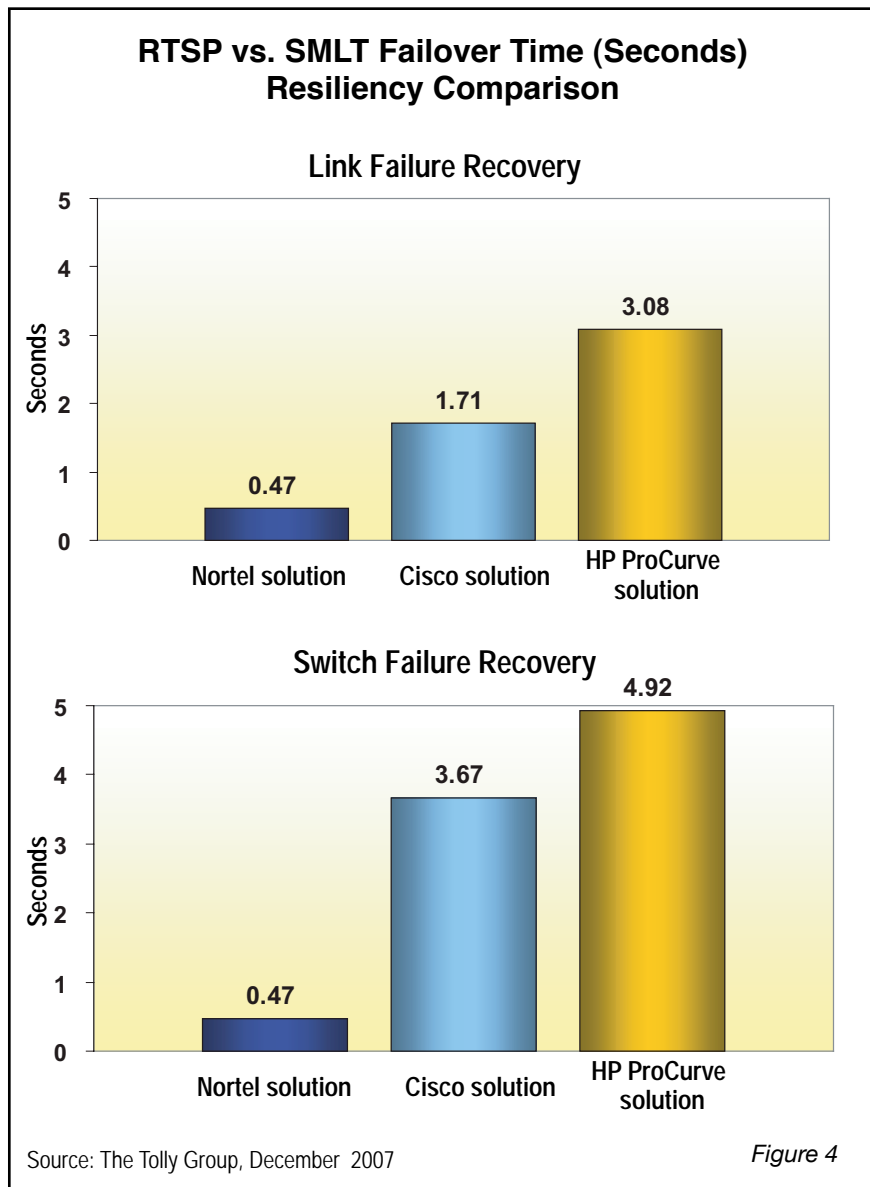


Figure 4

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 Nortel 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 Nortel converged data network provided auto recovery of link, switch and site failures while still achieving toll-quality voice and 100% call setup and completion.

RESILIENCY EXTENDS TO APPLICATIONS

Tolly Group tests also show that Nortel Application Switches, with global and local server load balancing, deliver uninterrupted service when encountering a failure.

Tests showed the Nortel's Global Server Load Balancing in its Application Switch 2424 and Application Switch 3408 delivered uninterrupted service to a Microsoft Live Communications Server 2005 application.

Voice and video sessions migrated gracefully during failover of an Application Switch, a link to the switch failed or when the Local LCS server managing sessions failed.

TCO CONSIDERATIONS

Nortel 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 Nortel 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.

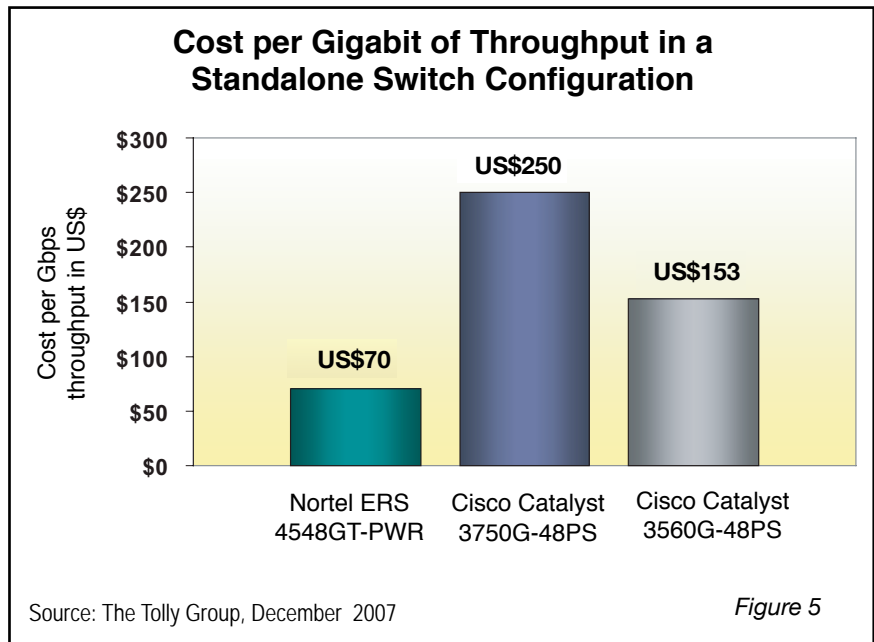
UPSIDE IN CAMPUS LANS

The Nortel 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 Nortel 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 Nortel stack retained its 60 Gbps throughput, but the Cisco stack cut back to 14 Gbps.

NORTEL 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 Nortel 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.



Nortel Reports Available at The Tolly Group

| Document | Title |
|------------------------|--|
| 207273 | Tolly Benchmarks Vol. 6 No. 4 - Nortel Highlights |
| 207237 | ERS 4548GT-PWR Competitive Layer 2 Performance Evaluation vs Cisco |
| 207220 | ERS 4500 Layer 2 Performance and Resiliency |
| 207212 | Nortel Application Accelerator 510 Evaluation |
| 207178 | Ethernet Routing Switch 2526T & 2550T Competitive Performance Evaluation vs. Cisco |
| 207179 | Nortel Application Switch 2424/3408 Evaluation |
| 207171 | Nortel Ethernet Routing Switches 5500, 1600, 8300 and 8600 Evaluation |
| 207177 | Nortel Application Switch 2424/3408 Evaluation |
| 206145 | Converged Network Infrastructure Evaluation |
| 206106 | Ethernet Routing Switch 5000 Series, Competitive Performance Evaluation vs. Cisco |
| 205143 | Nortel Secure Router 1002 and 1004 Competitive Evaluation vs. Cisco ISRs |
| 205146 | Nortel Secure Router 3120 Competitive Evaluation vs. Cisco ISRs |

For a complete listing of all Tolly Group reports on Nortel products, go to www.tolly.com and under search enter "Nortel"

The Tolly Group also tested a trio of ERS switches (ERS 5510, 5520 and 5530) and found that they cost 3X less than a Catalyst 3750G on a cost/megabit basis — US\$90 for Nortel vs. US\$313 for Cisco.

In the branch office class, buyers should look closely at Nortel’s Secure Router Series, each of which can consolidate the functions of multiple branch office devices into one, reducing manpower and operational costs, plus easing management. They also enable users to take advantage of the full bandwidth of WAN circuits they pay for on a monthly basis.

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



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