Nortel

Ethernet Routing Switches
5500, 1600, 8300 and 8600

Evaluation of Resilient Routing Switches for Real-Time Multimedia Traffic with Microsoft Live Communications Server 2005 and Nortel MCS 5100

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Test Summary

Premise: The convergence of voice, data and video services onto the enterprise LAN demands that the underlying infrastructure deliver high performance and availability and also be resilient. Furthermore, for enterprise class networks, that infrastructure must provide high quality QoS and application level intelligence to provide true "toll quality" voice and uninterrupted support for user multimedia sessions.

Nortel commissioned The Tolly Group to evaluate its Ethernet Routing Switch 5500, 1600, 8300 and 8600 series switches for their support of Nortel's Split Multi-Link Trunking (SMLT) protocol when deployed at the network core.

The series of tests called for demonstrating that each ERS model could be deployed as core SMLT Inter Switch Trunk (IST) switches to provide excellent resilience in the face of link and node outages. Tests also measured the impact of active link and switch failures on the voice quality for VoIP traffic and on the stability of multimedia user sessions using Nortel MCS (Multimedia Collaboration Server) 5100 and Microsoft Live Communications Server (LCS) 2005. Tests were conducted in October 2006.

Test Highlights

▸ Audio/video traffic from Microsoft Live Communications Server (LCS) 2005 and Nortel Multimedia Collaboration Server (MCS) 5100 runs uninterrupted over Nortel Ethernet Routing Switches during link and switch failure

▸ Nortel Ethernet Routing Switches tested support "toll-quality" voice and 100% call setup and completion by providing sub-second recovery

▸ Nortel Ethernet Routing Switches running Split Multi-Link Trunking (SMLT) deliver sub-second reliability and resiliency when handling audio/video traffic

Nortel Ethernet Routing Switches
Impact of Network Failures on Videoconference Sessions

Active multimedia application	Network failure scenario	ERS switch at network core*			
		ERS 8600	ERS 8300	ERS 5530	ERS 1600
Nortel Multimedia Collaboration Server 5100	Active uplink failure	Uninterrupted	Uninterrupted	Uninterrupted	Uninterrupted
	Active core switch failure	Uninterrupted	Uninterrupted	Uninterrupted	Uninterrupted
Microsoft Live Communications Server 2005	Active uplink failure	Uninterrupted	Uninterrupted	Uninterrupted	Uninterrupted
	Active core switch failure	Uninterrupted	Uninterrupted	Uninterrupted	Uninterrupted

* When a pair of ERS switches was at the network core, the other ERS switches were used at the edge. All switches were tested at the core and at the edge.

Source: The Tolly Group, October 2006   Figure 1

Executive Summary

Nortel Ethernet Routing Switch 5500, 1600, 8300 and 8600 series switches can be deployed at the network core with SMLT ensuring network resiliency and availability.

Converged network services are bringing IP-based voice, data and video services on to a common network backbone, enabling rich collaborative environments and applications.

Enterprise-class networks deploying converged network services demand an "always on" network infrastructure with robust resiliency and high availability for uninterrupted multimedia services and mission-critical applications.

Nortel ERS switches supporting SMLT at the network core

Nortel demonstrated that its ERS 5500, 1600, 8300 and 8600 models support SMLT and can be deployed at the core of networks of various sizes — from SMB to enterprise class networks — and can deliver sub-second failover times for data traffic and uninterrupted availability for multimedia services, while maintaining "toll quality" voice for VoIP traffic, in the event of active link and switch failure in the core network.

Nortel MCS in the ERS infrastructure

Tests proved that the Nortel ERS switching infrastructure could support robust link-, switch- and site-level resiliency using Nortel Application Switch 3408 to protect against failures of active Communication Servers.

A Nortel MCS (Multimedia Collaboration Server) 5100 was tested to deliver uninterrupted business multimedia communication services across multiple sites in the event of failure of the active link or switch or the communication server. (See Figure 1.)

Microsoft LCS 2005 on Nortel infrastructure

Tests also proved that Microsoft LCS (Live Communications Server) 2005 could be deployed with robust link, switch and site level resiliency on a network with the Nortel Ethernet Routing Switch infrastructure along with the Nortel Application Switch 3408 to deliver uninterrupted business multimedia communications services.

Active user sessions were tested to run uninterrupted in the event of failure of the active link or switch or the communication server in the network. (See Figure 1.)

Impact of Network Failures on Data and VoIP Traffic
Supported by ERS Switches using SMLT at the Network Core

Test Metric	Network failure scenario	ERS switch at network core*			
		ERS 8600	ERS 8300	ERS 5530	ERS 1600
		Impact on data traffic tested with 64-byte frames @ 10,000 fps			
Recovery Time (Seconds) as reported by Ixia IxExplorer	Active uplink failure	0.012	0.056	0.023	0.019
	Active core switch failure	0.023	0.057	0.02	0.022
		Impact on VoIP traffic with 100 simultaneous calls bidirectionally (G.711 µ-law codec and SIP protocol)			
Call Completion Rate (%) as reported by Spirent Abacus	Active uplink failure	100%	100%	100%	100%
	Active core switch failure	100%	100%	100%	100%
Voice Call Quality Score[†] as reported by Spirent Abacus	Active uplink failure	MOS = 4.597 PSQM = 0.011 PESQ = 4.473	MOS = 4.587 PSQM = 0.036 PESQ = 4.446	MOS = 4.596 PSQM = 0.012 PESQ = 4.482	MOS = 4.594 PSQM = 0.016 PESQ = 4.477
	Active core switch failure	MOS = 4.584 PSQM = 0.044 PESQ = 4.444	MOS = 4.591 PSQM = 0.026 PESQ = 4.467	MOS = 4.575 PSQM = 0.064 PESQ = 4.452	MOS = 4.596 PSQM = 0.010 PESQ = 4.486

* When one of the ERS switches is at the network core, the other ERS switches formed the edge switches

As per the ITU-T G.107 E-Model, the best possible score for MOS = 4.600, PSQM = 0.000 and PESQ = 4.500. Nortel's voice quality scores shown above correspond to a "Very Satisfied" user experience as per the ITU-T G.107 E-Model.

Source: The Tolly Group, October 2006   Figure 2

Test Methodology & Observations

Tolly Group engineers tested each Nortel ERS switch at the core in a two-switch configuration, while the remainder of the ERS switches formed the network edge in the manner shown in Figure 3.

With either data, VoIP or multimedia traffic flowing, engineers observed the switch port statistics on all the edge and core switches to determine the active uplink to the core, or the active core switch handling the traffic stream.

In each topology, engineers simulated failures of active uplink from the edge to the core, and failure of the active core switch while handling data and VoIP traffic and measured the fail-over time and the impact on VoIP call quality score and call completion rate, and the stability of video conference sessions using either Nortel MCS 5100 or Microsoft LCS 2005 solutions.

Sub-second fail-over for Data

In every network topology and failure scenario tested, the ERS switches at the core demonstrated a sub-second fail-over with data traffic of 64-byte frames transmitted at 10,000 frames per second, generated using Ixia 1600T and IxExplorer. (See Figure 2.)

Traffic was unidirectional from one Ixia port to another. The active link or core switch was then failed, and the fail-over time was calculated from the number of frames lost during the fail-over.

'Toll Quality' VoIP

The same failure scenarios were carried out to gauge the impact on VoIP traffic, using Spirent Abacus to place a series of 100 calls bidirectionally spanning the network edge and core. Voice calls used G.711 µ-law and the SIP protocol.

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ERS 5500
ERS 1600
ERS 8300
ERS 8600
in the core
with SMLT

Switch Resiliency and Availability

The bidirectional VoIP traffic was generated using the Spirent Abacus, which was connected to two edge switches. The VoIP traffic travels from the Abacus port to the edge switch port, gets uplinked to the core switch which directs the traffic to the other edge switch, from where the traffic gets terminated on the other Abacus port.
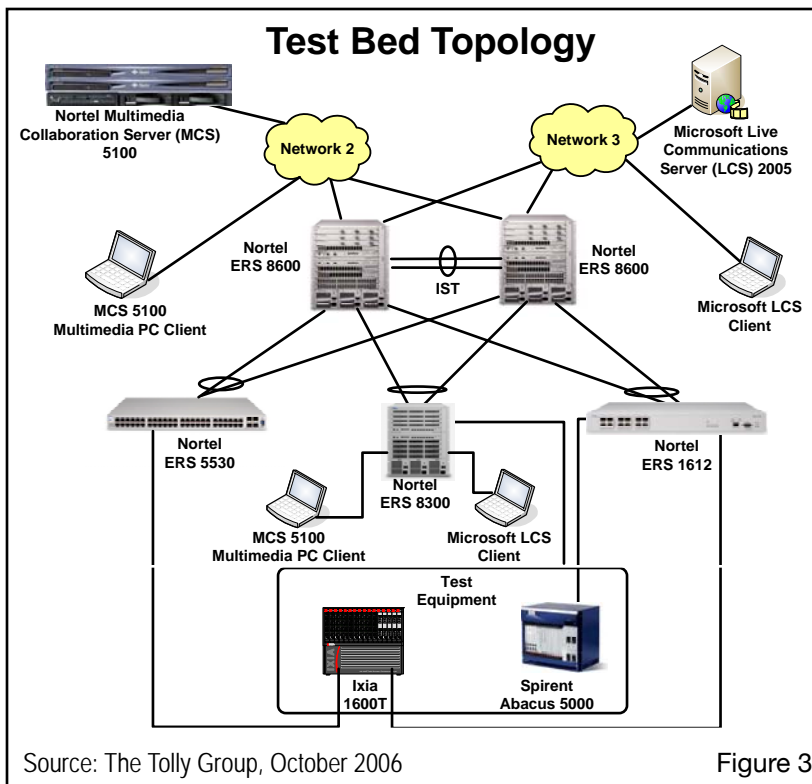
Once 100 calls were established, and while traffic was flowing, the active uplink to the core, or the core switch handling the traffic streams, was failed. Abacus measured the call completion rate and voice call quality (in terms of MOS, PESQ and PSQM).

Once again, as shown in Figure 2, in every network topology and failure scenario, the ERS switches at the core achieved 100% call completion and maintained 'toll-quality' voice quality scores.

Uninterrupted user multimedia sessions

Once again, the failure scenarios were repeated, this time with a multimedia video conference session active between PC endpoints running Nortel MCS PC client or Microsoft LCS client.

The video sessions were never dropped due to the failure of the active uplink to the core, or the failure of the active core switch handling the session traffic.

Test Bed Topology

Nortel Multimedia Collaboration Server (MCS) 5100

Network 2

Network 3

Microsoft Live Communications Server (LCS) 2005

MCS 5100 Multimedia PC Client

Nortel ERS 8600

IST

Nortel ERS 8600

Microsoft LCS Client

Nortel ERS 5530

Nortel ERS 8300

Nortel ERS 1612

MCS 5100 Multimedia PC Client

Microsoft LCS Client

Test Equipment

Ixia 1600T

Spirent Abacus 5000

Source: The Tolly Group, October 2006

Figure 3

Products Under Test

- Ethernet Routing Switch 8600, SW ver. 4.1.00
- Ethernet Routing Switch 8300, SW ver. 3.0.0
- Ethernet Routing Switch 5520, SW ver. 5.0.0008
- Ethernet Routing Switch 1600, SW ver. 2.1.0.0
- Application Switch 3408, SW ver. 23.0.3
- Multimedia Collaboration Server (MCS) 5100,
  SW ver. 3.0.54.1, running on Sun SunFire V100 servers
- MCS 5100 Multimedia PC Client, Release 4.1,
  SW ver. 3.5.208
- Microsoft Live Communications Server (LCS) 2005
  Enterprise Edition with Service Pack 1, running on Windows
  2003 Server Enterprise Edition
- Microsoft Office Communicator 2005 client, ver. 1.0559

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 http://www.tolly.com, sales@tolly.com

Test Equipment Summary

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

Vendor	Product	Web
Ixia	Ixia 1600T Ixia IxExplorer 4.10.250	www.ixiacom.com
Spirent Communications	Abacus 5000 ver. 3.2.r25	http:www.spirent.com

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