A Light Reading Webinar

Data Center Migration: Why Testing Matters

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Hosted by

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About Spirent Communications

Spirent Communication is a…. 
- Global test vendor with solutions for the lab and into live networks for Service Provider and Enterprise Networks 
- Next Generation Technology coverage from Data Centers, Virtualization, 3G/4G Wireless Technologies, Mobile Backhaul, Satellite/Positioning and 40/100 G Ethernet 
- Market leader in enterprise network test and measurement

Spirent TestCenter our flagship platform 
- Holistically validate the performance of all data center elements 
- Perform line rate layer 2-7 testing 
- Benchmark with IETF industry standard logic

Jurrie van den Breekel 
- Market Segment Lead for Spirent’s Enterprise and Data Center Test Solutions

http://www.spirent.com
About Network Test

• An independent test lab
• We test networking equipment and live networks
• Clients include equipment makers, large enterprises, service providers, and trade publications
• Hundreds of tests published
• Network Test president David Newman wrote/cowrote:
  • RFC 2647 – Benchmarking Terminology for Firewall Performance
  • RFC 3511 – Benchmarking Methodology for Firewall Performance
  • RFC 4814 – Hash and Stuffing: Overlooked Factors in Network Device Benchmarking

http://networktest.com
Agenda

• Introductions and Scope
• Impact of Data Center Virtualization
• Impact of Data Center Convergence
• The need for High Speed Ethernet
• Summary
• Q&A
The Impact of Data Center Virtualization
Data Center Virtualization Trends

• Better utilization through virtualization
  • Expanding from 4 to 32 VMs per physical server
  • Processors optimized for virtualization

• Network devices go virtual
  • Blades and virtual switches
  • Virtual appliances

• Virtualization enables cloud computing
Data Center Virtualization Impact

• Virtualized nets are 10x the scale and complexity
  • 100,000-plus virtual servers in a dynamic data centers
  • Exponential growth in application and network traffic
• More pressure on virtual, physical infrastructure
  • Overprovisioning moving from 1:20 to 1:4 or less
• Resource scheduling and live migration
  • The ‘killer apps’ for dynamic data centers
Data Center Virtualization Challenges

• How does virtualization perform?
  • Live migration consumes lots of extra bandwidth
  • Where are the bottlenecks?
    • Not just aggregation and core network infrastructure
    • Also measure vSwitch, vAppliance, CNA, blade switch, application performance

• How does virtualization scale?
  • How do network and application events correlate?

• How will cloud computing affect performance?
Data Center Virtualization Testing

- Key questions for virtualization testing
  - How do I attach the test instrument?
  - Do I trust the virtual test instrument’s numbers?
  - How do virtual and physical device performance compare?
  - What about protocol and feature support?

Virtual servers
- Virtual appliances
- Load balancer
- IDS/firewall
- Ethernet switch

10G CNA
Poll Question #1

How do you see as the best way to use more virtualization in your data center(s)?

- More VM instances on current hardware
- More VM instances on new higher-capacity hardware
- Outsource to cloud computing service
- No plans to expand
The Impact of Data Center Convergence
Data Center Convergence Trends

- 10GE on the server enables convergence of Ethernet and Fibre Channel
  - Enough bandwidth for SAN and LAN combined
  - Fibre Channel over Ethernet (FCoE)

- Converging data, storage networks saves money
  - One network, fewer cables, easier cabling, lower power

Lossy Ethernet  Lossless Fibre Channel

50% cable and High performance
interface reduction
10GE performance

10GE FCoE Top of rack switching
Data Center Convergence Impact

- Fibre Channel requires lossless connectivity
  - Converged Enhanced Ethernet (CEE)/Data Center Ethernet (DCE)
- Could double Ethernet traffic
- Network QoS is critically important
Data Center Convergence Challenges

- FCoE is easy
  - Encapsulate Fibre Channel frames in Ethernet
  - Add Fibre Channel Initialization Protocol (FIP)
    - Does fabric discovery and login
- FCoE is hard
  - Ethernet tolerates loss and high jitter
  - FC does not
Data Center Convergence Testing

- DCB/DCE/CEE reliable transport mechanisms
  - 802.1Qbb – Priority Flow Control (PFC)
    - Different traffic types can share link without interference
  - 802.1Qaz – Priority Groups (traffic shaping)
    - Scheduling mechanism to ensure QoS/QoE
  - 802.1Qau – Congestion Notification
- Data Center Bridging Exchange Protocol (DCBX)
  - LLDP extension for discovery, capability exchange
- All these present new testing challenges
  - New test tools
  - New test methodologies
Data Center Convergence Testing

- Are you testing the switch or the tester?
  - Will the test instrument obey PFC pause frames?
- What methodology to use?
  - Throughput no longer appropriate
  - Flow control breaks “lock step” traffic patterns
  - Must instead focus on PFC efficiency
  - New metrics: Pause duration, pause response time, maximum latency
Poll Question #2

When are you planning to converge your data and storage networks?

• Already implemented
• 0 – 6 months
• 6 – 12 months
• 12 - 24 months
• More than 24 months
• No plans
The need for High Speed Ethernet
40G/100G Ethernet Trends

• 10G server connectivity is rapidly increasing
  • 10G on server motherboards coming soon
• ‘Top-of-rack’ and ‘end-of-row’ switches increase 10G density in the data center
• 10G servers drive the need for 40G/100G uplinks

10GE Switch Market Size and Forecast (Ports)

Source: Infonetics Research '09
40G/100G Ethernet Impact

• 4-10x faster than 10G
• 40-100x faster than gigabit
  • 100G Ethernet is 148.8 million 64-byte frames/second
• 40G/100G Ethernet are multi-lane
  • Involves multiplexing/demultiplexing
  • Some early solutions will use parallel implementations of lower-speed circuits
  • Out-of-order frames harmful for FCoE and video quality
40G/100G Ethernet Challenges

- Key concept is **timestamp resolution**
- At **10G** rates, everything is good with 20-ns resolution
  Key number here is **67.2 ns**
40G/100G Ethernet Challenges

- At 40G rates, we may run into a problem rather fast
40G/100G Ethernet Challenges

- At **100G** rates, 20-ns resolution will not work
40G/100G Ethernet Challenges

- If more than 1 frame is transmitted per clock tick, the test instrument is blind
  - Accurate throughput, latency, jitter, even packet counts not possible
- All measurements require accurate packet counts
- Video, IPDV (jitter) depend heavily on precise timing
- Key question for 40G/100G test tools:
  - What’s the timestamp resolution?
40G/100G Ethernet Testing

- Key questions for high-speed testing:
  - Single stream measurement at 40G/100G rates
  - Must be able to count
  - Accurate latency, jitter, inter-arrival times
  - Must be able to determine sequencing
  - Same latency port2port, slot2slot, chassis2chassis
Poll Question #3

What is your preferred option for higher speed Ethernet?

• 40G
• 100G
• Combination of 40G and 100G
• No plans to adopt 40G or 100G
Summary

- Virtualization increases network utilization
- Convergence demands FC quality over Ethernet
- High-speed Ethernet will enable virtualization, convergence
- Testing is a must
  - Take holistic approach to data center testing
  - Validate any-to-any connectivity, virtual/physical/combined
  - Measure customer cost savings and satisfaction targets