



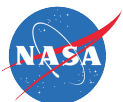
Sample Results From NASA High End Computing (HEC) WAN File Accessing Experiments/Demonstrations At SC10

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November 29, 2010

Information Supporting NASA HEC WAN File Accessing
Experiments/Demonstrations At SC10



11/29/10
GODDARD SPACE FLIGHT CENTER

J. P. Gary



Sample Results From NASA HEC WAN File Accessing Experiments/Demonstrations At SC10

Topics

- References to Introduction To NASA High End Computing (HEC) WAN File Accessing Experiments/Demonstrations At SC10
- Special SC10 Demonstration/Evaluation Experiments
 - Objectives and Reference Configuration
 - Sample Results
 - MRTG index page 1 graphs from NASA's five intra-booth 10GE switches
 - Sample MRTG graphs of 10GE network interfaces from NASA net-test workstations
 - Screenshots from cPacket cVu monitoring





Sample Results From NASA HEC WAN File Accessing Experiments/Demonstrations At SC10

Reference Articles & Websites Per SC10 Demos

- Introduction To NASA High End Computing (HEC) WAN File Accessing Experiments/Demonstrations At SC10
 - http://science.gsfc.nasa.gov/606.1/docs/SC10_HECN-demos_110210.pdf
- Update To NASA High End Computing (HEC) WAN File Accessing Experiments/Demonstrations At SC10
 - http://science.gsfc.nasa.gov/606.1/docs/SC10_HECN-demos_111110.pdf
- "NASA and Partners to Demonstrate 40- and 100-Gigabit Network Technologies at SC10"
 - http://science.gsfc.nasa.gov/606.1/HECN-highlights/HECN_SC10_Net-Demo_announce_110210.html
 - Also published as:
 - <http://www.hpcwire.com/offthewire/NASA-to-Demo-40100-Gigabit-Networking-at-SC10-106691913.html>
 - <http://supercomputingonline.com/latest/nasa-and-partners-to-demonstrate-40-and-100-gigabit-network-technologies-at-sc10>

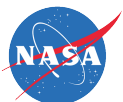




Sample Results From NASA HEC WAN File Accessing Experiments/Demonstrations At SC10

NASA Partners in “Using 100G Network Technology in Support of Petascale Science” Special SC10 Demonstration/Evaluation Experiments

- Internet2, National LambdaRail, National Oceanic and Atmospheric Administration, Northwestern University’s International Center for Advanced Internet Research, SCinet Research Sandbox, University of Illinois at Chicago’s Laboratory for Advanced Computing, University of Maryland College Park’s Mid-Atlantic Crossroads
- Vendors who loaned equipment: Arista, Ciena, Cisco, ColorChip, cPacket, Extreme Networks, Fusion-io, HP, Panduit
- For an indication of the generous contributions, please see previously cited “Update To NASA High End Computing (HEC) WAN File Accessing Experiments/Demonstrations At SC10”

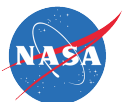




Sample Results From NASA HEC WAN File Accessing Experiments/Demonstrations At SC10

Special SC10 Demonstration/Evaluation Experiments

- Use a set of the NASA/HECN Team's network-testing-workstations deployed into both the NCDM-LAC/iCAIR and NASA Exhibit Booths, capable of:
 - >100G uni-directional memory-to-memory data flows
 - >80G aggregate-bidirectional memory-to-memory data flows
 - ~40G uni-directional disk-to-disk file copies (using SSDs)
- Demonstrate/evaluate different vendor-provided 40G/100G network technology solutions with full-duplex 40G and 100G LAN data flows across SCinet Research Sandbox inter-booth fiber
- Use existing 4x10G dedicated pathway across NLR and MAX/DRAGON between GSFC and StarLight, plus a mix of 8 other 10G NLR+Cisco-provisioned pathways and a 1x100G Internet2-provisioned pathway between StarLight and SC10, to conduct science-oriented WAN data flow demonstrations



Using 100G Network Technology in Support of Petascale Science

A Collaborative Initiative Among NASA, NLR, NOAA, Northwestern/iCAIR, SCinet & UIC/LAC
 Also Using Internet2's Multi-Vendor 100GigE Infrastructure Between StarLight and SC10

Demo Summary

12x10Gbps* between: 

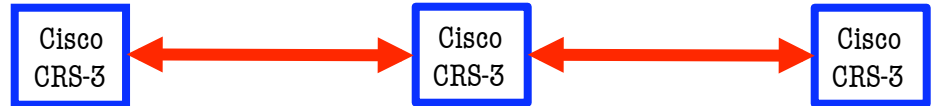
1x40Gbps full-duplex across:



1x100Gbps full-duplex across:



1x100Gbps full-duplex across:



1x100Gbps full-duplex across:



8x10Gbps full-duplex across:



40Gbps disk-to-disk between:



40Gbps disk-to-disk across:



***bi-directionally**

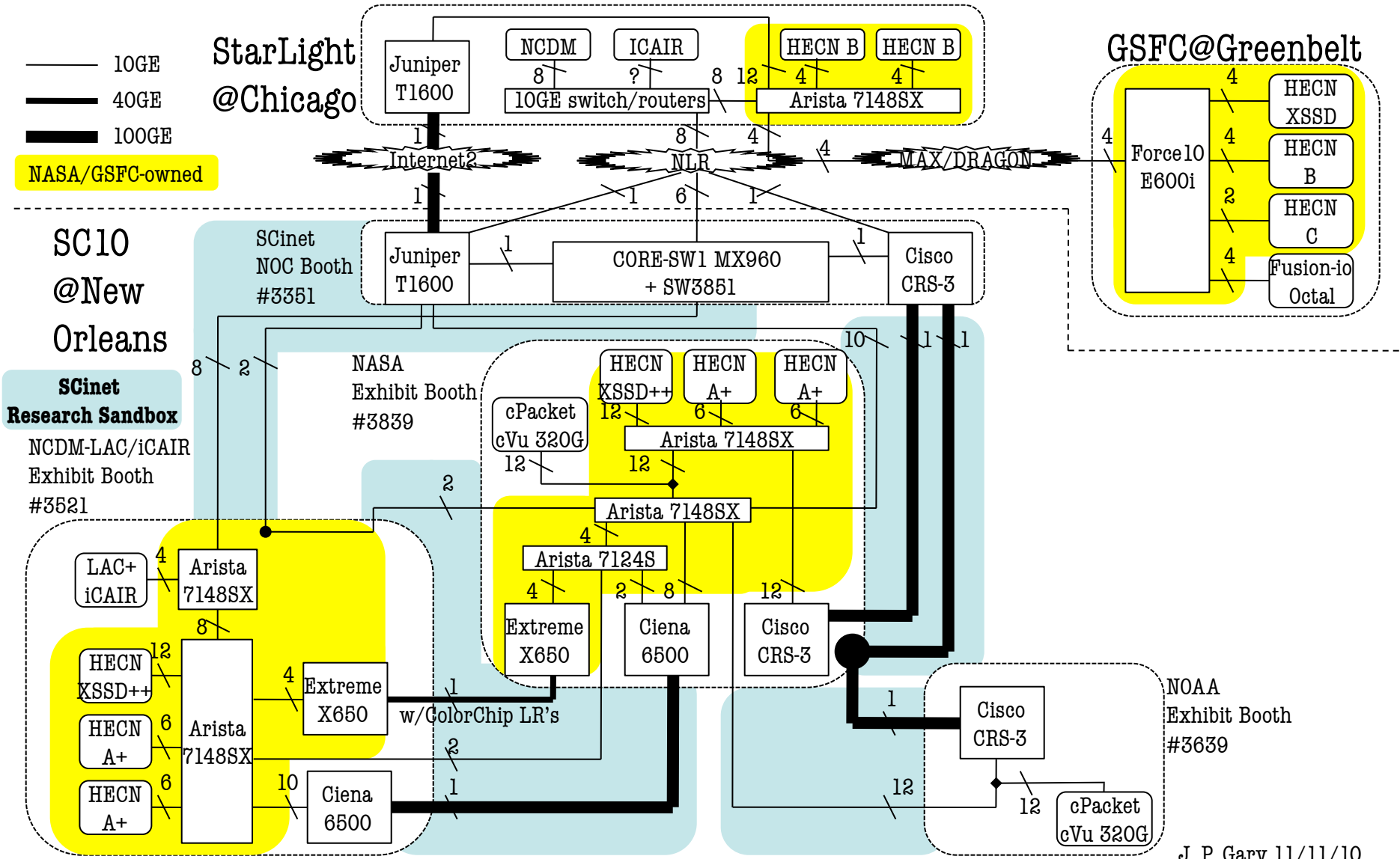
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Snapshots During Setup of NASA Exhibit Booth for SC10

NASA and Partners Demonstrate 40- and 100-Gigabit Network Technologies

http://science.gsfc.nasa.gov/606.1/HECN-highlights/HECN_SC10_Net-Demo_announce_110210.html



NASA and partners network-demo racks in NCDM Exhibit Booth.



NASA and partners network-demo rack in NASA Exhibit Booth.



Network-demo rack with NASA network-demo posters displayed in NOAA Exhibit Booth.



From left Paul Lang and Bill Fink.



From left Jeff Martz and Matt Mountz.

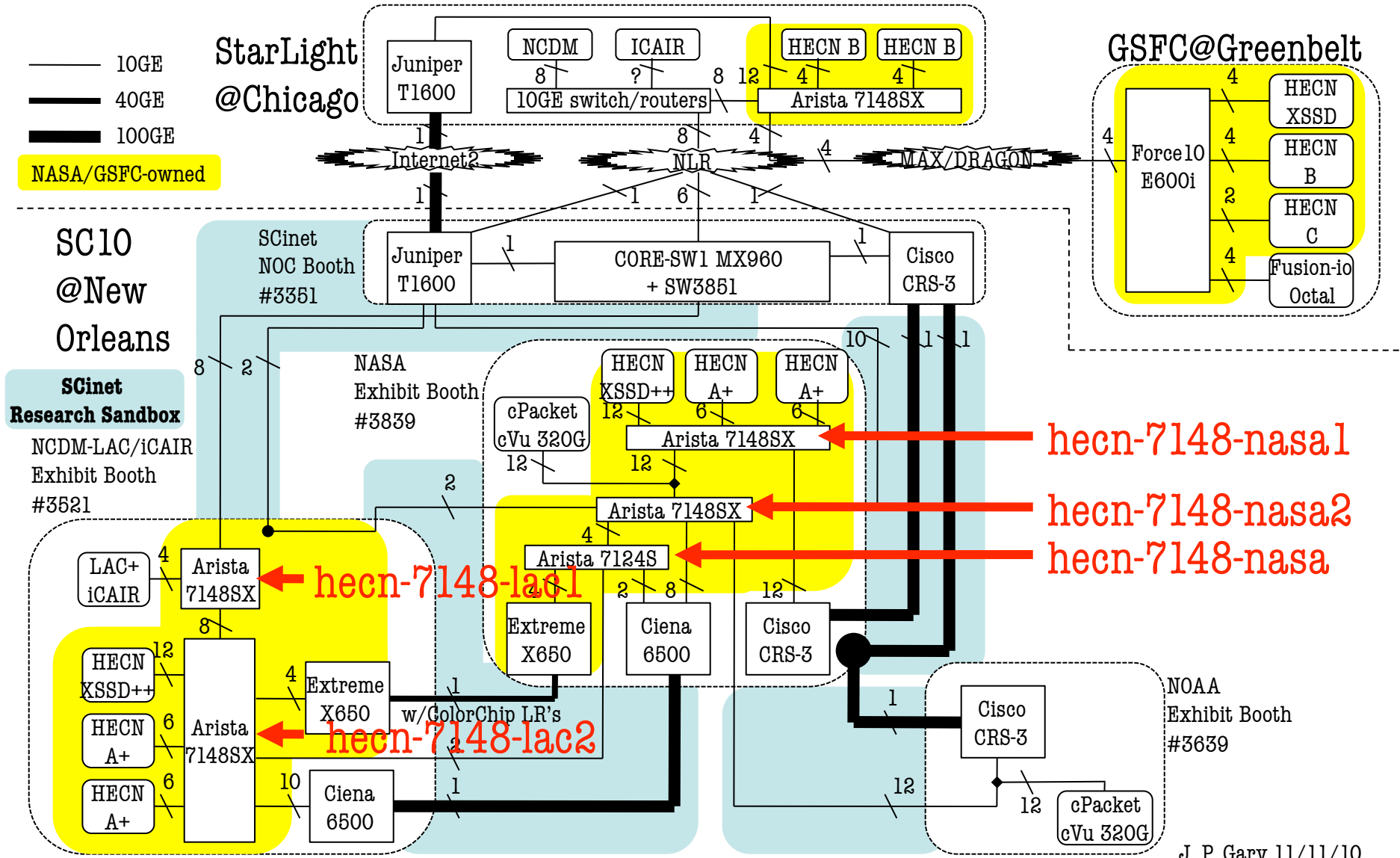


From Left Extreme Networks' Renuke Mendis and ColorChip's Paul Goldgeier pointing to their working beta products.

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Using 100G Network Technology in Support of Petascale Science

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 Also Using Internet2's Multi-Vendor 100GigE Infrastructure Between StarLight and SC10



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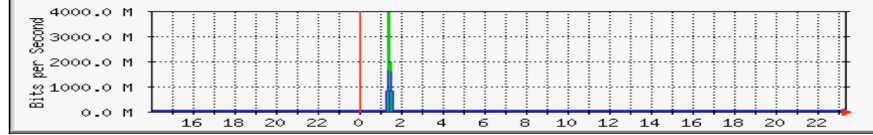
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1 of 4

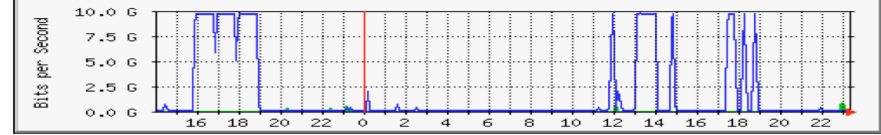
MRTG Index Page for hecn-7148-lac2

Nov 17, 2010, 10:28 PM CT

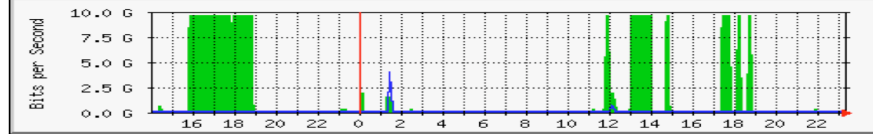
1. Traffic Analysis for Ethernet1 -- hecn-7148-lac2



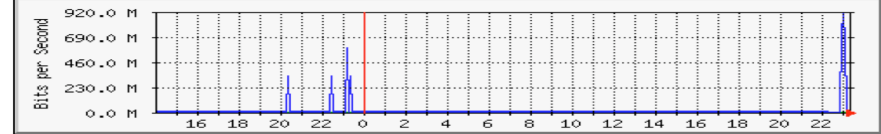
2. Traffic Analysis for xeontest1



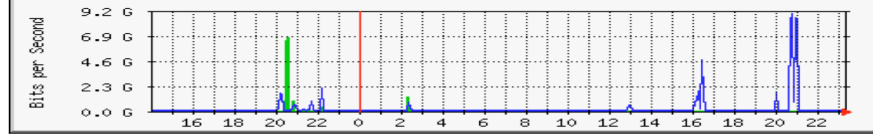
3. Traffic Analysis for xssd1



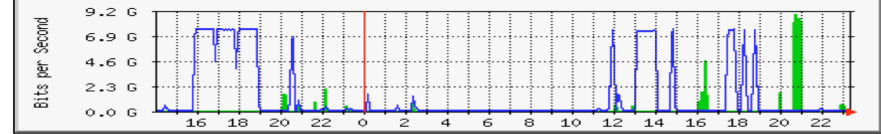
4. Traffic Analysis for i7test1



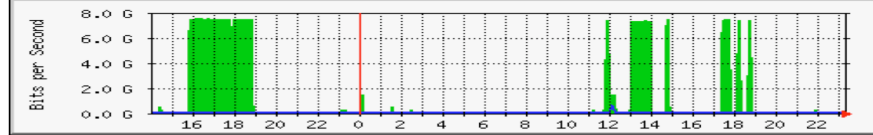
5. Traffic Analysis for Ethernet5 -- hecn-7148-lac2



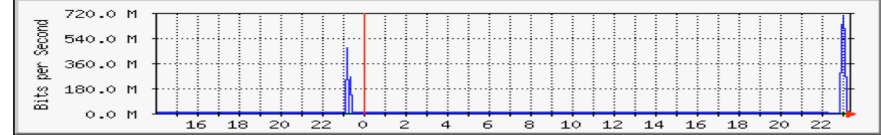
6. Traffic Analysis for xeontest1



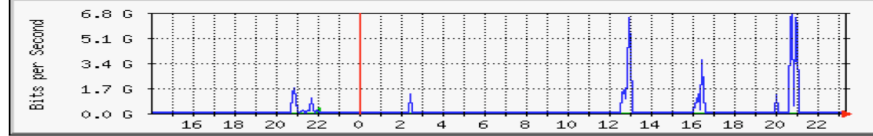
7. Traffic Analysis for xssd1



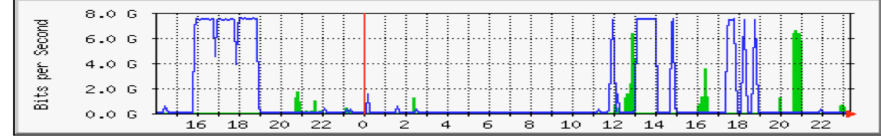
8. Traffic Analysis for i7test1



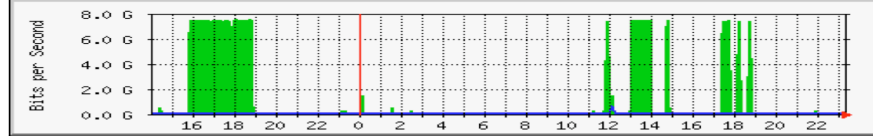
9. Traffic Analysis for xeontest1



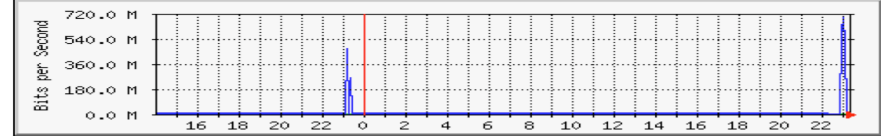
10. Traffic Analysis for xssd1



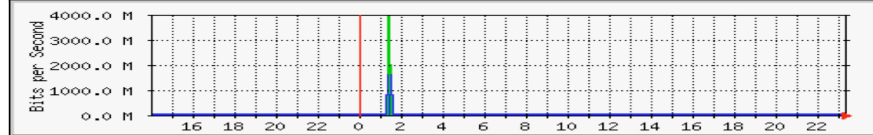
11. Traffic Analysis for xssd1



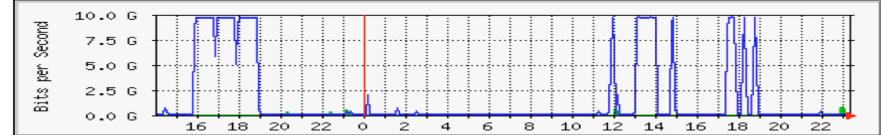
12. Traffic Analysis for i7test1



13. Traffic Analysis for Ethernet13 -- hecn-7148-lac2



14. Traffic Analysis for xeontest1

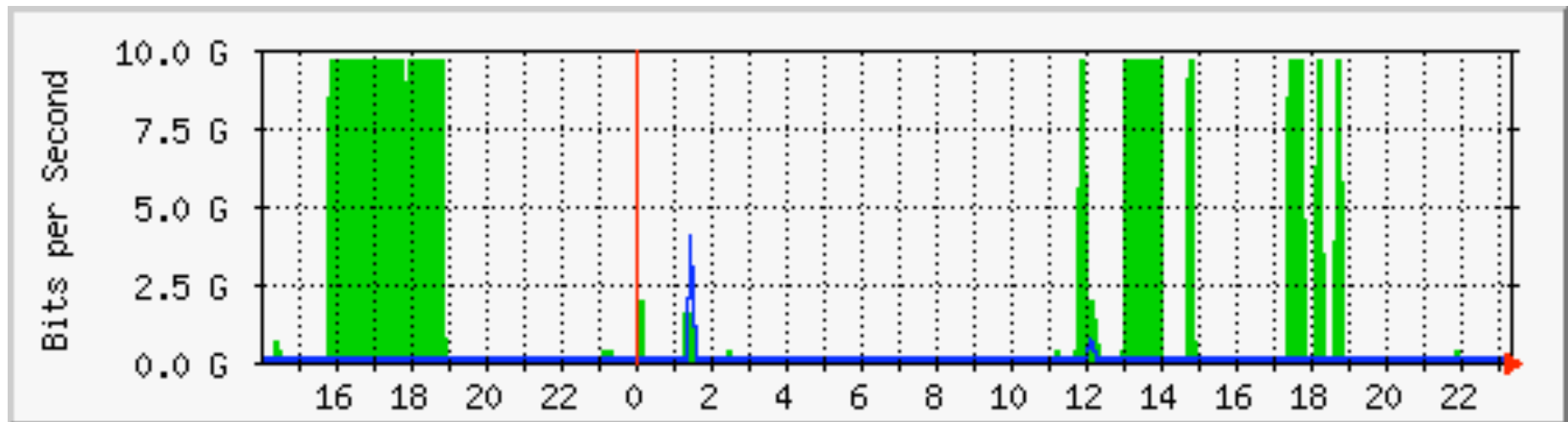




A Sample MRTG-Generated Traffic Analysis From NASA's hecn-7148-lac2 10-GE Switch In NCDM's Exhibit Booth During SC10 Of NASA Workstation XSSD1's 10-GE Network Interface #1

The statistics were last updated **Wednesday, 17 November 2010 at 22:28**

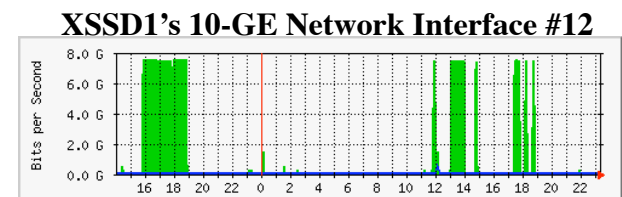
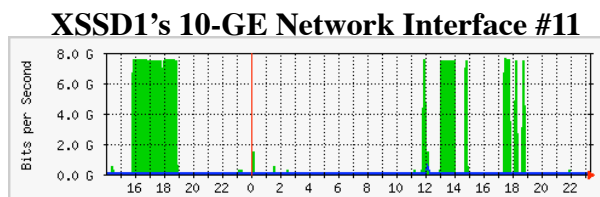
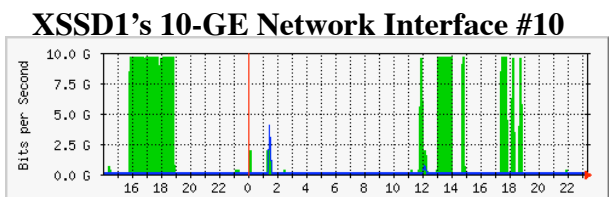
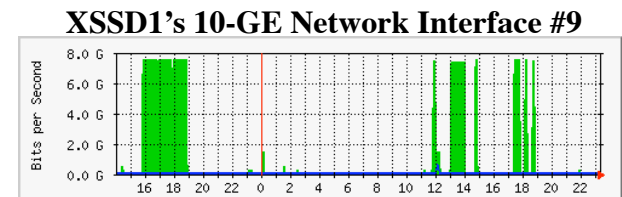
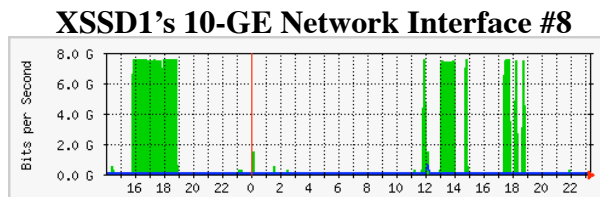
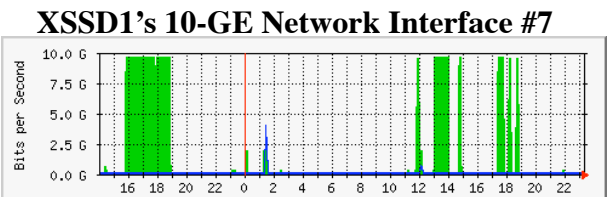
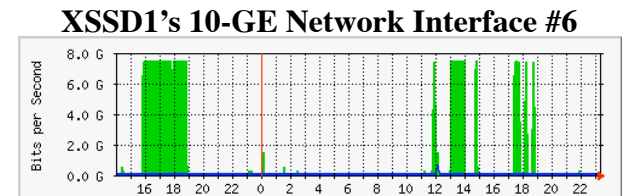
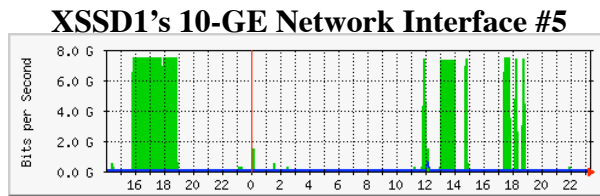
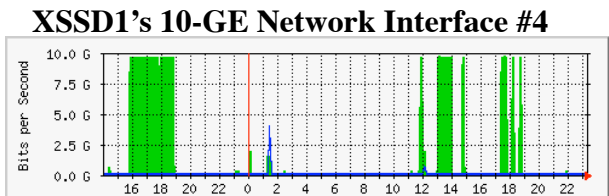
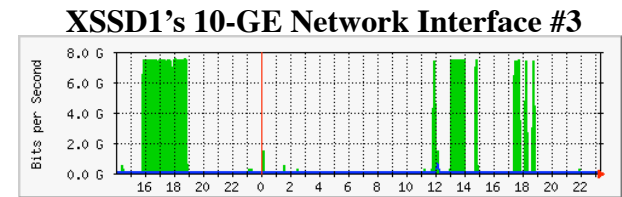
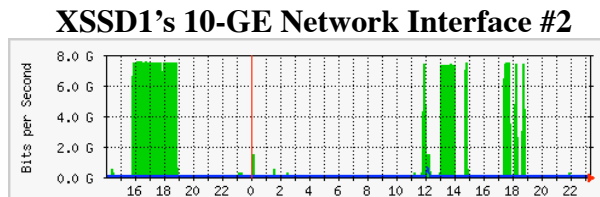
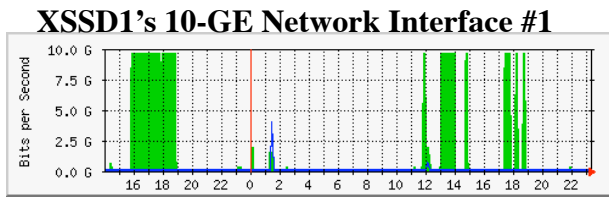
`Daily' Graph (5 Minute Average)





Sample MRTG-Generated Traffic Analyses From NASA's hecn-7148-lac2 10-GE Switch In NCDM's Exhibit Booth During SC10 Of NASA Workstation XSSD1's 10-GE Network Interfaces

The statistics were last updated Wednesday, 17 November 2010 at 22:28
'Daily' Graph (5 Minute Average)

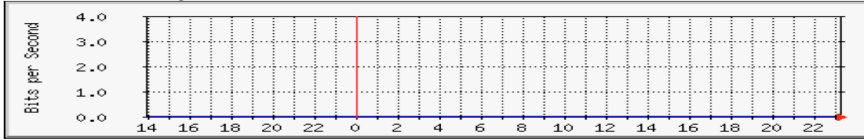


1 of 4

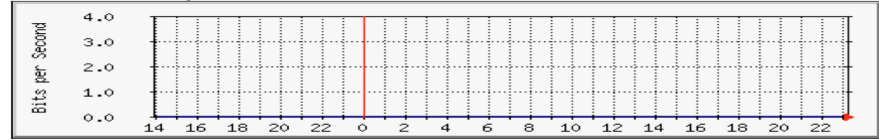
Nov 17, 2010, 10:27 PM CT

MRTG Index Page For hecn-7148-lac1

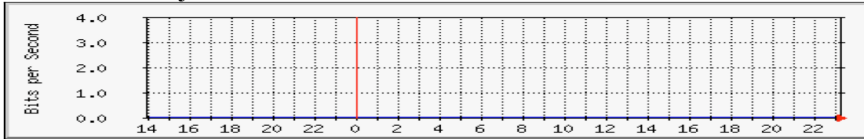
1. Traffic Analysis for Ethernet1 -- hecn-7148-lac1



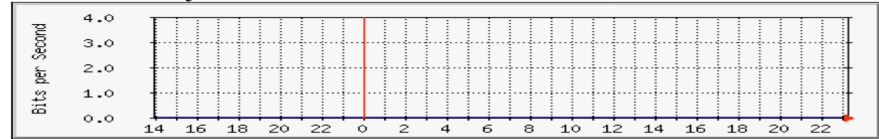
2. Traffic Analysis for Ethernet2 -- hecn-7148-lac1



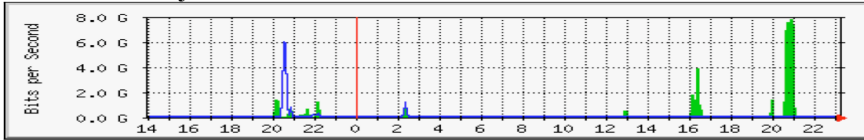
3. Traffic Analysis for Ethernet3 -- hecn-7148-lac1



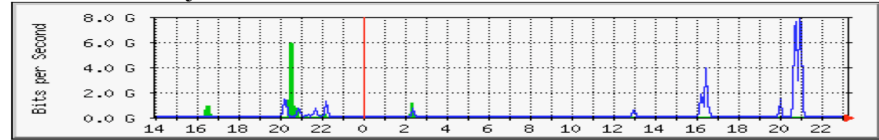
4. Traffic Analysis for Ethernet4 -- hecn-7148-lac1



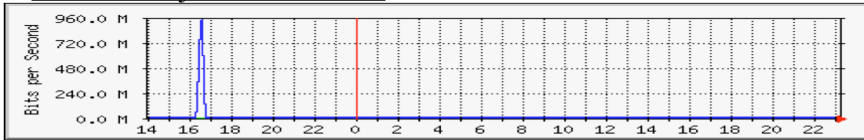
5. Traffic Analysis for hecn-7148-lac2



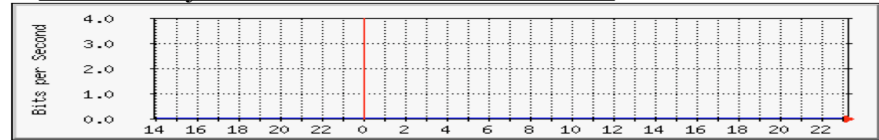
6. Traffic Analysis for scinet-mx960



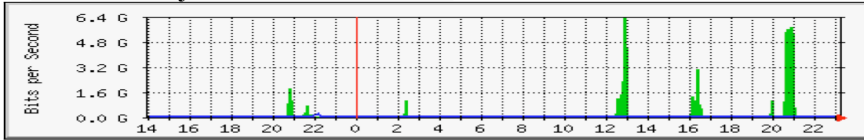
7. Traffic Analysis for lac-s2410



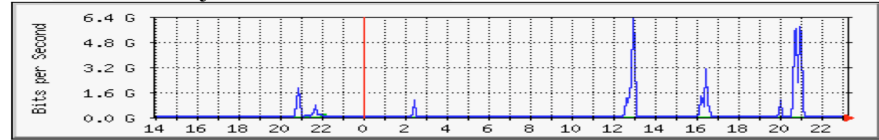
8. Traffic Analysis for Ethernet8 -- hecn-7148-lac1



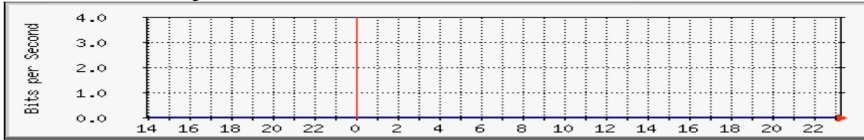
9. Traffic Analysis for hecn-7148-lac2



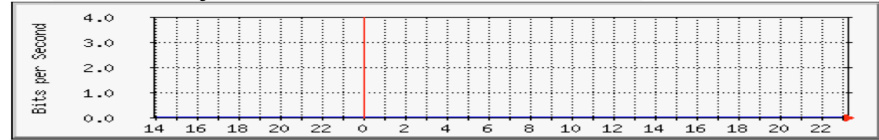
10. Traffic Analysis for scinet-mc960



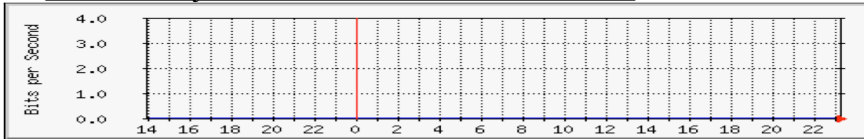
11. Traffic Analysis for Ethernet11 -- hecn-7148-lac1



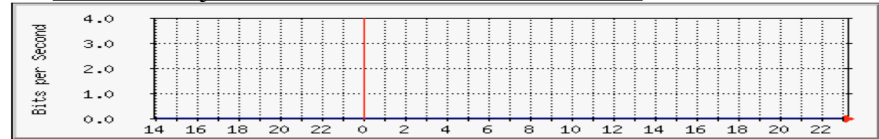
12. Traffic Analysis for Ethernet12 -- hecn-7148-lac1



13. Traffic Analysis for Ethernet13 -- hecn-7148-lac1



14. Traffic Analysis for Ethernet14 -- hecn-7148-lac1

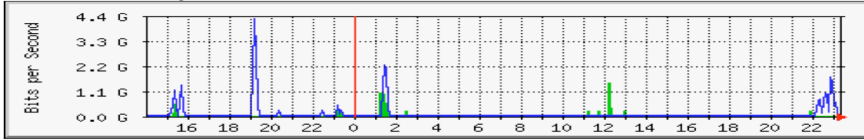


1 of 4

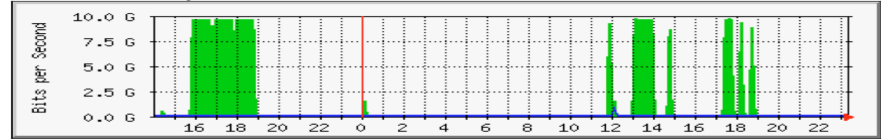
MRTG Index Page hecn-7148-nasa1

Nov 17, 2010, 10:23 PM CT

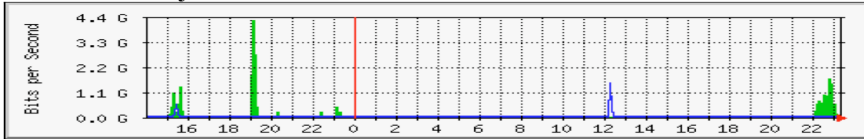
1. Traffic Analysis for hecn-7148-nasa2



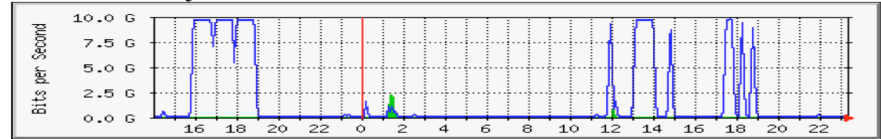
2. Traffic Analysis for cisco-crs3-nasa



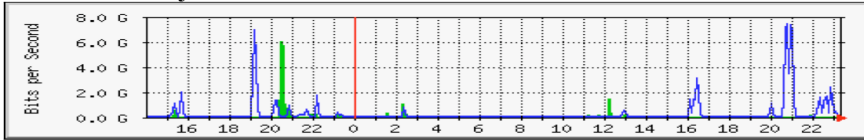
3. Traffic Analysis for xssd2



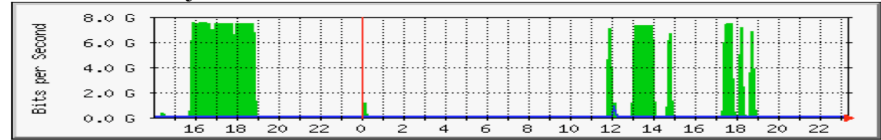
4. Traffic Analysis for i7test17



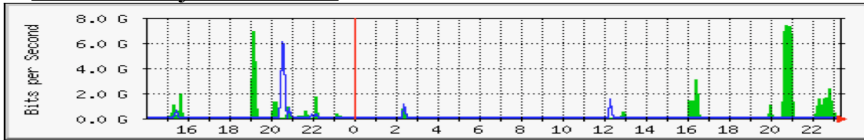
5. Traffic Analysis for hecn-7148-nasa2



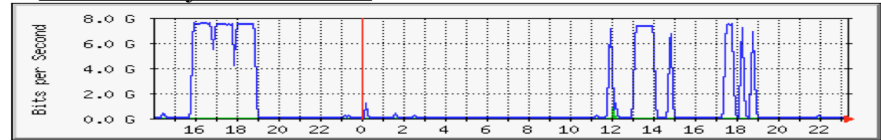
6. Traffic Analysis for cisco-crs3-nasa



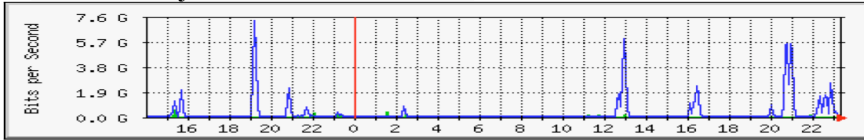
7. Traffic Analysis for xssd2



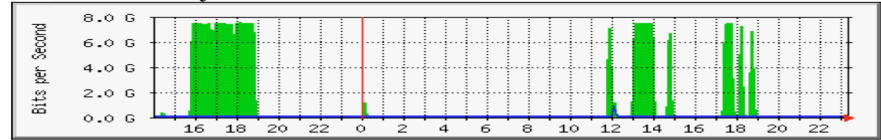
8. Traffic Analysis for i7test17



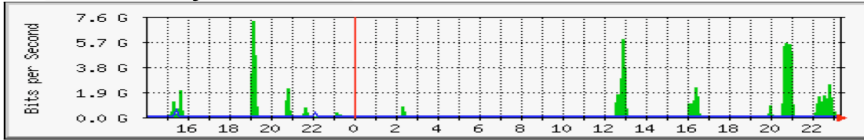
9. Traffic Analysis for hecn-7148-nasa2



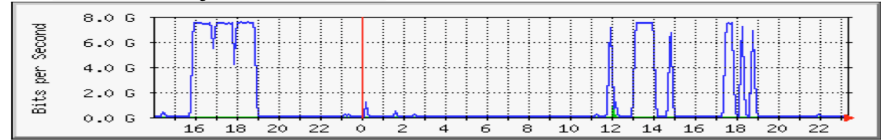
10. Traffic Analysis for cisco-crs3-nasa



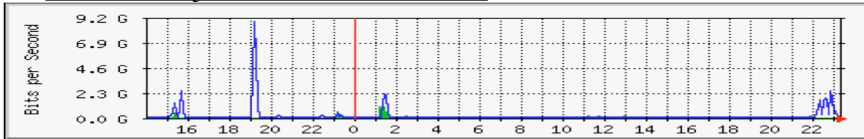
11. Traffic Analysis for xssd2



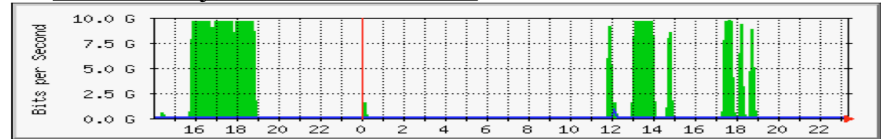
12. Traffic Analysis for i7test17



13. Traffic Analysis for hecn-7148-nasa2



14. Traffic Analysis for cisco-crs3-nasa

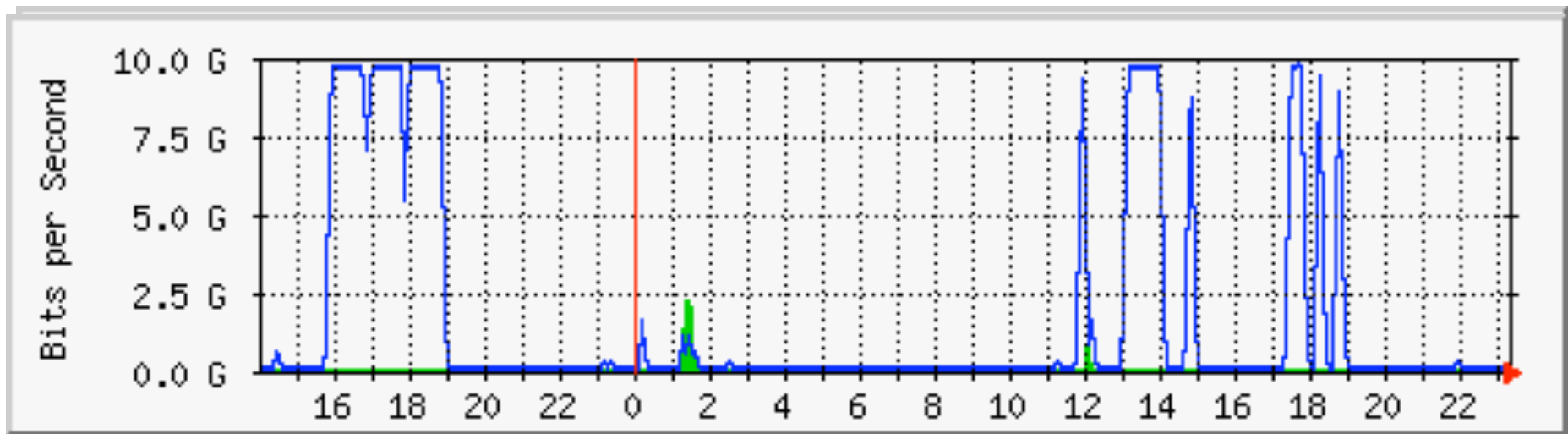




A Sample MRTG-Generated Traffic Analysis From NASA's hecn-7148-nasa1 10-GE Switch In NASA's Exhibit Booth During SC10 Of NASA Workstation i7test17's 10-GE Network Interface #1

The statistics were last updated **Wednesday, 17 November 2010 at 22:23**

`Daily' Graph (5 Minute Average)

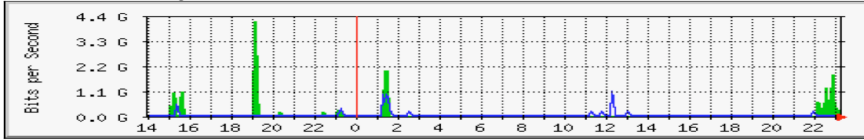


1 of 4

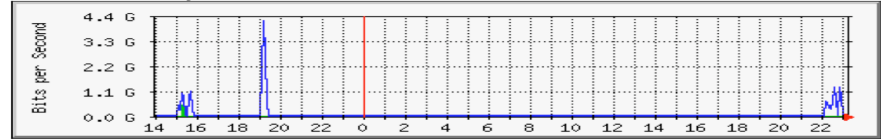
MRTG Index Page for hecn-7148-nasa2

Nov 17, 2010, 10:26 PM CT

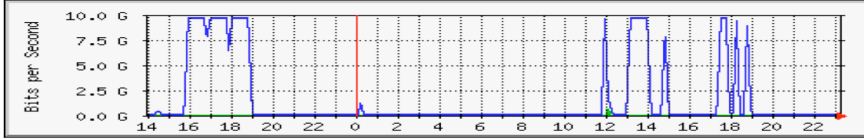
1. Traffic Analysis for hecn-7148-nasa1



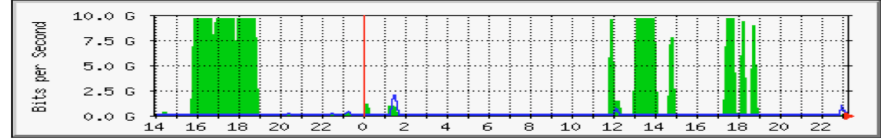
2. Traffic Analysis for i2-t1600



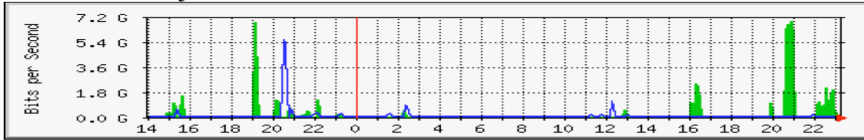
3. Traffic Analysis for Ethernet3 -- hecn-7148-nasa2



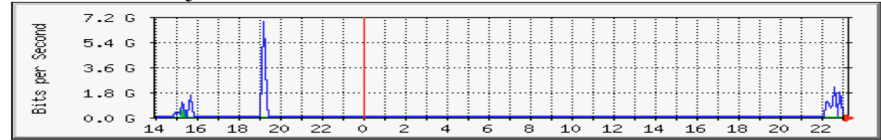
4. Traffic Analysis for Ethernet4 -- hecn-7148-nasa2



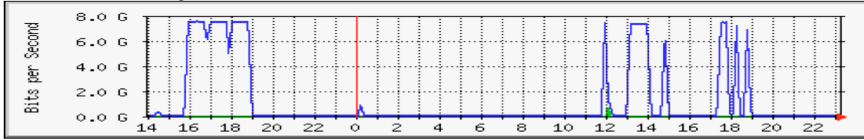
5. Traffic Analysis for hecn-7148-nasa1



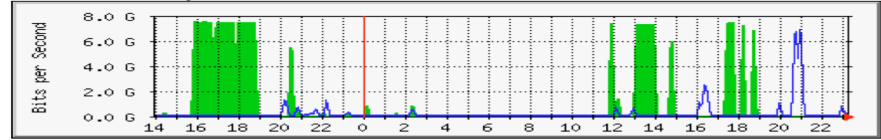
6. Traffic Analysis for i2-t1600



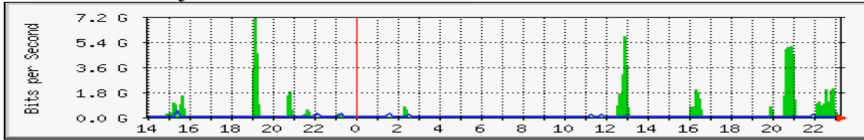
7. Traffic Analysis for Ethernet7 -- hecn-7148-nasa2



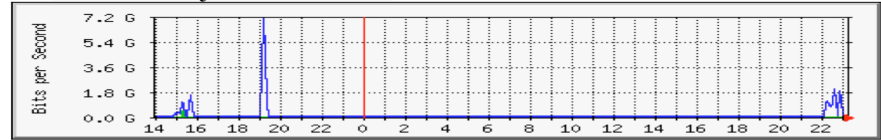
8. Traffic Analysis for Ethernet8 -- hecn-7148-nasa2



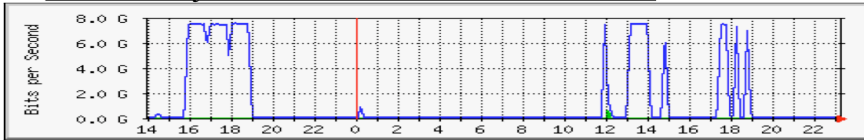
9. Traffic Analysis for hecn-7148-nasa1



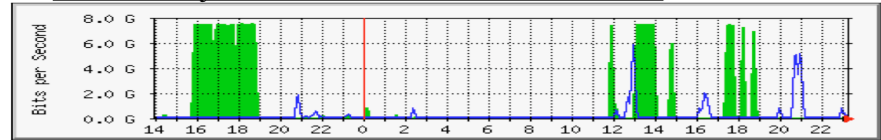
10. Traffic Analysis for i2-t1600



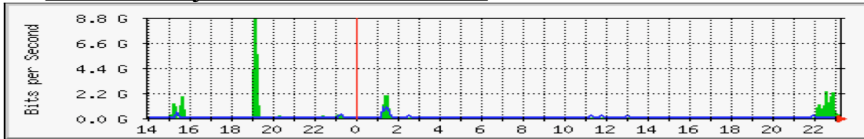
11. Traffic Analysis for Ethernet11 -- hecn-7148-nasa2



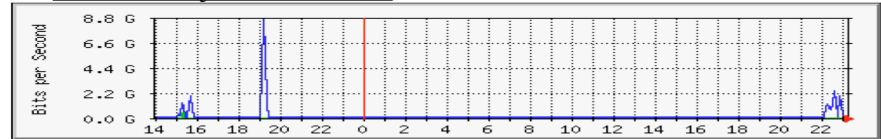
12. Traffic Analysis for Ethernet12 -- hecn-7148-nasa2



13. Traffic Analysis for hecn-7148-nasa1



14. Traffic Analysis for i2-t1600

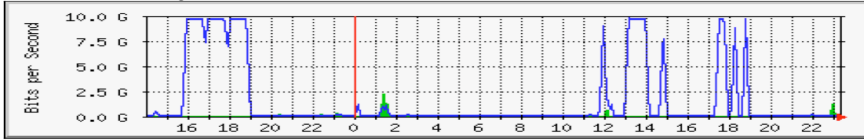


1 of 2

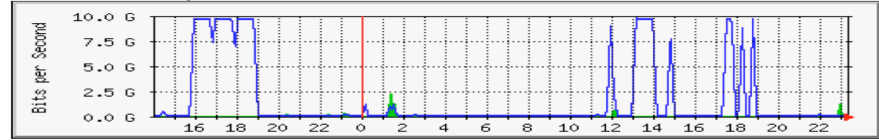
Nov 17, 2010, 10:26 PM CT

MRTG Index Page For hecn-7124-nasa

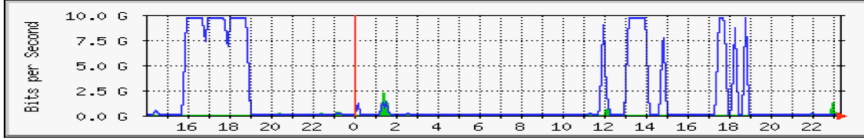
1. Traffic Analysis for hecn-7148-nasa2



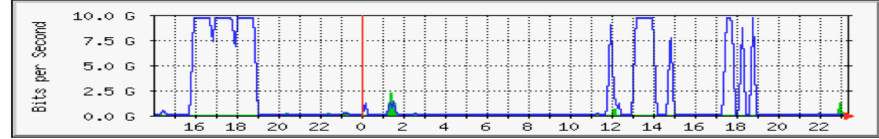
2. Traffic Analysis for hecn-7148-nasa2



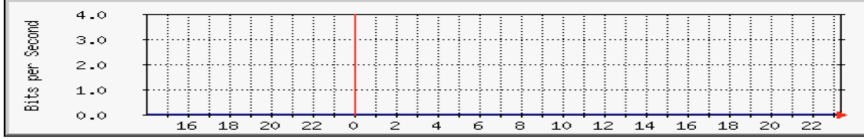
3. Traffic Analysis for hecn-7148-nasa2



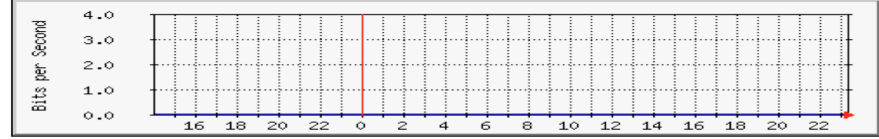
4. Traffic Analysis for hecn-7148-nasa2



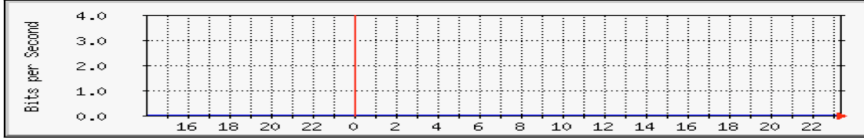
5. Traffic Analysis for Ethernet5 -- hecn-7124-nasa



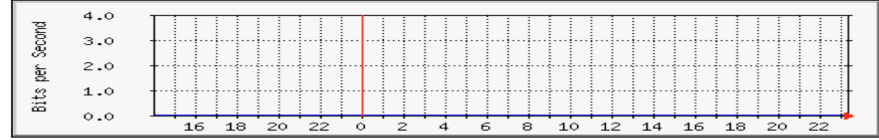
6. Traffic Analysis for Ethernet6 -- hecn-7124-nasa



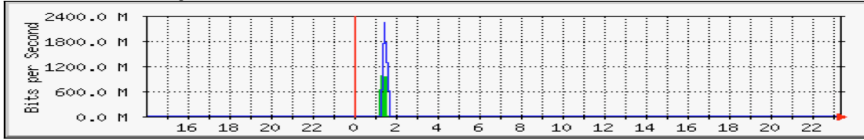
7. Traffic Analysis for Ethernet7 -- hecn-7124-nasa



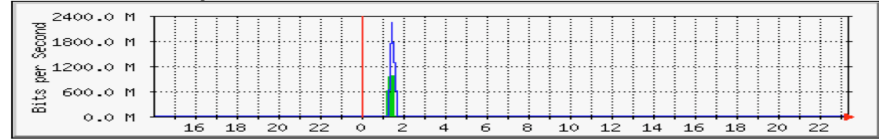
8. Traffic Analysis for Ethernet8 -- hecn-7124-nasa



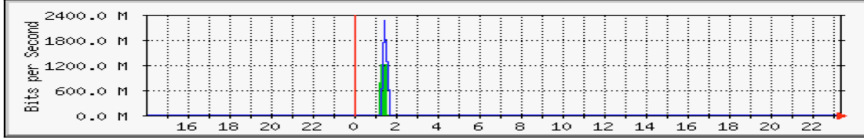
9. Traffic Analysis for hecn-x650-nasa



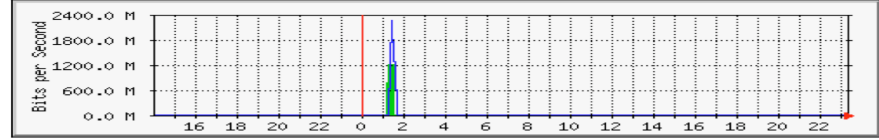
10. Traffic Analysis for hecn-x650-nasa



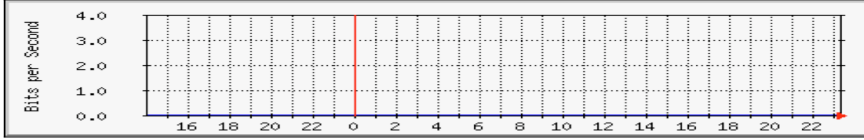
11. Traffic Analysis for hecn-x650-nasa



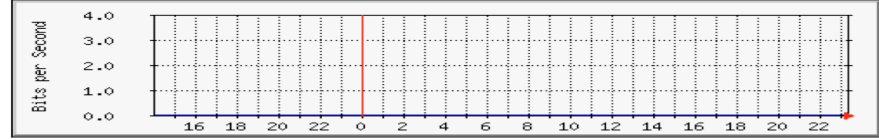
12. Traffic Analysis for hecn-x650-nasa



13. Traffic Analysis for Ethernet13 -- hecn-7124-nasa

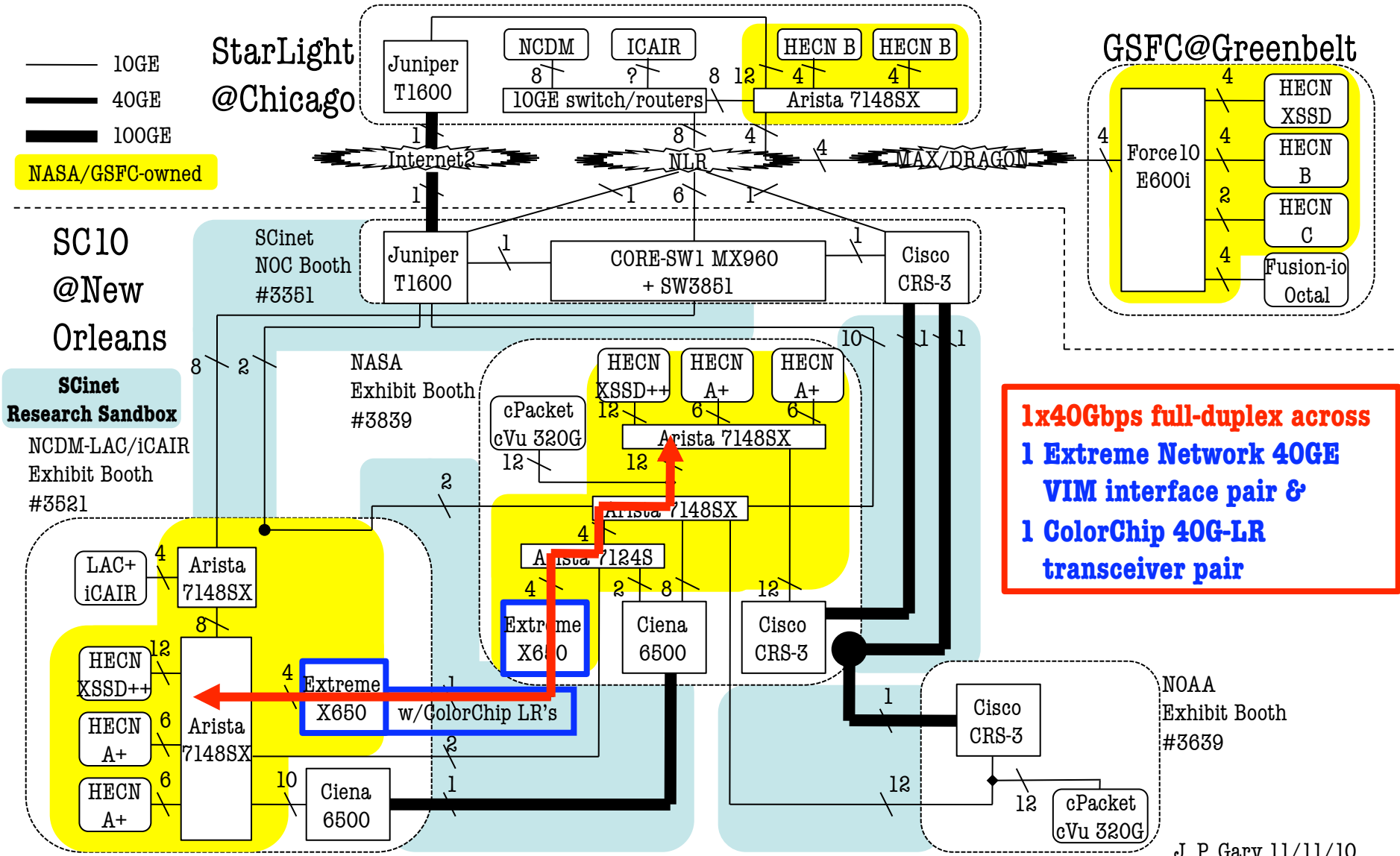


14. Traffic Analysis for Ethernet14 -- hecn-7124-nasa



Using 100G Network Technology in Support of Petascale Science

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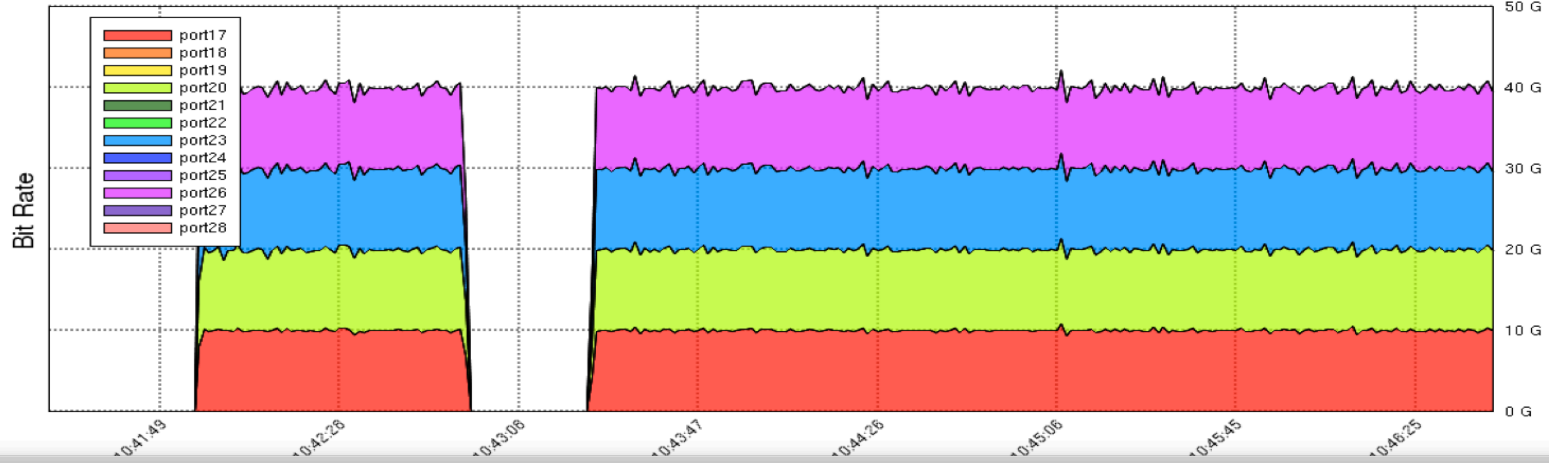
J. P. Gary 11/11/10



SC10 100G DEMO



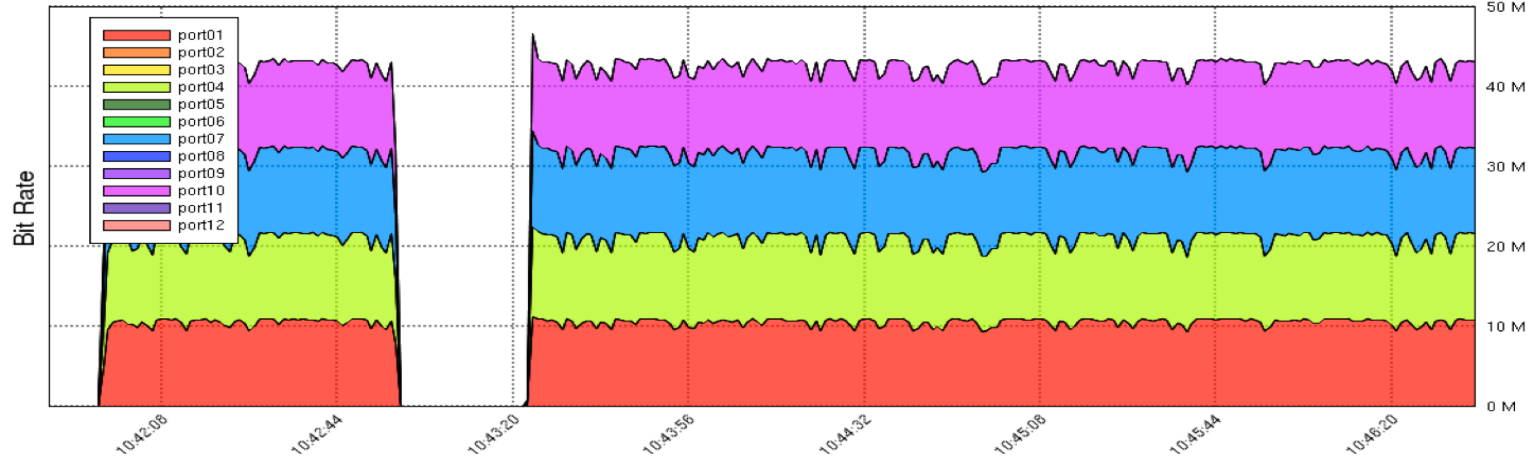
NASA-NOAA 100G Demo 18/Nov/2010 : 10:41:24 - 10:46:42 (GMT-6:00)



SC10 100G DEMO



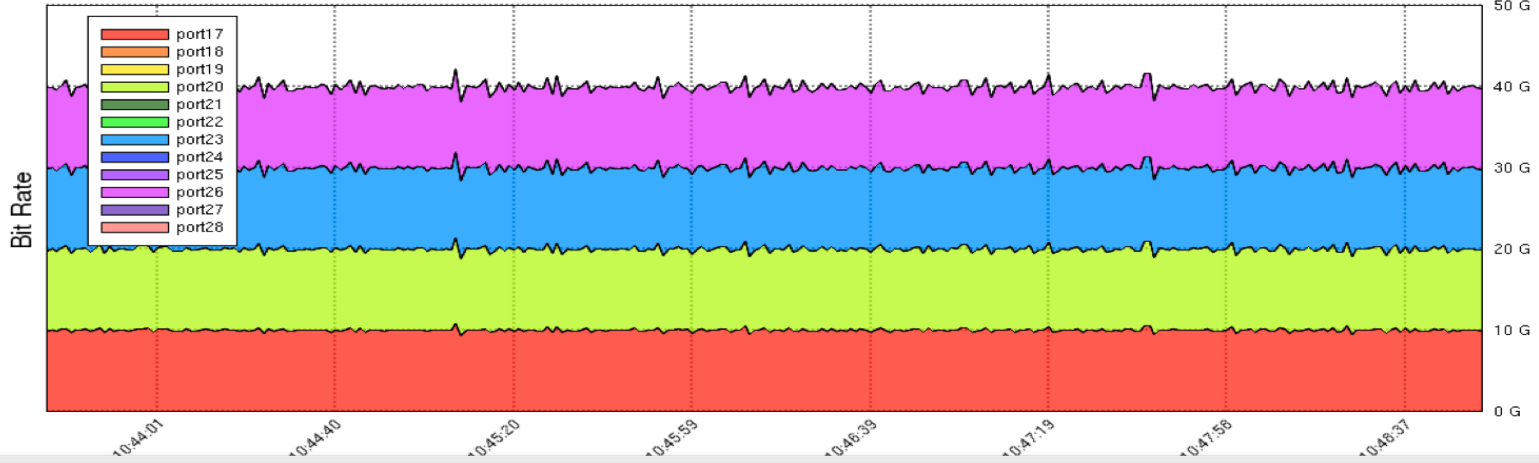
NASA-NOAA 100G Demo 18/Nov/2010 : 10:41:45 - 10:46:37 (GMT-6:00)



SC10 100G DEMO



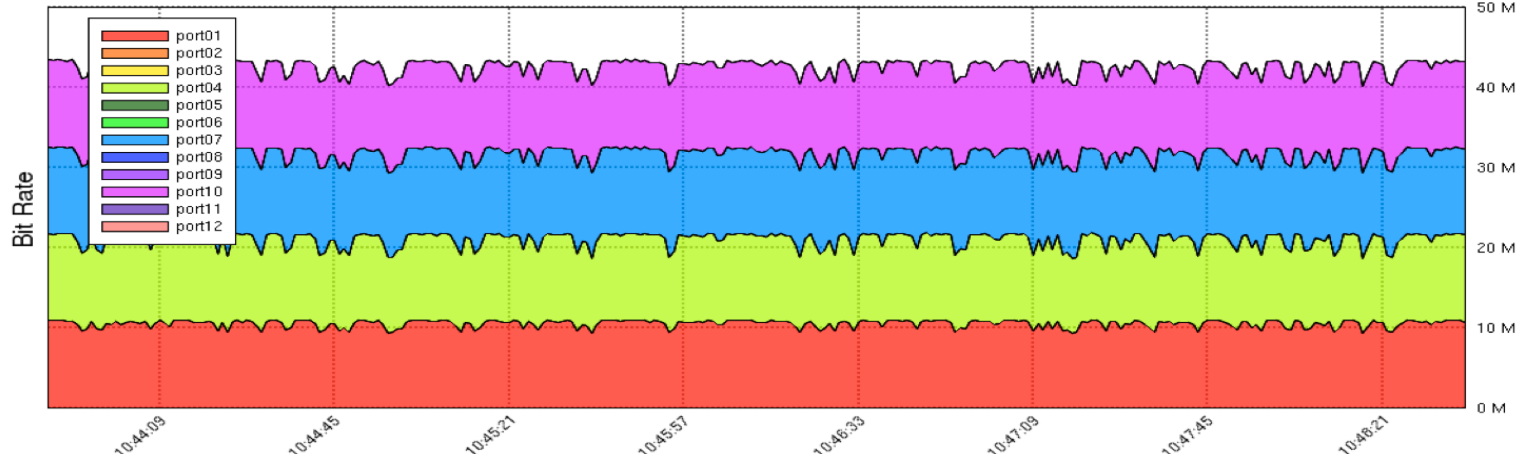
NASA-NOAA 100G Demo 18/Nov/2010 : 10:43:36 - 10:48:54 (GMT-6:00)



SC10 100G DEMO



NASA-NOAA 100G Demo 18/Nov/2010 : 10:43:46 - 10:48:38 (GMT-6:00)

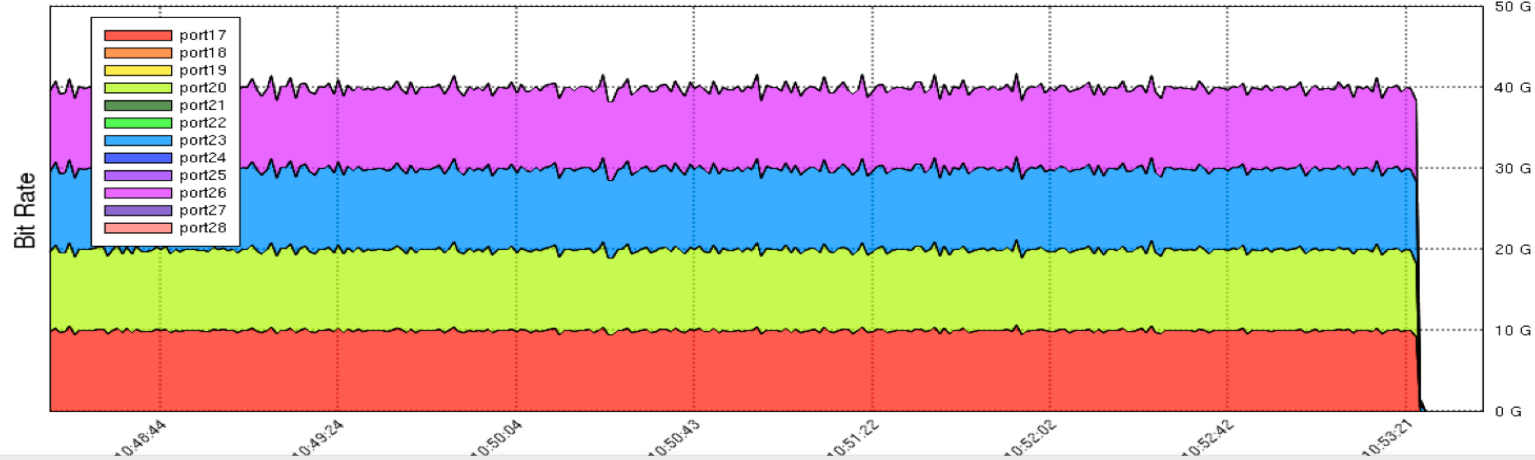




SC10 100G DEMO



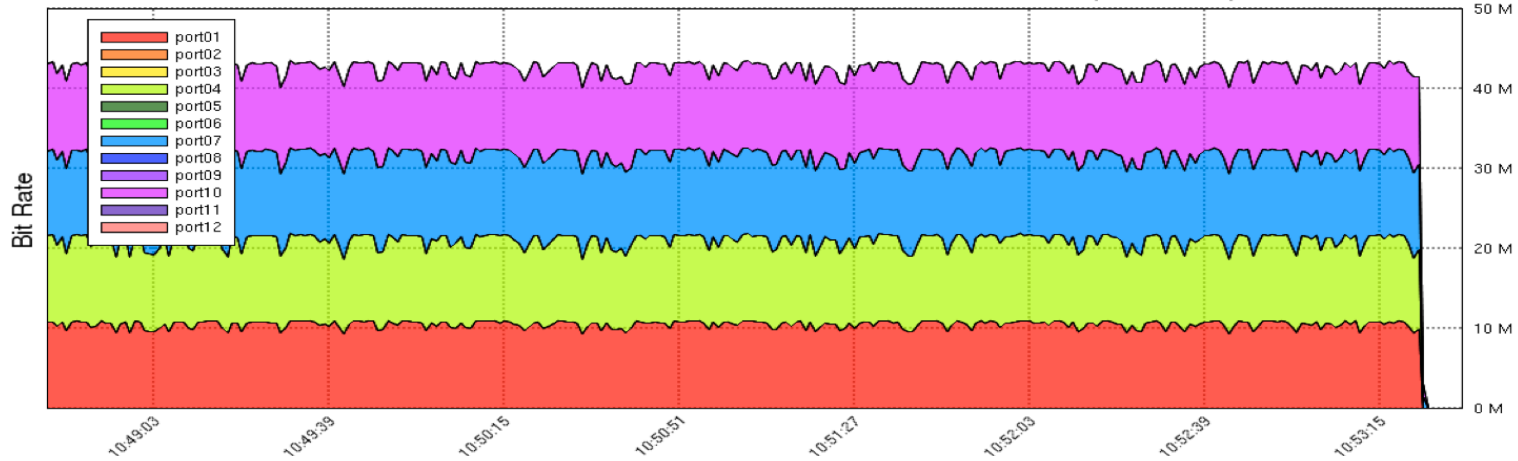
NASA-NOAA 100G Demo 18/Nov/2010 : 10:48:20 - 10:53:38 (GMT-6:00)



SC10 100G DEMO

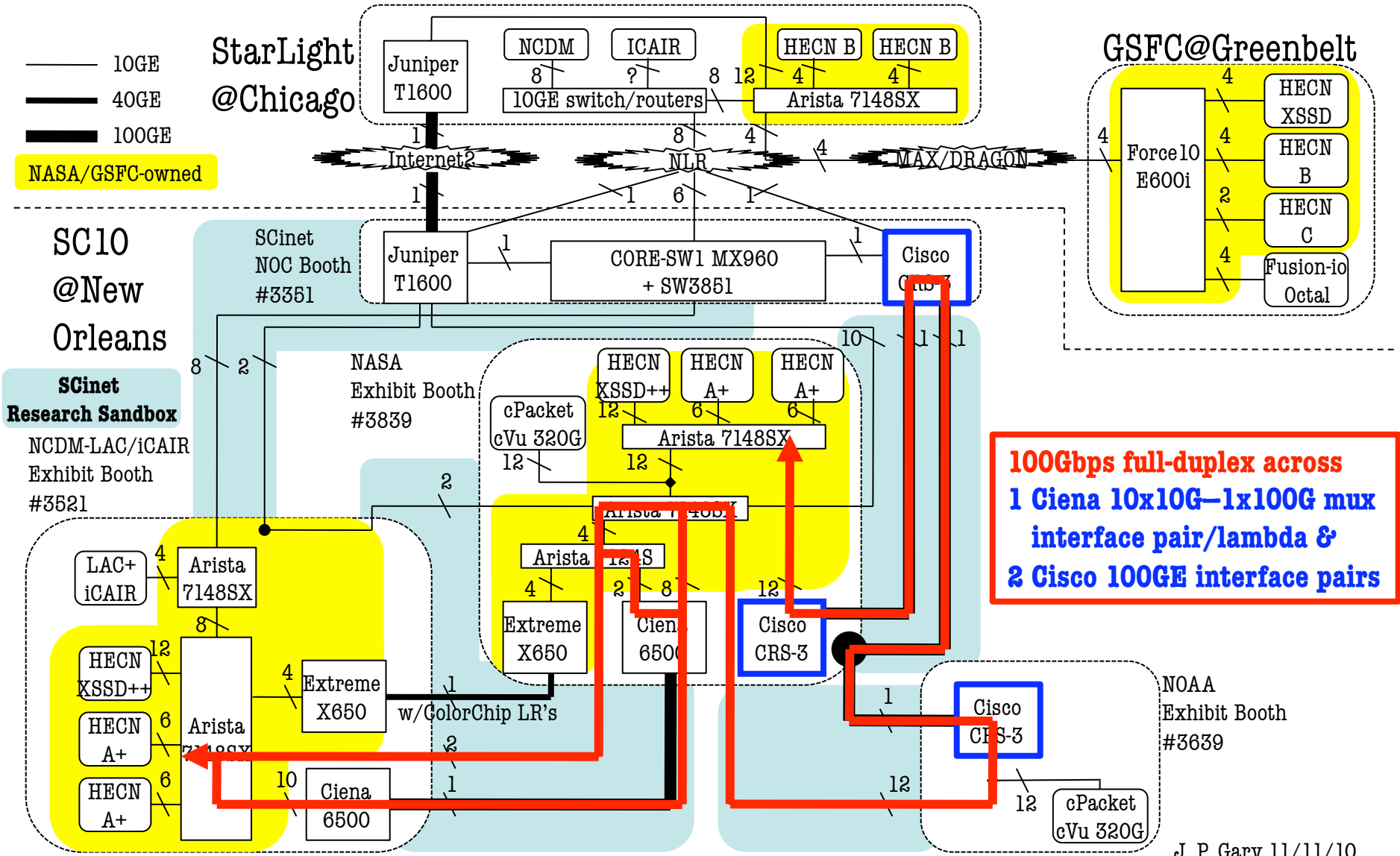


NASA-NOAA 100G Demo 18/Nov/2010 : 10:48:41 - 10:53:32 (GMT-6:00)



Using 100G Network Technology in Support of Petascale Science

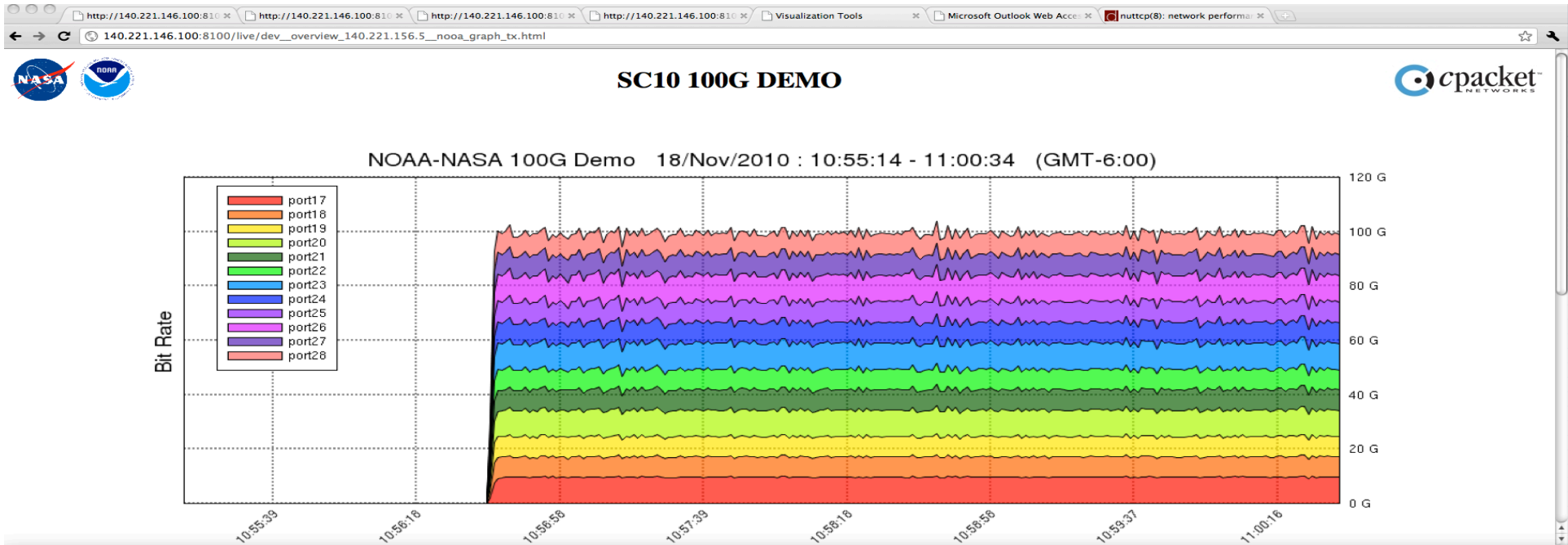
A Collaborative Initiative Among NASA, NLR, NOAA, Northwestern/iCAIR, SCinet & UIC/LAC
 Also Using Internet2's Multi-Vendor 100GigE Infrastructure Between StarLight and SC10



11/29/10

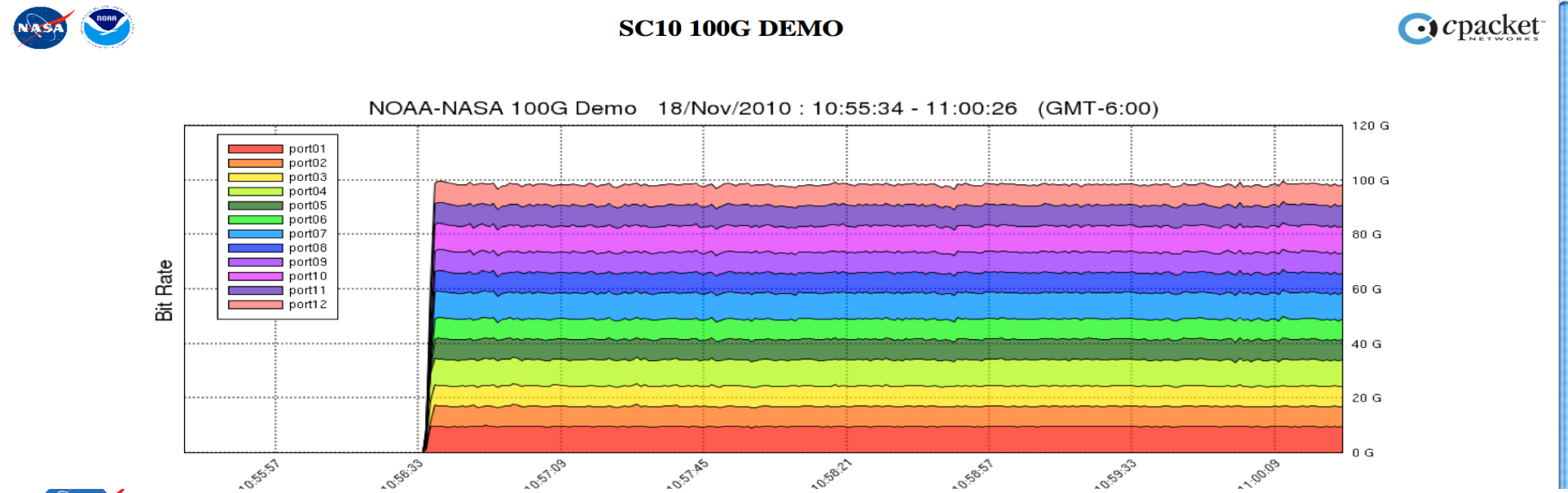
J. P. Gary

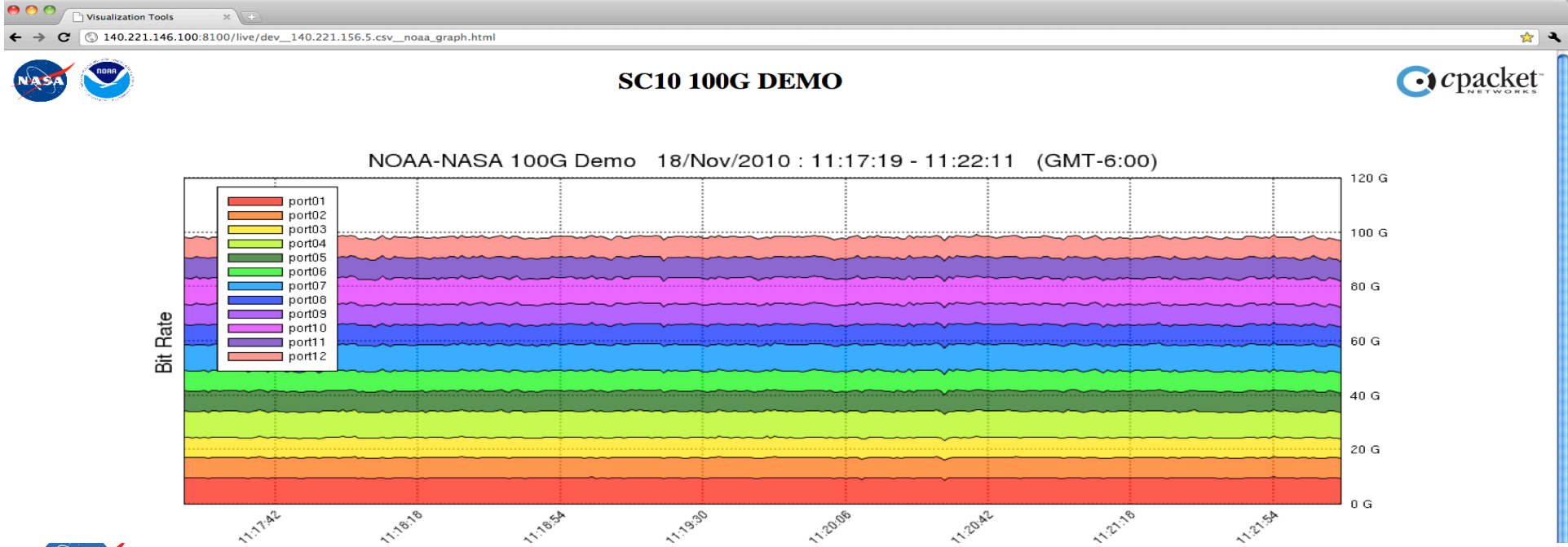
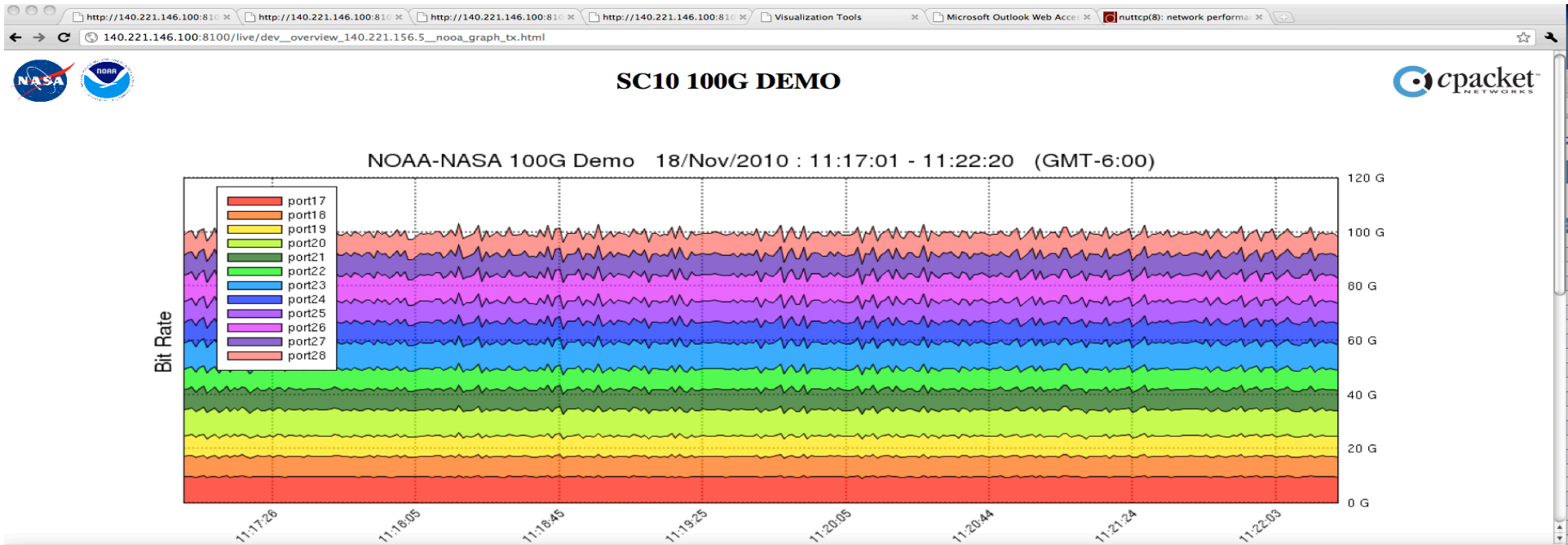
J. P. Gary 11/11/10



Visualization Tools

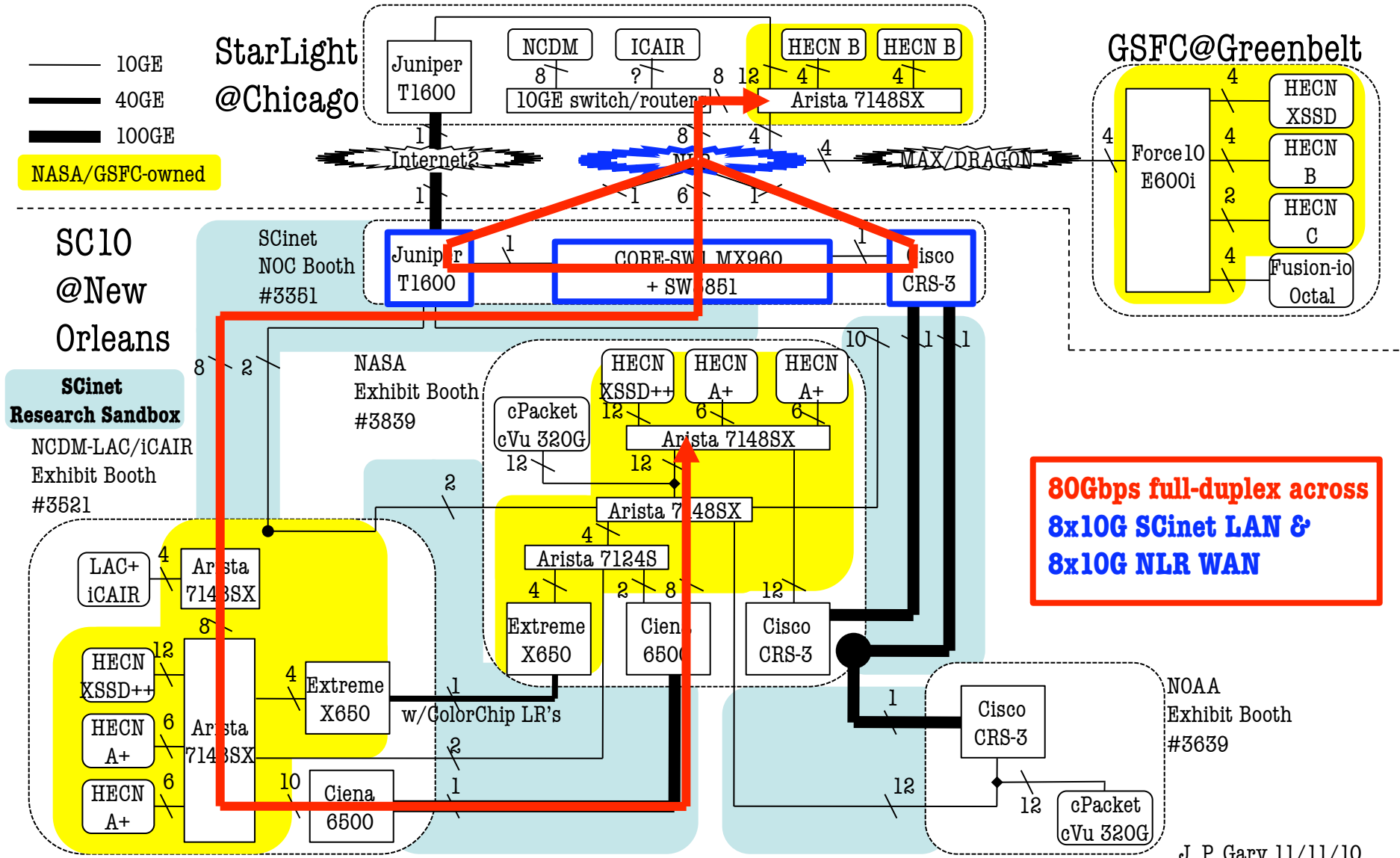
140.221.146.100:8100/live/dev_140.221.156.5_csv__noaa_graph.html





Using 100G Network Technology in Support of Petascale Science

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11/29/10

J. P. Gary

J. P. Gary 11/11/10



Subject: NLR 60 sec tests - after removal of port channel

Date: Wednesday, November 17, 2010 5:12 PM

From: Paul Lang <Paul.A.Lang@nasa.gov>

VLAN: 1321 1322 1323 1324 1325 1326 1327 1328

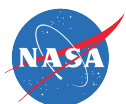
Individual

60-second

Tests:

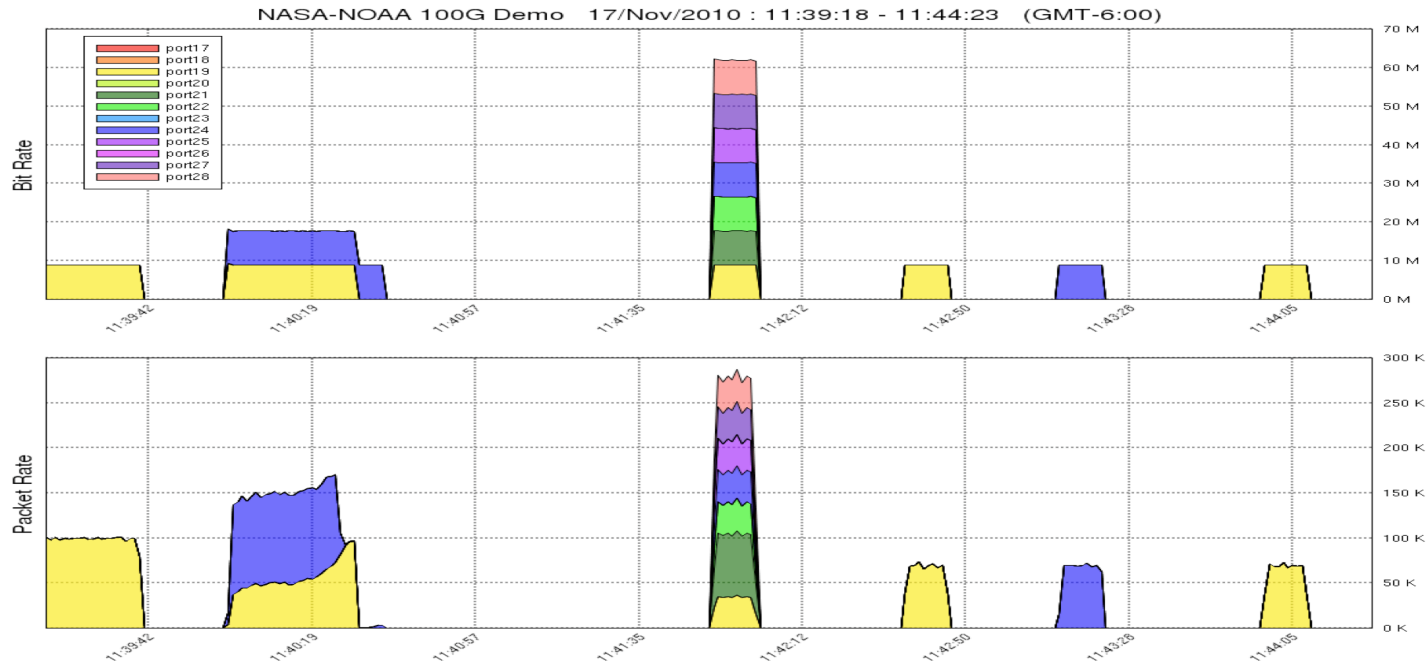
8816	6526	712	9352	994	9573	7384	3140
8747	6370	935	9336	1047	9410	6158	4354
6503	6220	1167	9092	1011	9431	8447	2070
8645	6262	1030	9210	1008	9216	4543	5986
8779	6387	806	9299	1078	9304	4843	5691
7621	6401	811	8826	917	9641	8913	1431

Note: Some VLANs weere shared PacketNet lambdas.



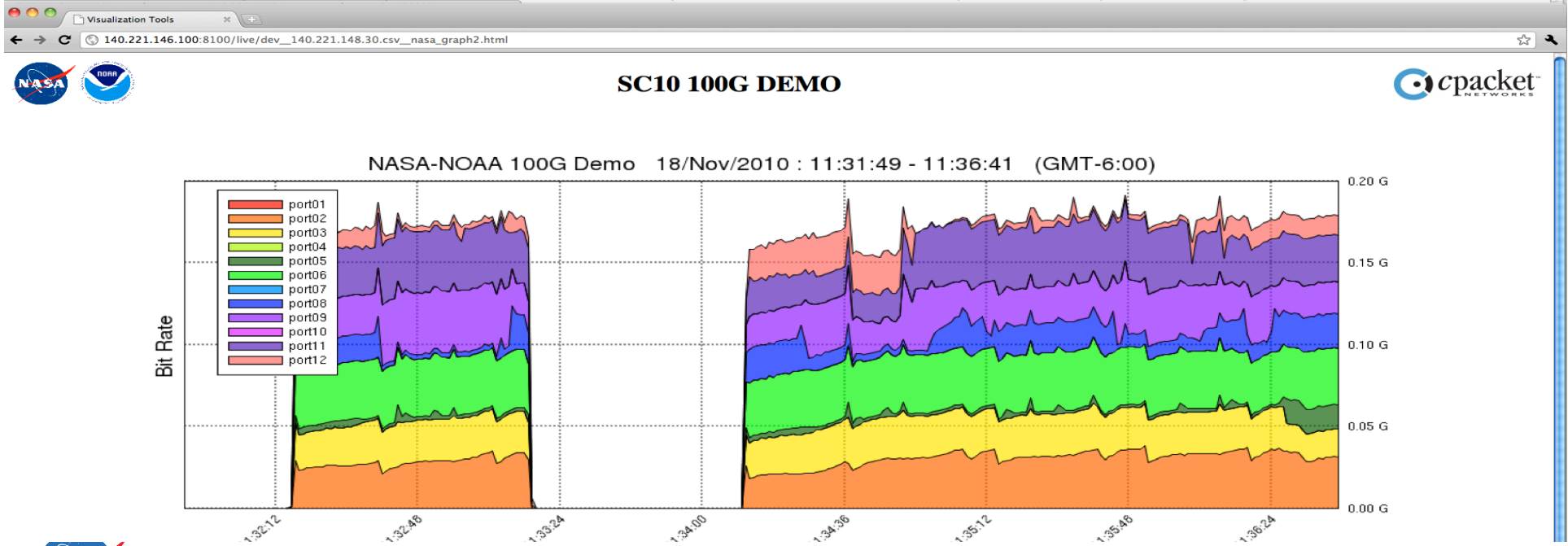
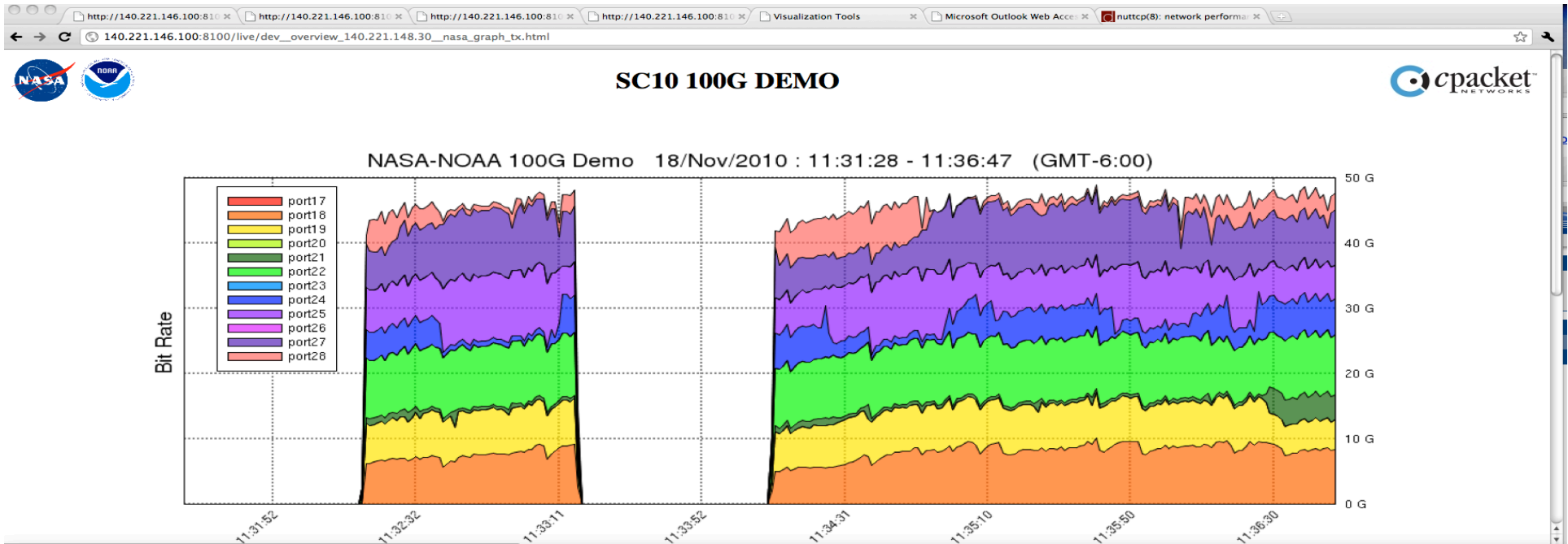


SC10 100G DEMO



[overview](#)

- [port_01](#)
- [port_02](#)
- [port_03](#)
- [port_04](#)
- [port_05](#)
- [port_06](#)
- [port_07](#)
- [port_08](#)
- [port_09](#)
- [port_10](#)
- [port_11](#)
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- [port_13](#)
- [port_14](#)
- [port_15](#)
- [port_16](#)
- [port_17](#)
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- [port_26](#)
- [port_27](#)
- [port_28](#)
- [port_29](#)
- [port_30](#)
- [port_31](#)
- [port_32](#)

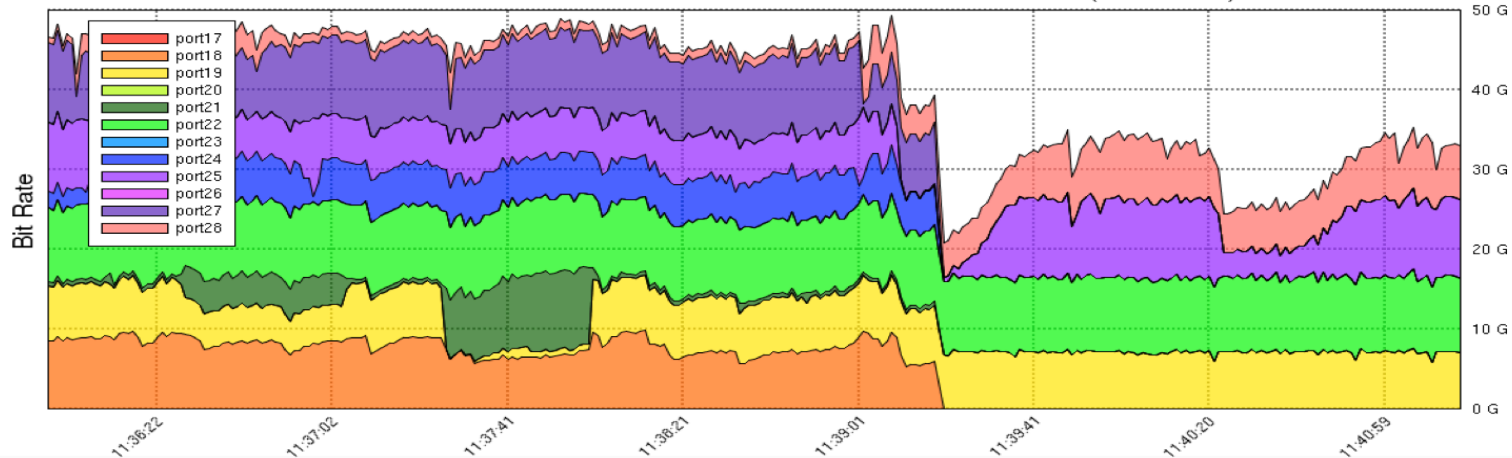




SC10 100G DEMO



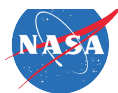
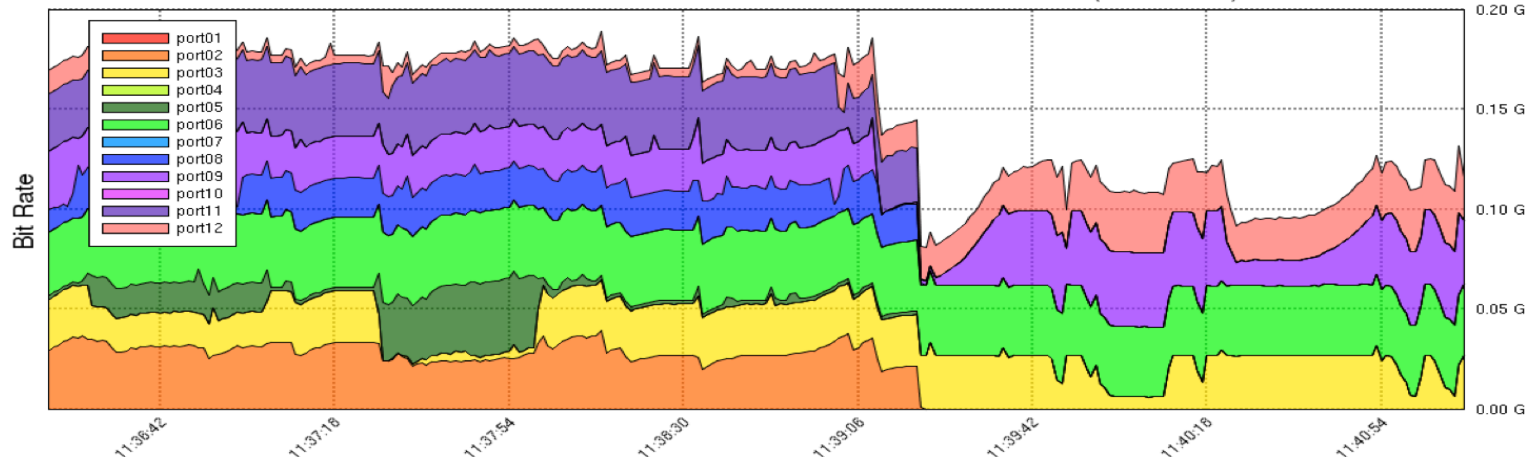
NASA-NOAA 100G Demo 18/Nov/2010 : 11:35:58 - 11:41:17 (GMT-6:00)



SC10 100G DEMO

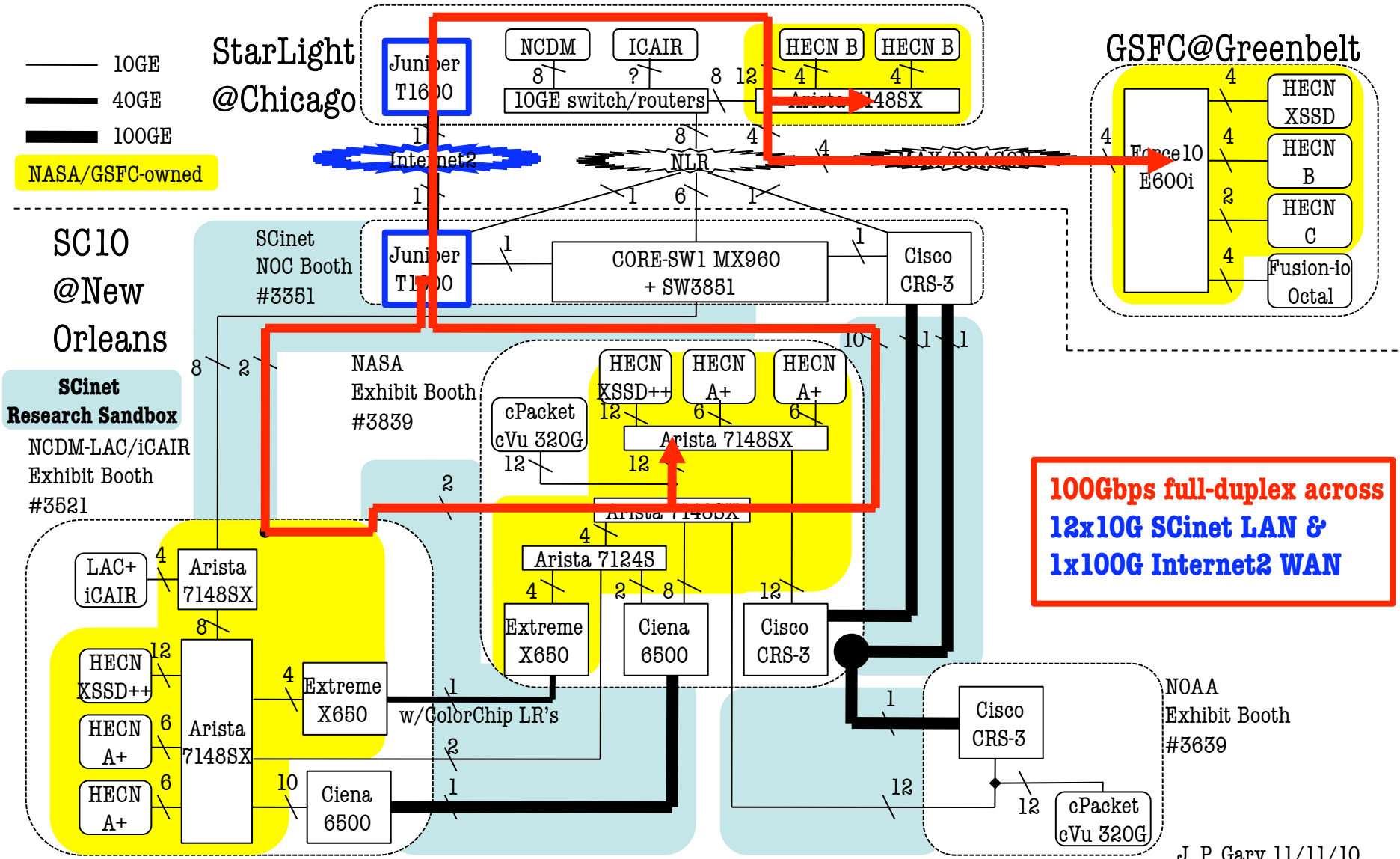


NASA-NOAA 100G Demo 18/Nov/2010 : 11:36:19 - 11:41:11 (GMT-6:00)



Using 100G Network Technology in Support of Petascale Science

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**100Gbps full-duplex across
 12x10G SCinet LAN &
 1x100G Internet2 WAN**

11/29/10

J. P. Gary

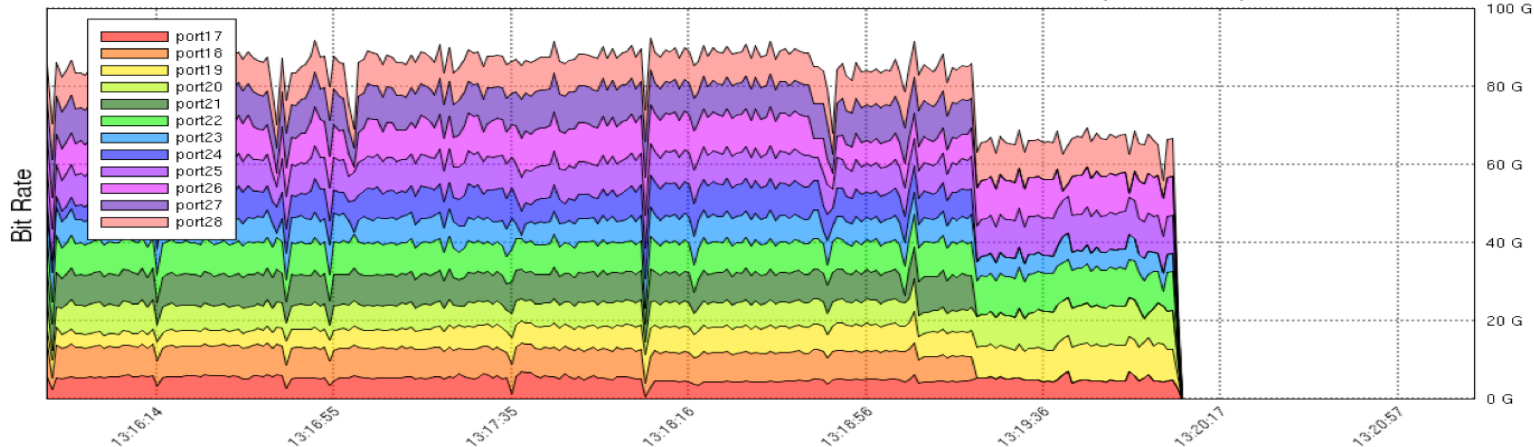
J. P. Gary 11/11/10



SC10 100G DEMO



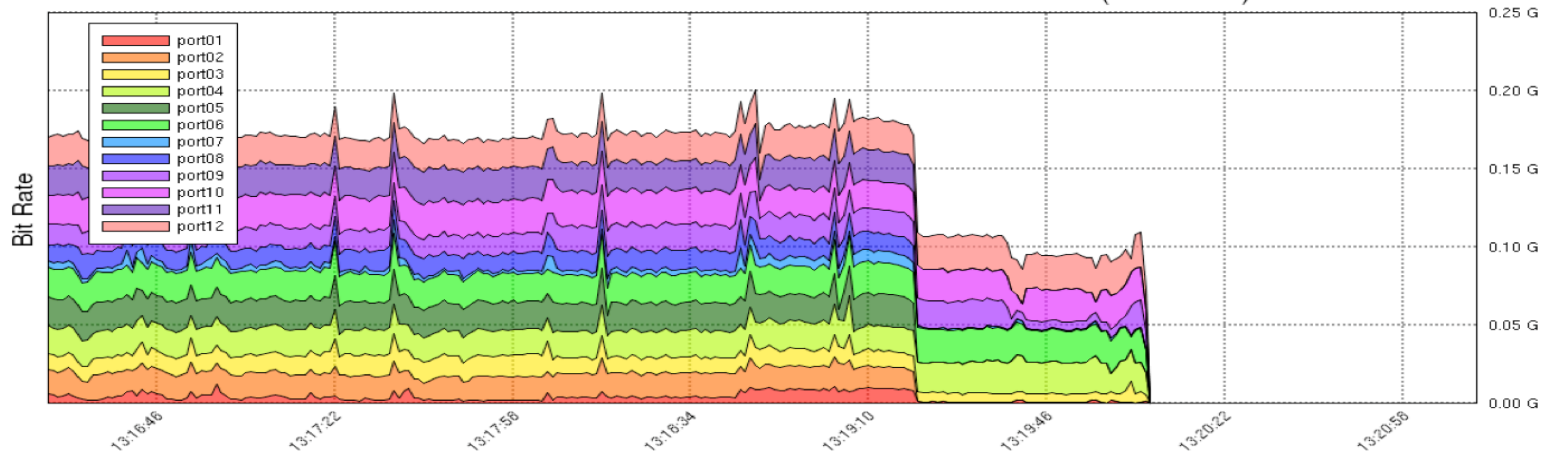
NASA-NOAA 100G Demo 18/Nov/2010 : 13:15:50 - 13:21:15 (GMT-6:00)

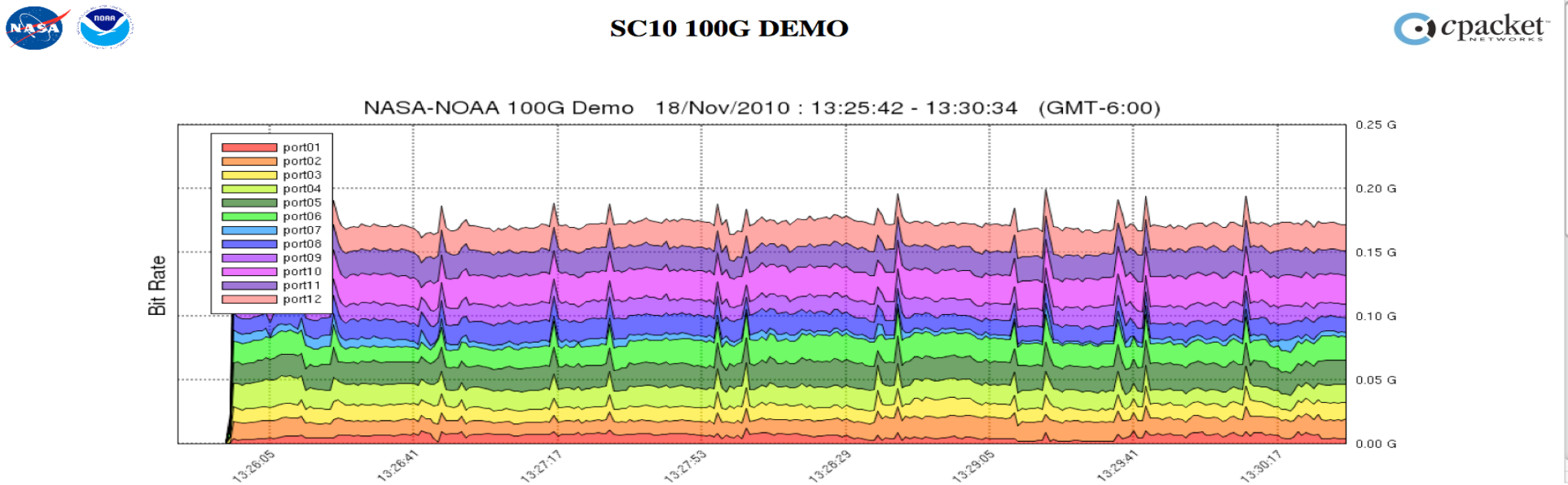
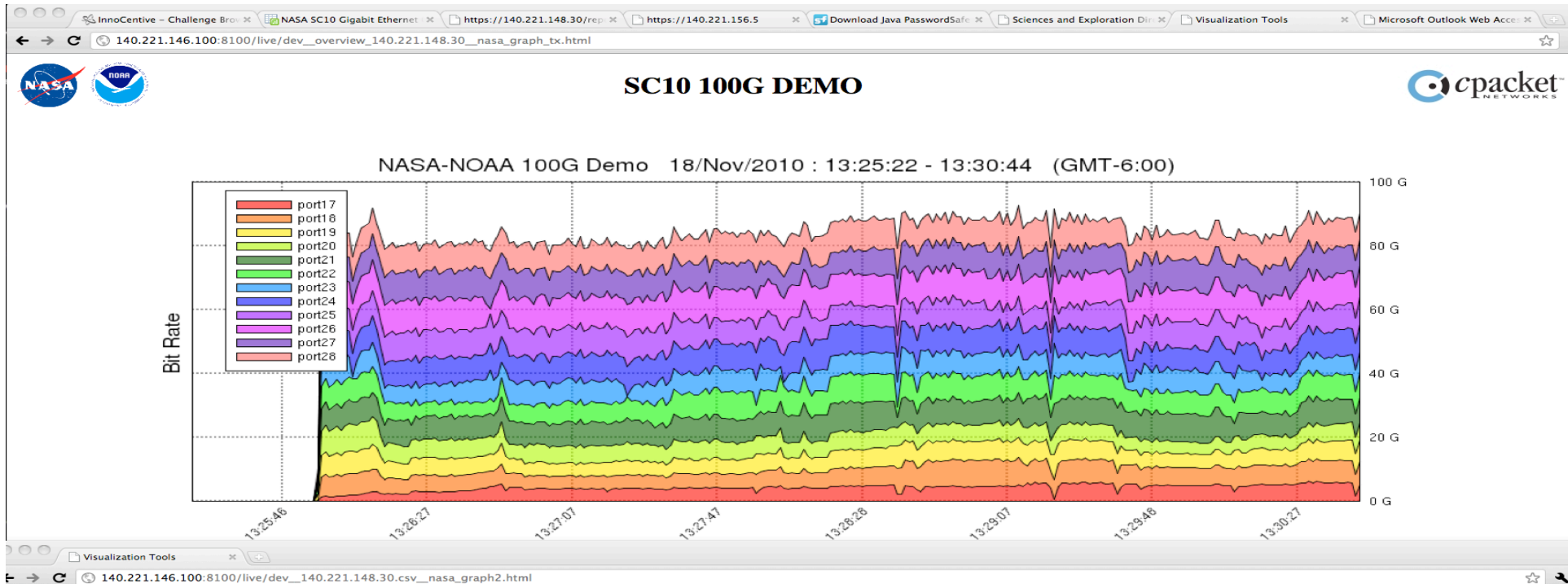


SC10 100G DEMO

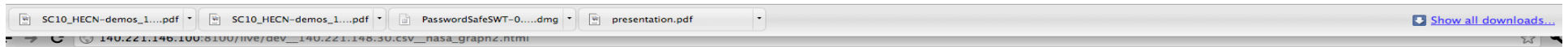
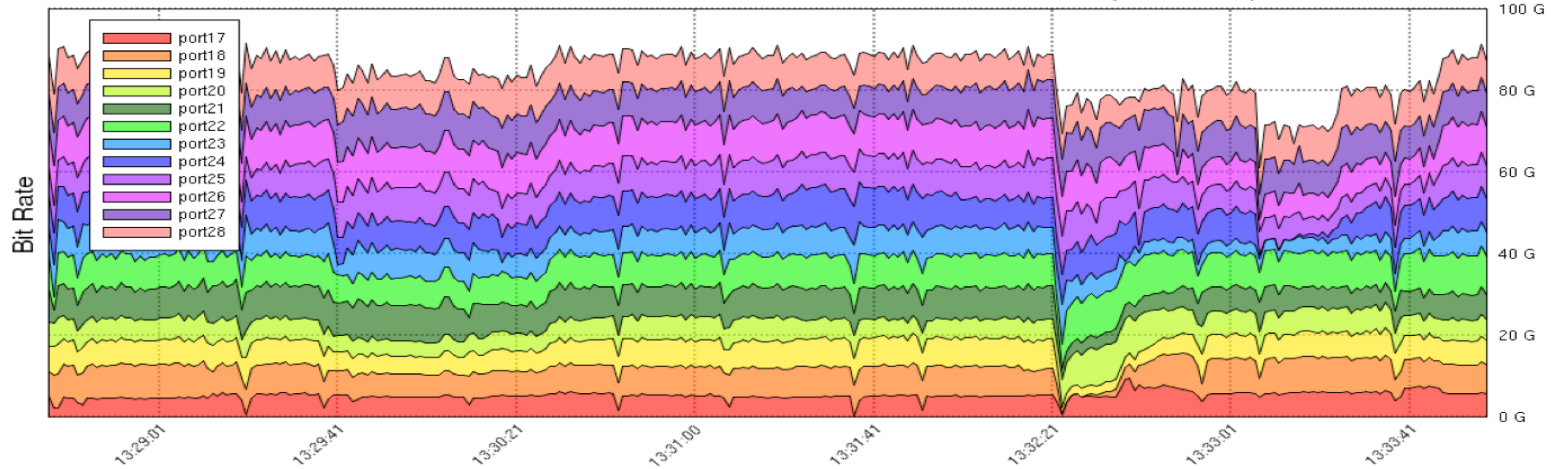


NASA-NOAA 100G Demo 18/Nov/2010 : 13:16:24 - 13:21:13 (GMT-6:00)

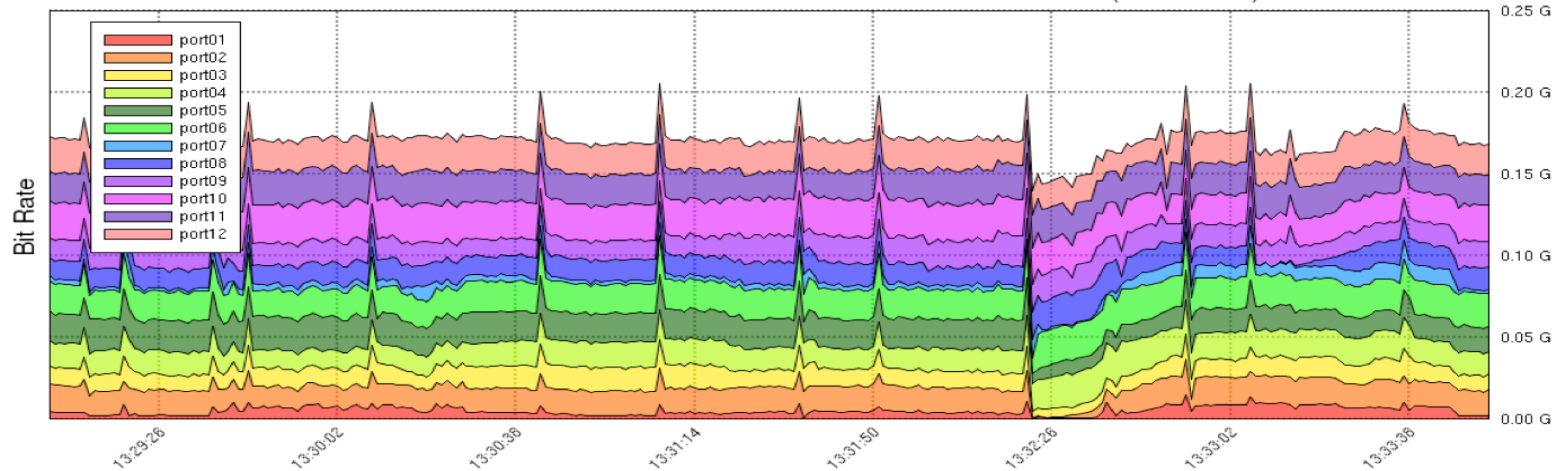




NASA-NOAA 100G Demo 18/Nov/2010 : 13:28:36 - 13:33:58 (GMT-6:00)

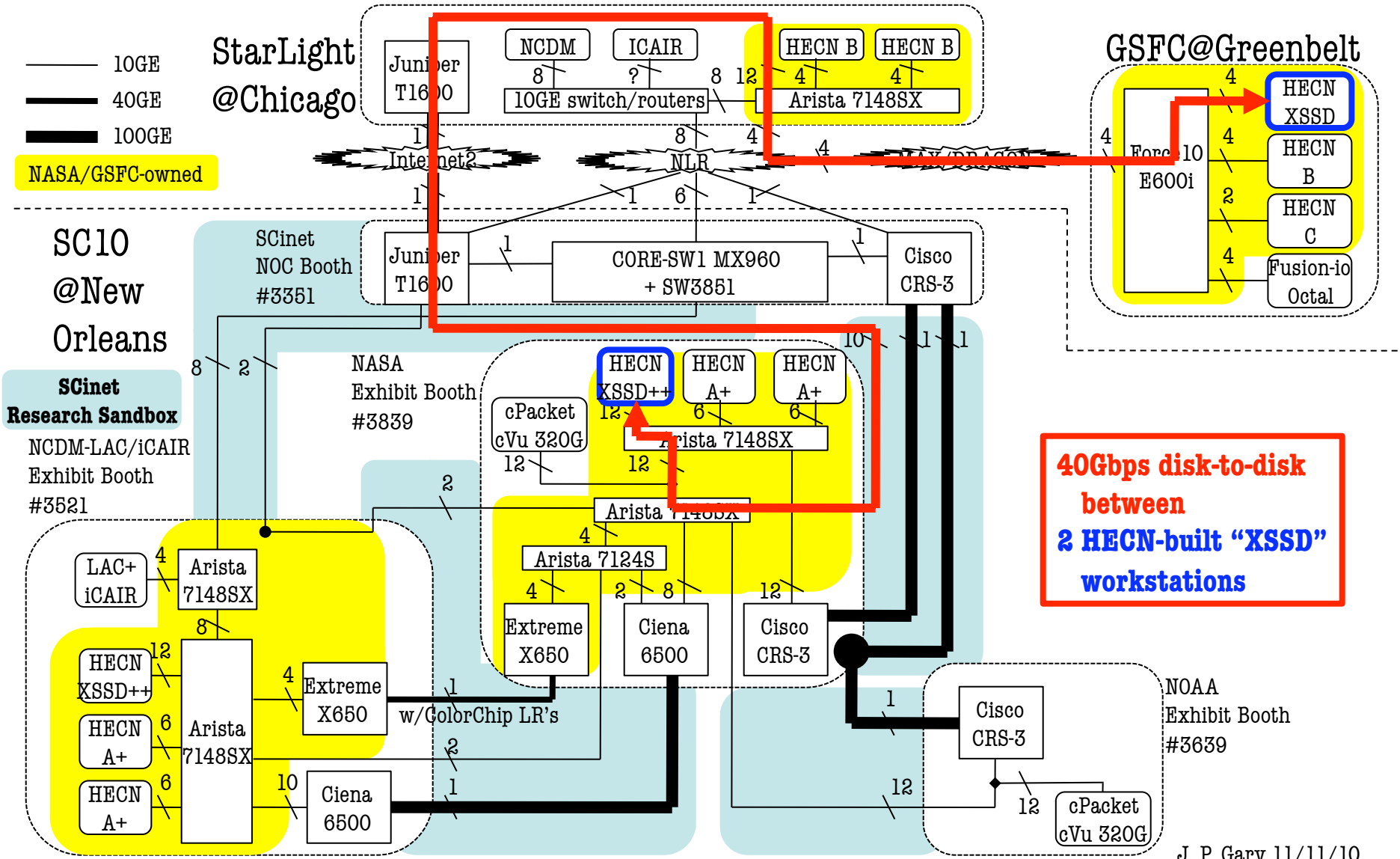


NASA-NOAA 100G Demo 18/Nov/2010 : 13:29:04 - 13:33:54 (GMT-6:00)



Using 100G Network Technology in Support of Petascale Science

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**40Gbps disk-to-disk
 between
 2 HECN-built "XSSD"
 workstations**

11/29/10

J. P. Gary

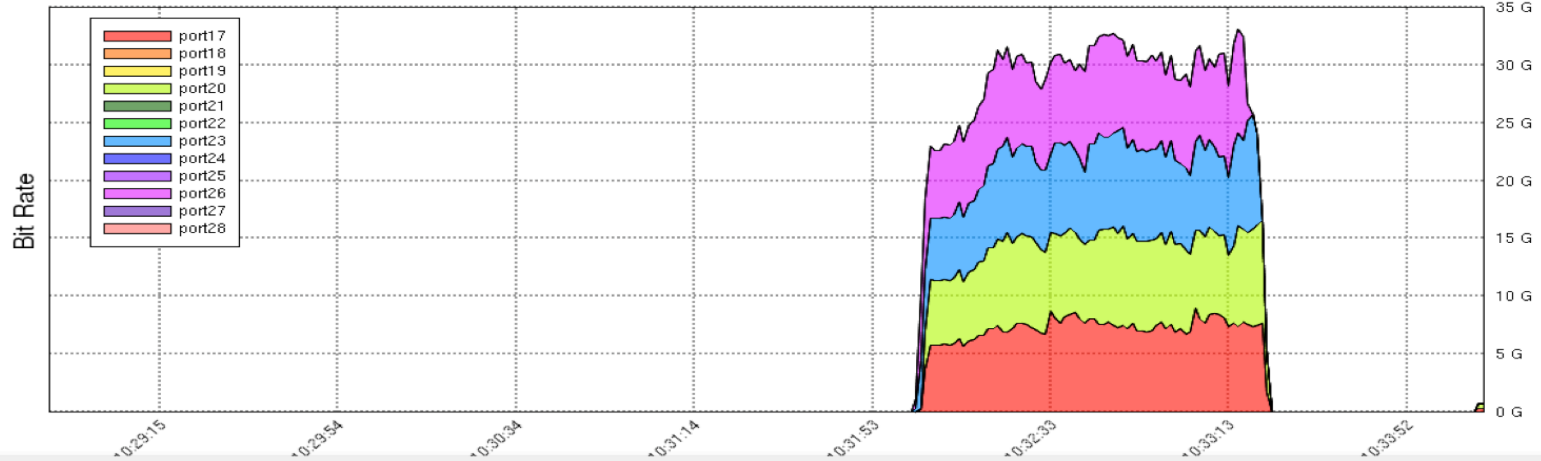
J. P. Gary 11/11/10



SC10 100G DEMO



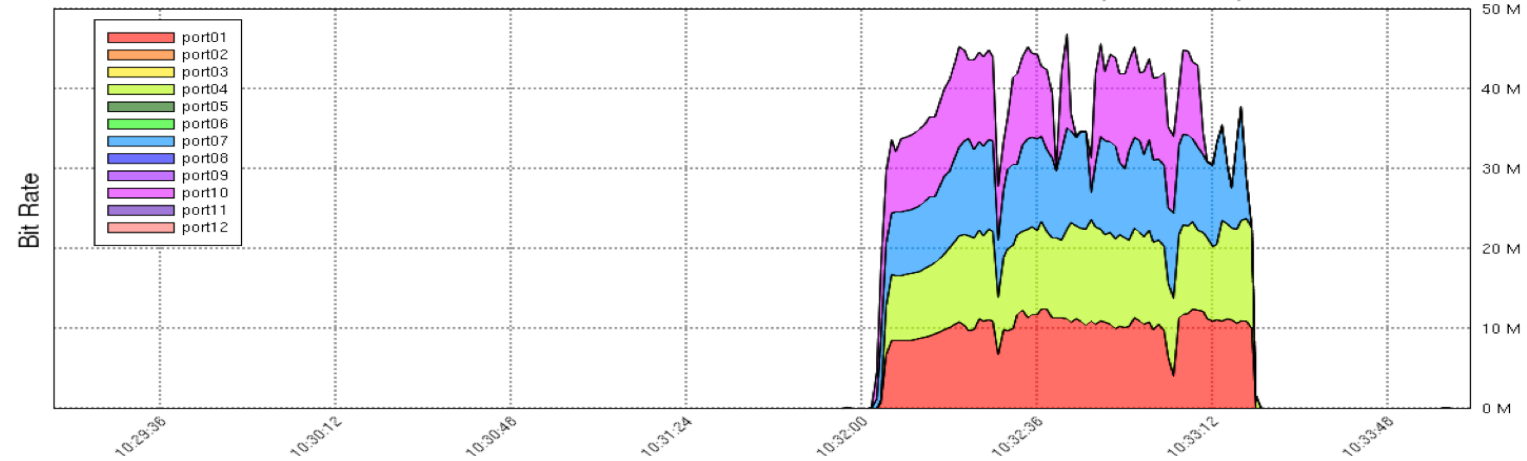
NASA-NOAA 100G Demo 18/Nov/2010 : 10:28:51 - 10:34:09 (GMT-6:00)

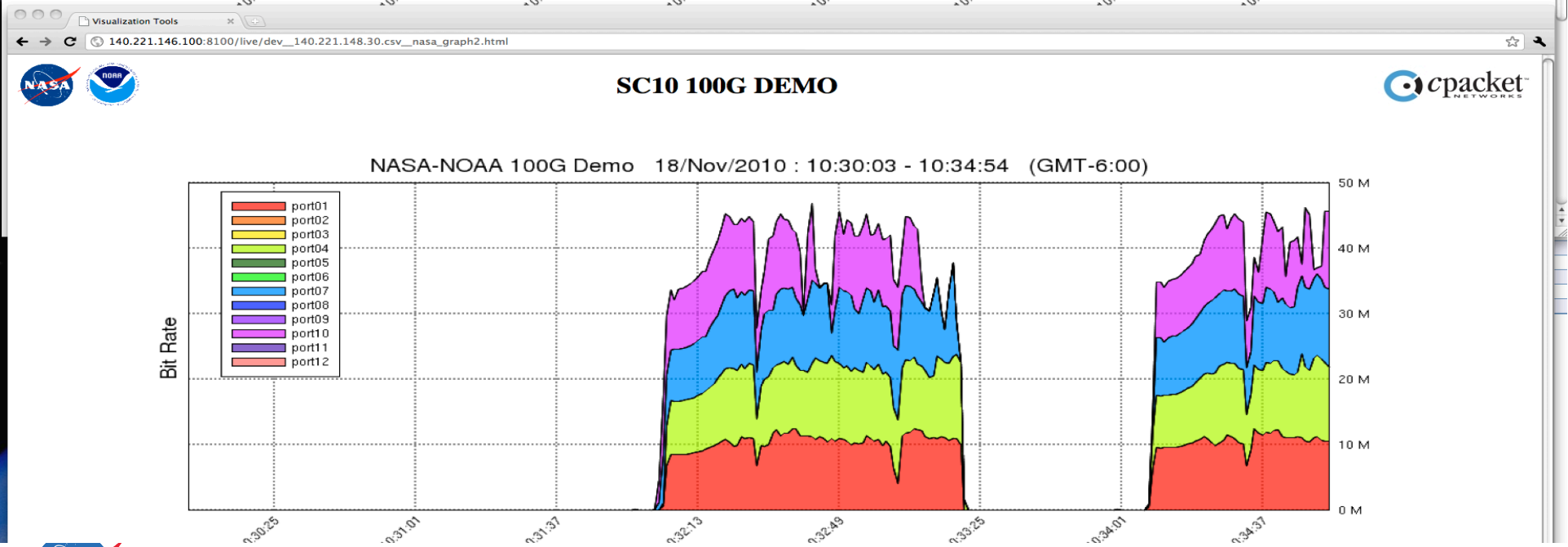
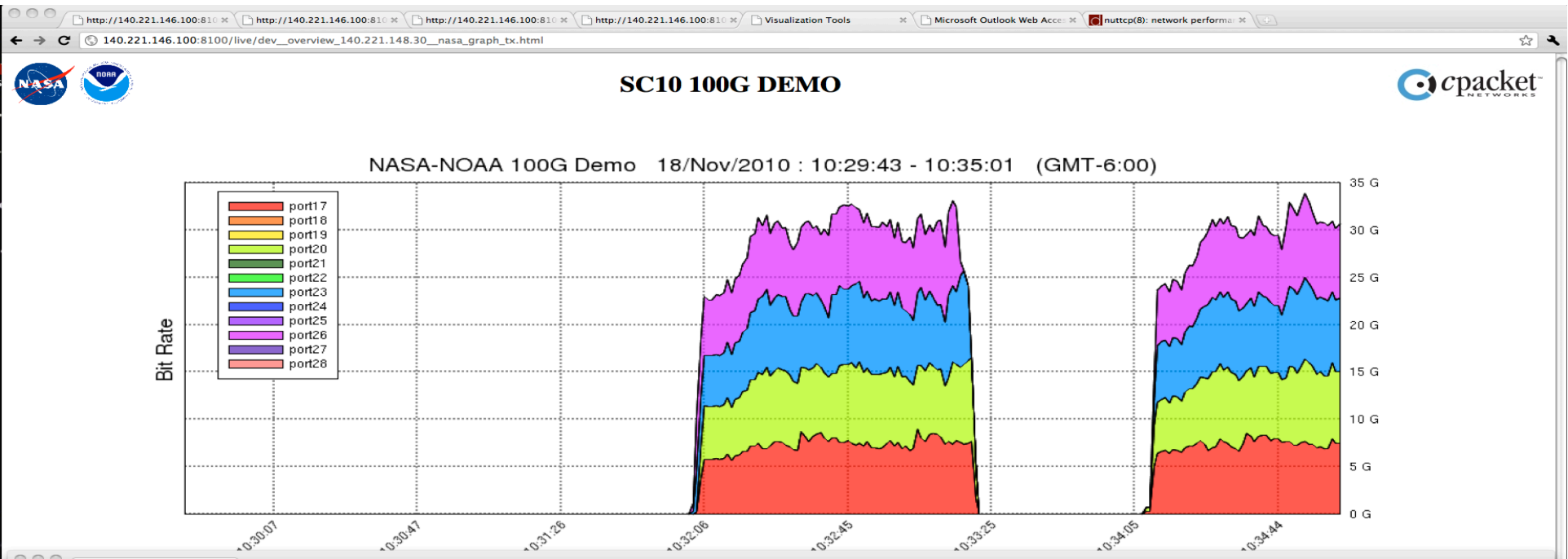


SC10 100G DEMO



NASA-NOAA 100G Demo 18/Nov/2010 : 10:29:14 - 10:34:05 (GMT-6:00)



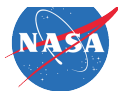
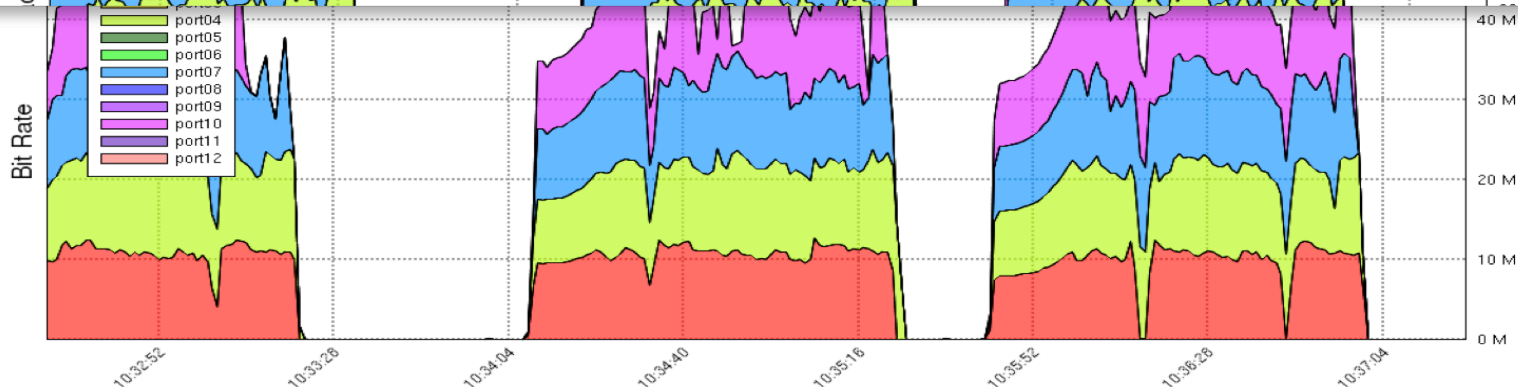
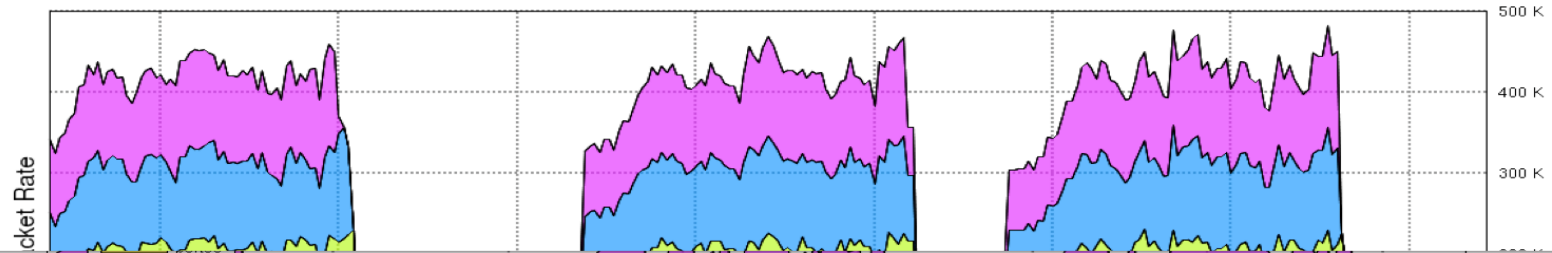
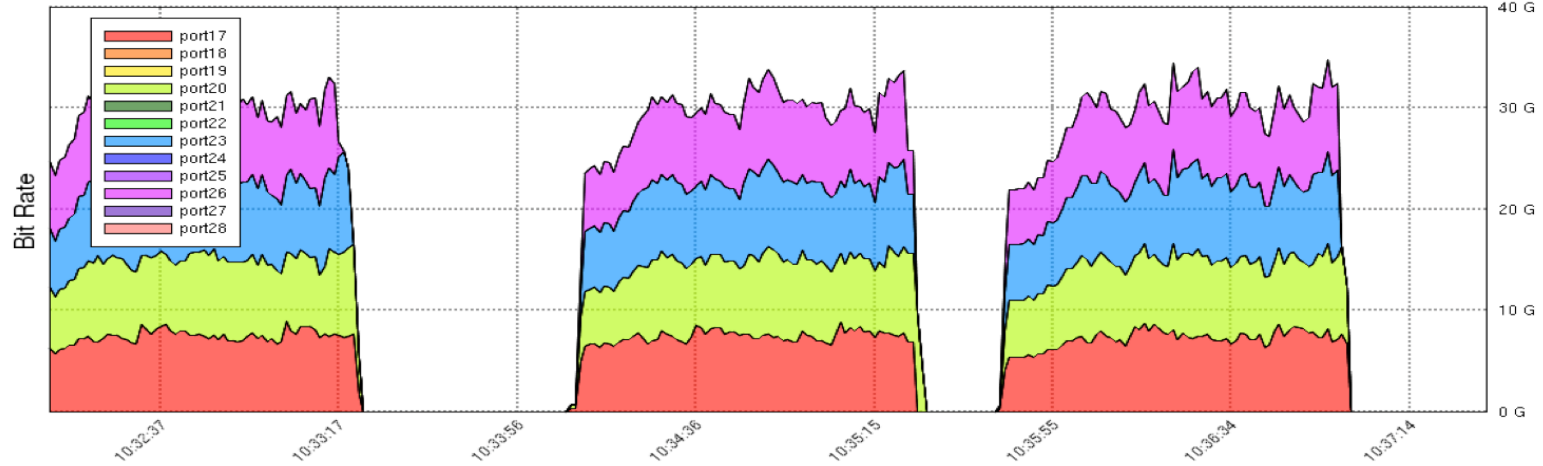




SC10 100G DEMO



NASA-NOAA 100G Demo 18/Nov/2010 : 10:32:12 - 10:37:30 (GMT-6:00)





~~NETWORK BOTTLENECKS~~

