GSFC Network Support for SC06 Demos

HECN Team Supports Four Realtime Demonstrations at SC2006, Nov. 11-17, 2006

GSFC's High End Computer Network (HECN) Team supported four realtime high performance networking data flow demonstrations into the showroom floor of the International Conference for High Performance Computing, Networking and Storage, a.k.a. SC2006, hosted in Tampa, FL. The provided support was in the form of either HECN's physical network infrastructure used in the critical path of a demo's realtime data flows or network engineering or troubleshooting expertise to help setup the demo.

The demos supported were those of the following projects:

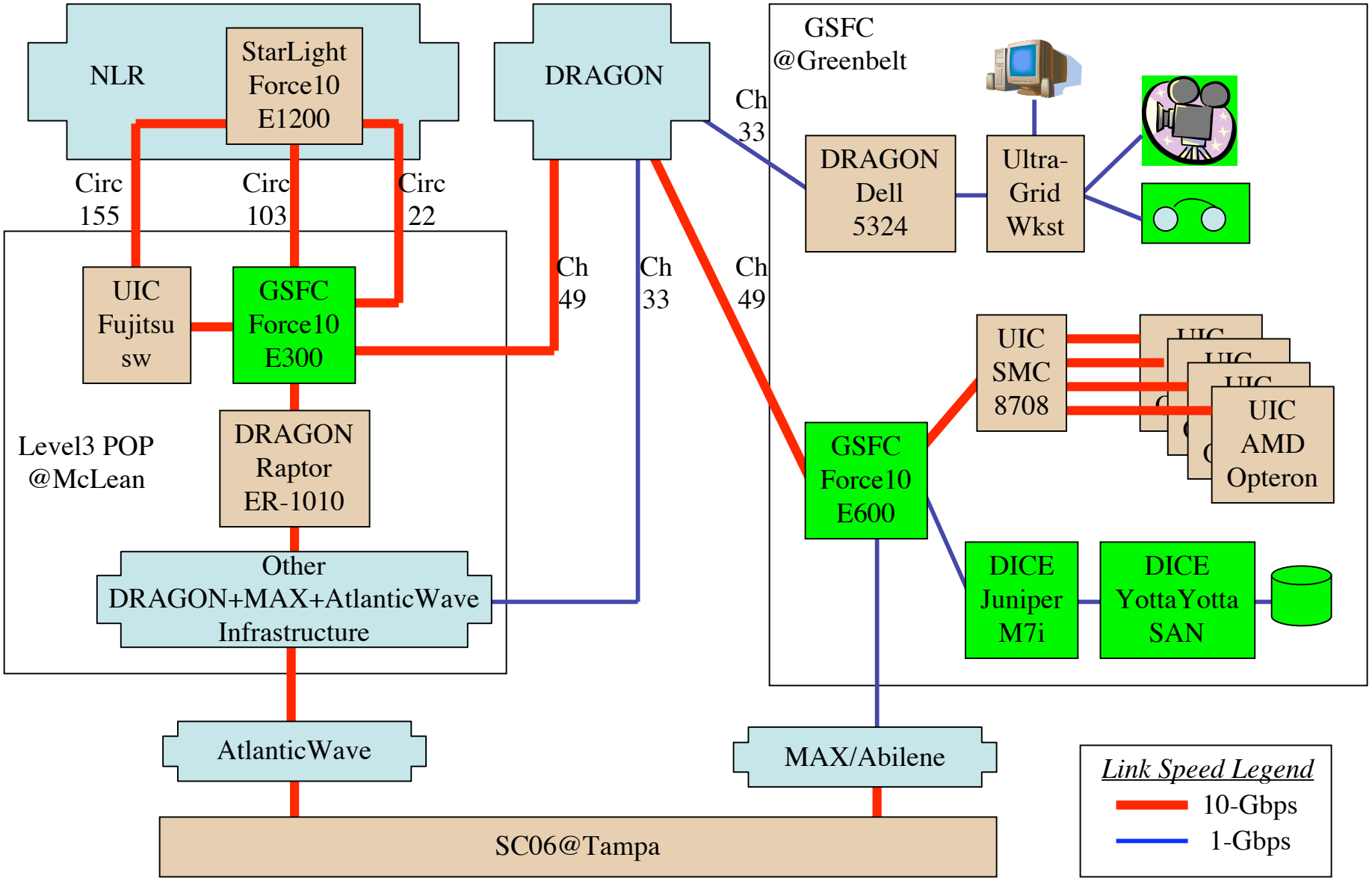
- **DRAGON: http://dragon.maxgigapop.net/**
- **TeraFlow Testbed: http://www.teraflowtestbed.net/**
- **OptIPuter: http://www.optiputer.net/**
- **DICE: http://www.avetec.org/dice/**

SC06 Demos Supported By GSFC's HECN

- **DRAGON's XNET Demo**
  - Ability to dynamically establish application specific networks that exhibit deterministic, predictable, and repeatable performance characteristics
  - On demand provisioning of optical lambda and VLAN layer network services linking to facilities in Japan, Europe, and across the US to create a */dedicated/* distributed environments for scientific collaboration
  - http://dragon.maxgigapop.net/twiki/bin/view/DRAGON/SuperComputingPlanning2006
- **TeraFlow Testbed Demo**
  - An international application testbed for exploring, integrating, analyzing, and detecting changes in massive and distributed data over wide area high performance networks
  - http://www.ncdm.uic.edu/ & http://sdss.ncdm.uic.edu/
- **OptIPuter Demo**
  - The California Institute for Telecommunications and Information Technology (Calit2), the Center for Earth Observations and Applications (CEOA), the National Center for Microscopy and Imaging Research (NCMIR), and the Electronic Visualization Laboratory (EVL) at the University of Illinois at Chicago present collaborative research on sensor networks and instrument grids.
  - http://iebms.heiexpo.com/iebms/oep/oep_p2_details.aspx?sessionid=ejnff5ei1fb6fg7ei8&OrderNbr=1626&rescode=3101X62&newrestype=3101
- **DICE Demo**
  - Live data intensive computing environment between multiple booths
  - http://www.avetec.org/dice/SC06_overview.htm

GSFC Network Support for SC06 Demos

Relevant Network Infrastructure Used



GSFC Network Support for SC06 Demos

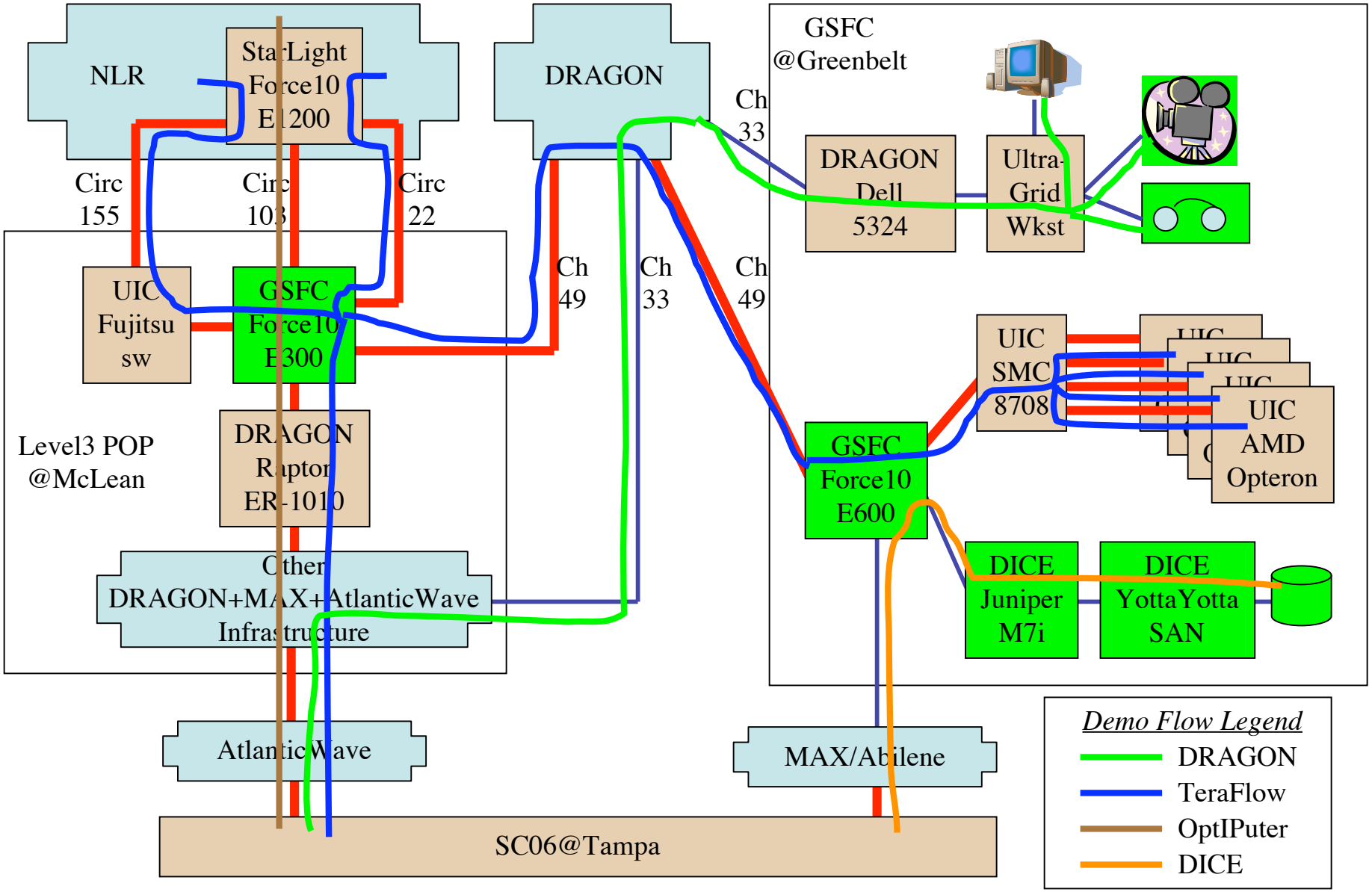
HECN Team Supports Four Realtime Demonstrations at SC2006, Nov. 11-17, 2006

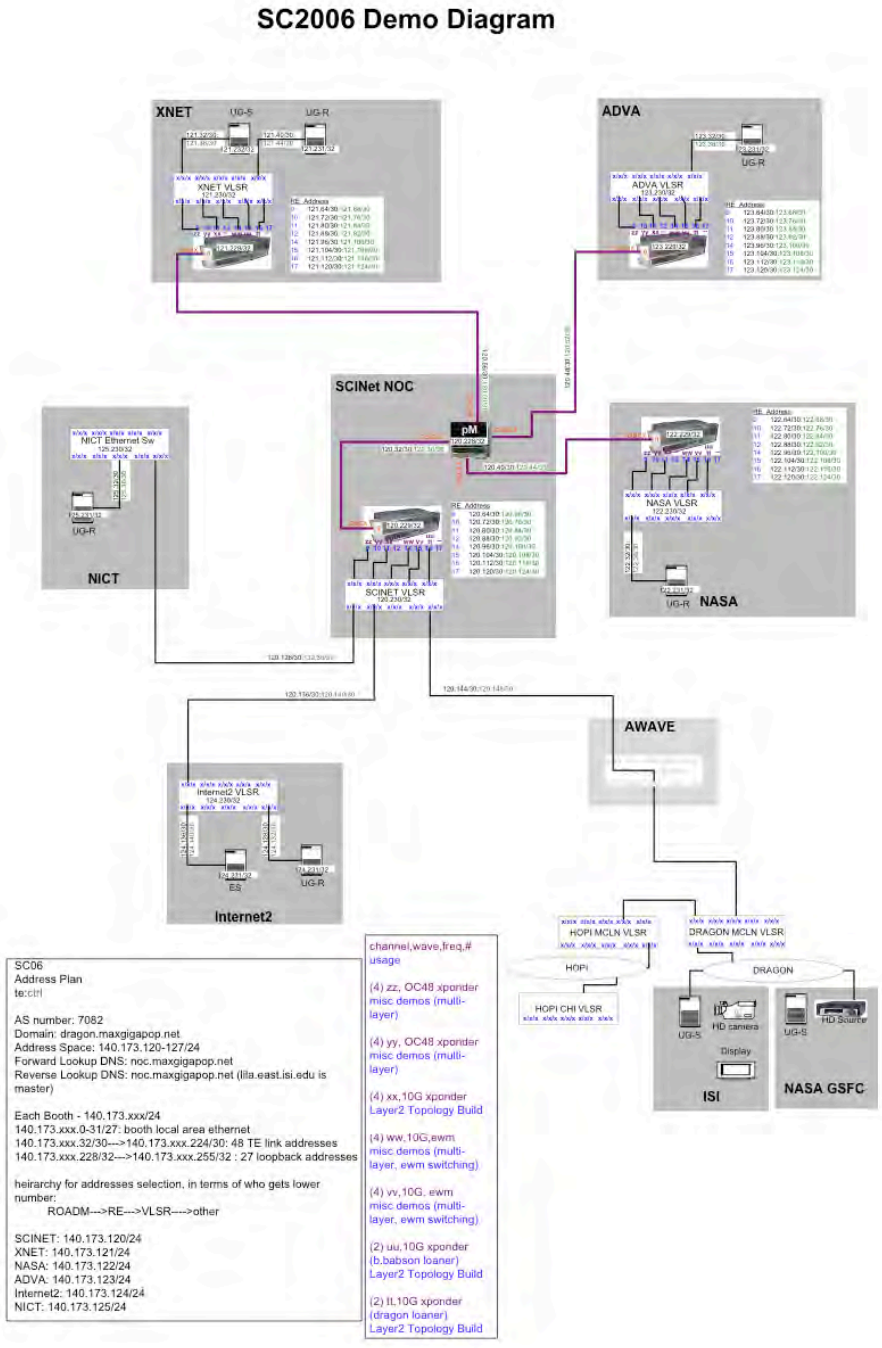
The HECN supported SC2006 data flows are illustrated in the next slide as "overlays" on the Relevant Network Infrastructure Used.

The overlays are mapped to the supported projects via the following legend:

- DRAGON
- TeraFlow
- OptIPuter
- DICE

GSFC Network Support for SC06 Demos



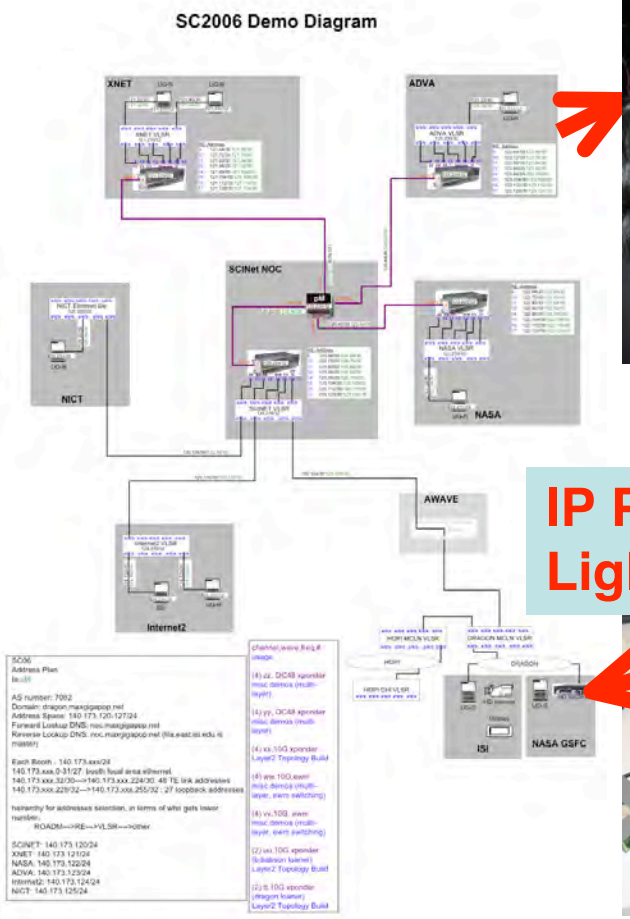


High level network diagram, prepared by DRAGON's Chris Tracy, showing the optical WAN pathways between GSFC and the five booths at SC06 hosting DRAGON's Xnet demo:

- ADVA (booth 1542)
- Internet2 (booth 1451)
- NASA (booth 917)
- NICT (booth 443)
- XNET (booth 1848)

GSFC Network Support for DRAGON Xnet Demo During SC06

Streaming NASA HD Video Uncompressed in Realtime from GSFC to the SC2006 Showroom Floor in Tampa



High level network diagram, prepared by DRAGON's Chris Tracy, showing the optical WAN pathways between GSFC and the five booths at SC06 hosting DRAGON's Xnet demo.

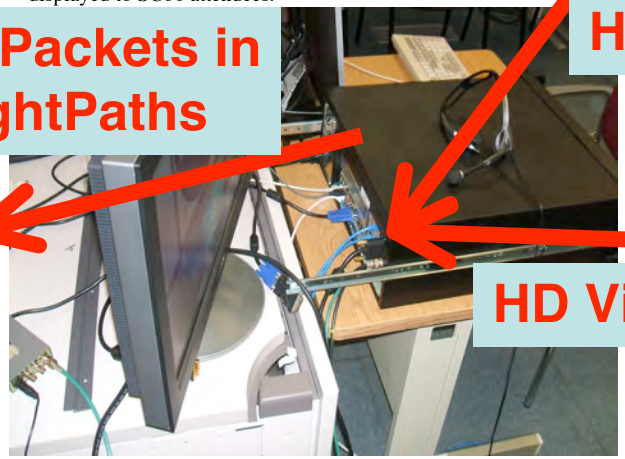
At the Internet2 booth at SC06 (one of five hosting DRAGON's Xnet demo) realtime uncompressed HD video from the High End Computer Network (HECN) Team's lab at GSFC is displayed to SC06 attendees.

A Panasonic AJ-HD1200AP HD player, loaned from GSFC's TV Studio (courtesy of Pat Kennedy), provides one of the HD video stream sources.

IP Packets in LightPaths

HD Video

HD Video



UltraGrid software and a HD video capture/compression card, loaned from USC/ISI-East's Tom Lehman, in HECN's Pentium4 IP-packetizes and transmits the digital video at 1-Gbps through an optical WAN path dynamically provisioned by DRAGON's network control-plane software.

A Hitachi SK-3010P HD camera, loaned from GSFC's TV Studio (courtesy of Pat Kennedy), provides one of the realtime HD video stream sources.

GSFC Network Support for SC06 Demos

Kudos for GSFC Realtime HD Content Streaming As Part Of DRAGON Xnet Demos During SC06

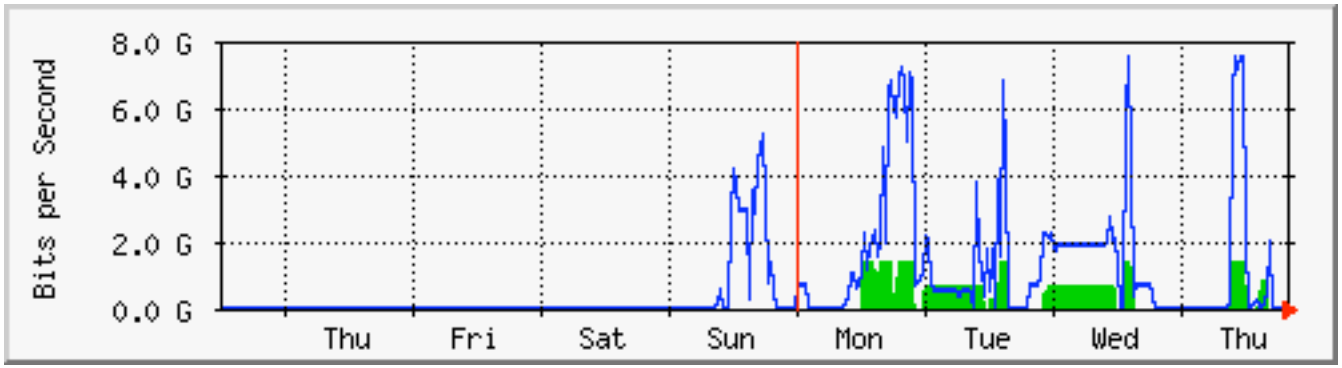
- GSFC's TV Studio, esp. Pat Kennedy
  - For loan of HD content, player and camera
- DRAGON/ISI-E's Tom Lehman and Ladan Gharai
  - For loan of HD capture card and monitor
- GSFC's High End Computer Network Team, i.e., Bill Fink, Paul Lang, Aruna Muppalla, and Pat Gary
  - For network infrastructure I&T and M&O

GSFC Network Support for SC06 Demos

Combined TeraFlow and OptIPuter Data Flows to/from SC06

GSFC High End Computer Network (HECN)
Mrtg-based Graphs
Bits per second In and Out
On Selected Interfaces

"Weekly"
30 Minute Averages
16 November 2006



Max In:1515.8 Mb/s (15.2%) Average In:198.2 Mb/s (2.0%) Current In:56.0 b/s (0.0%)
Max Out:7533.7 Mb/s (75.3%) Average Out: 795.4 Mb/s (8.0%) Current Out:0.0 b/s (0.0%)

Measured At:

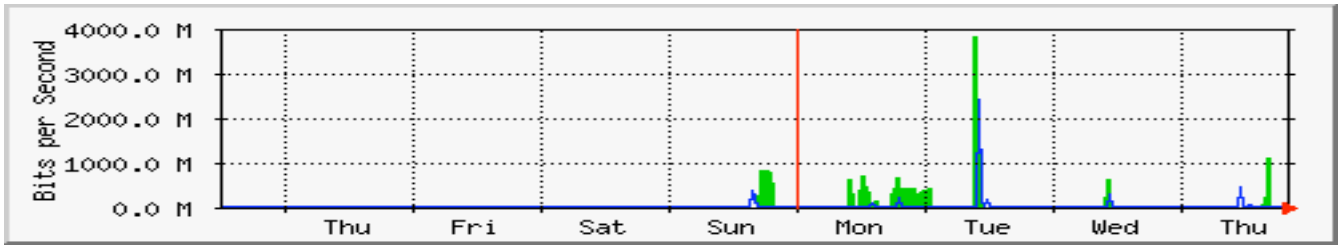
GSFC/HECN's Force10 E300 10-GE Interface with DRAGON's Raptor (and then AtlanticWave) in Level3 POP at McLean

GSFC Network Support for SC06 Demos

TeraFlow Data Flows to/from SC06

GSFC High End Computer Network (HECN)
Mrtg-based Graphs
Bits per second In and Out
On Selected Interfaces

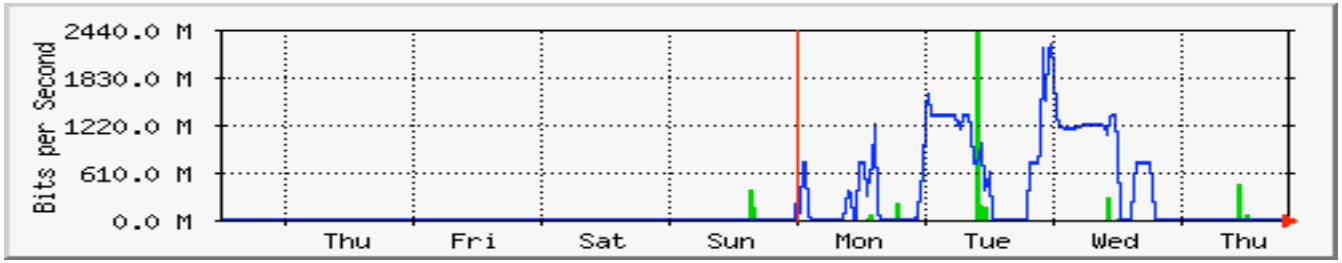
"Weekly"
30 Minute Averages
16 November 2006



Max In:3862.7 Mb/s (38.6%) Average In:58.1 Mb/s (0.6%) Current In:320.9 kb/s (0.0%)
Max Out:2410.9 Mb/s (24.1%) Average Out: 11.7 Mb/s (0.1%) Current Out:13.3 kb/s (0.0%)

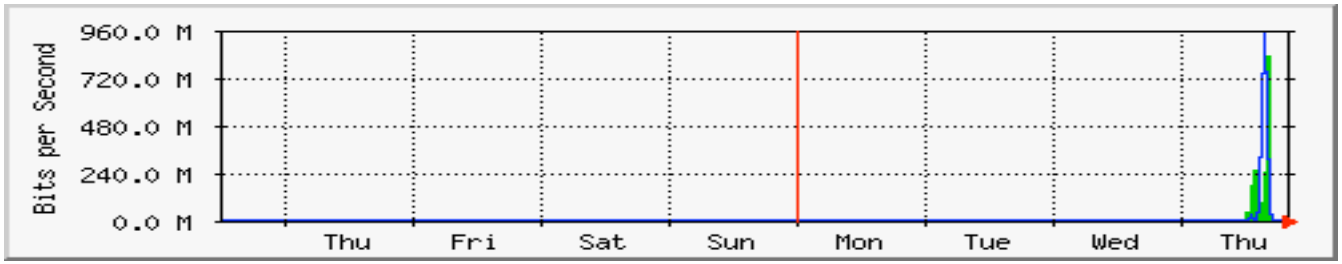
Measured At:

GSFC/HECN's Force10 E600 10-GE Interface with UIC's SMC 8708 at GSFC



Max In:2418.7 Mb/s (24.2%) Average In:11.8 Mb/s (0.1%) Current In:14.2 kb/s (0.0%)
Max Out:2260.1 Mb/s (22.6%) Average Out:218.4 Mb/s (2.2%) Current Out:888.0 b/s (0.0%)

GSFC/HECN's Force10 E300 10-GE Interface with NLR-22 in Level3 POP at McLean



Max In:835.3 Mb/s (8.4%) Average In:26.2 Mb/s (0.3%) Current In:0.0 b/s (0.0%)
Max Out:943.5 Mb/s (9.4%) Average Out:32.0 Mb/s (0.3%) Current Out:0.0 b/s (0.0%)

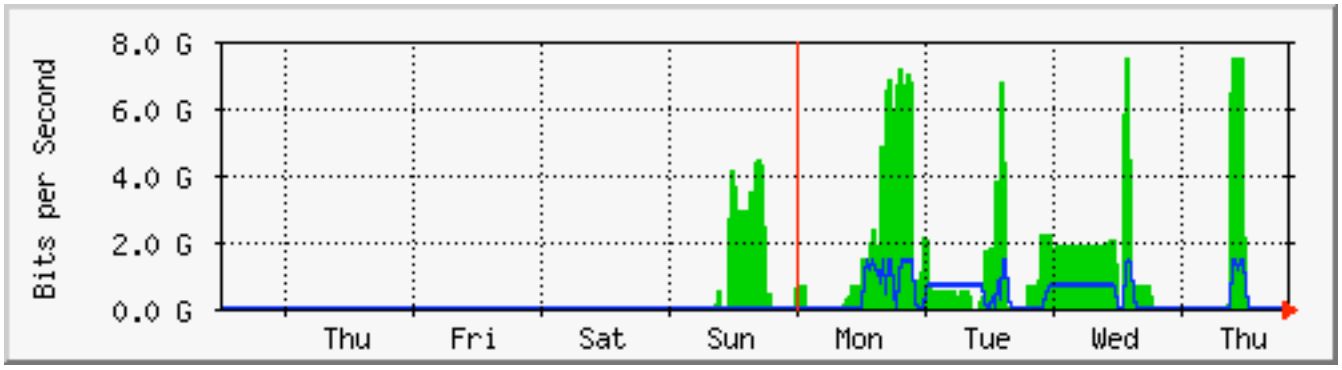
GSFC/HECN's Force10 E600 10-GE Interface with NLR-155 in Level3 POP at McLean

GSFC Network Support for SC06 Demos

OptIPuter Data Flows to/from SC06

GSFC High End Computer Network (HECN)
Mrtg-based Graphs
Bits per second In and Out
On Selected Interfaces

"Weekly"
30 Minute Averages
16 November 2006



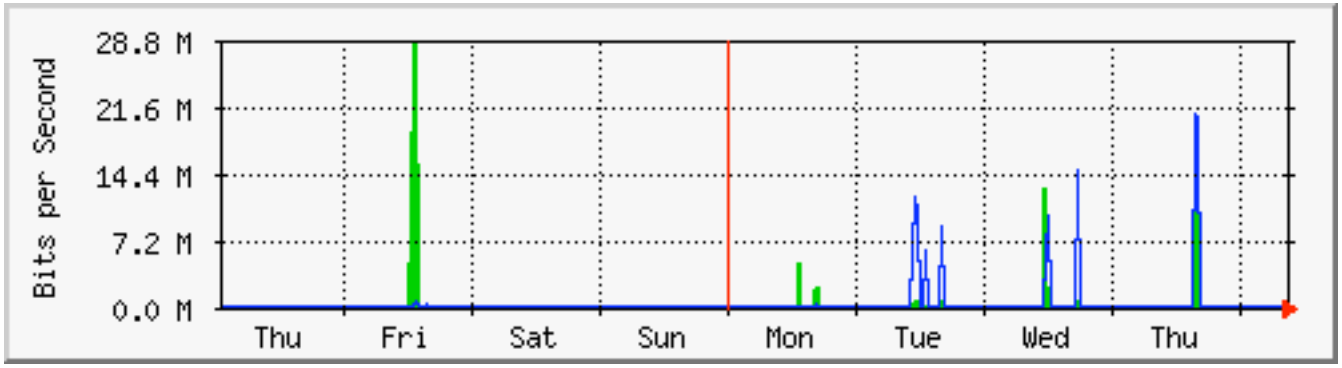
Max In:7533.5 Mb/s (75.3%) Average In:751.8 Mb/s (7.5%) Current In:256.0 b/s (0.0%)
Max Out:1506.2 Mb/s (15.1%) Average Out:193.1 Mb/s (1.9%) Current Out:0.0 b/s (0.0%)

Measured At:

GSFC/HECN's Force10 E600 10-GE Interface with NLR-103 in Level3 POP at McLean

DICE Data Flows to/from SC06

"Weekly"
30 Minute Averages
17 November 2006



Max In:835.3 Mb/s (8.4%) Average In:26.2 Mb/s (0.3%) Current In:0.0 b/s (0.0%)
Max Out:943.5 Mb/s (9.4%) Average Out:32.0 Mb/s (0.3%) Current Out:0.0 b/s (0.0%)

GSFC/HECN's Extreme Network Summit 400 1-GE Interface At GSFC

GSFC Network Support for SC06 Demos

For Additional Info

- **Further References**
  - **AtlanticWave: http://www.atlanticwave.net/**
  - **HECN: http://cisto.gsfc.nasa.gov/IRAD_Lambda.html**
  - **MAX/Abilene: http://www.maxgigapop.net/index.html**
  - **NLR: http://www.nlr.net/**
  - **SC06: http://sc06.supercomputing.org/**
  - **UltraGrid: http://ultragrid.east.isi.edu/**

- **Or Contact**
  - **J. Patrick Gary**
  - **Network Project Leader and HECN Team Lead**
  - **NASA Goddard Space Flight Center**
  - **Pat.Gary@nasa.gov, 301-286-9539**