GridPP

UK Computing for Particle Physics

perfSONAR and IPv6

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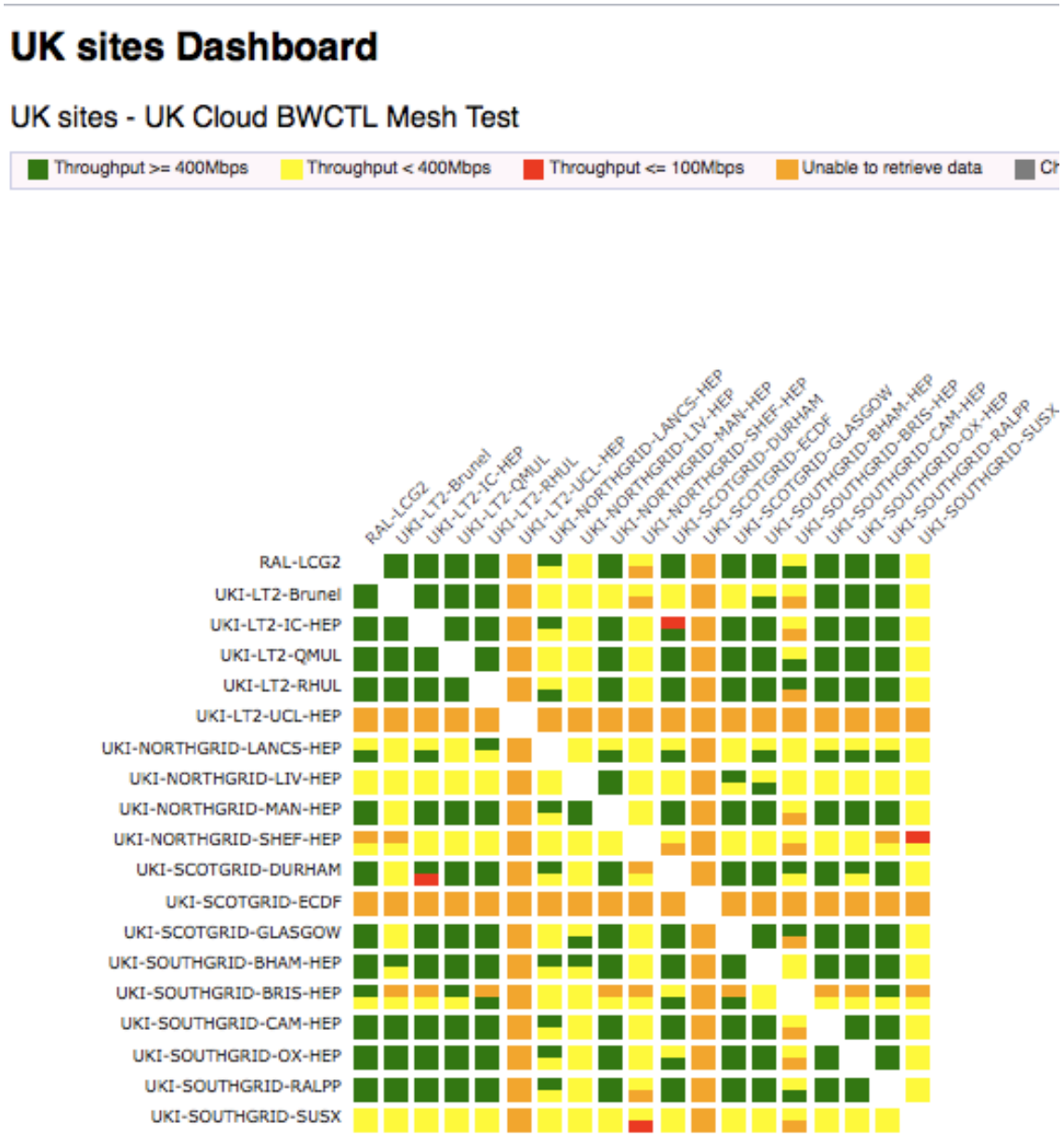
WLCG perfSONAR deployment

- The WLCG has deployed perfSONAR for network monitoring
- Country-based meshes, e.g. UK shown here
- A number of these WLCG production perfSONAR hosts are already dual-stack
- So it makes sense to try to measure IPv4 and IPv6 traffic separately



PerfSONAR-PS IPv6 status

- perfSONAR-PS software is nominally ready for use with IPv6
- BWCTL measures throughput (iperf)
- OWAMP measures one-way latency and loss
- It is possible to specify IPv4 or IPv6 in a test definition
- If not specified, the tools will prefer IPv6 if available on both endpoints

PerfSONAR-PS IPv6 status April 19 2011 (Joe Metzger)

IPv6 in the perfSONAR-PS codebase

(Green check means activity is done. Yellow means in progress. Red means no firm plans to address.)

Tool	IPV6 Development Completed	Limited Deployment	Production Deployment Across Multiple Domains
BWCTL	✓	✓	✓
OWAMP	✓	✓	✓
pSB MA	✓	✓	
Lookup Services	✓		
Topology Service	✓		
SNMP MA	✓	✓	
PinGER	✓	✓	
NDT	✓		
NPAD	✓		
Toolkit Configuration Tools & GUI	✓		

http://www.nitrd.gov/nitrdgroups/images/8/87/2011-04-19-JET_PerfSONAR_Presentation.pdf
http://www.nitrd.gov/nitrdgroups/images/2/2a/JET-pS-IPv6-V2.pdf

HEPiX IPv6 mesh

- Set up a mesh for testing dual-stack hosts
- Hosts can optionally have hostnames with –v4 and –v6 suffixes e.g.

  netmon00.grid.hep.ph.ic.ac.uk has address 146.179.247.74 and IPv6 address 2001:630:12:580:207:43ff:fe11:ffb0

  netmon00-v4.grid.hep.ph.ic.ac.uk has address 146.179.247.74

  netmon00-v6.grid.hep.ph.ic.ac.uk has IPv6 address 2001:630:12:580:207:43ff:fe11:ffb0

Site definition


```
{
   "sites" : [
      {
         "hosts" : [
            {
               "addresses" : [
                  "perfsonar03.esc.qmul.ac.uk",
                  "perfsonar03-v4.esc.qmul.ac.uk",
                  "perfsonar03-v6.esc.qmul.ac.uk"
               ],
               "measurement_archives" : [
                  {
                     "read_url" : "http://perfsonar03.esc.qmul.ac.uk:8085/perfSONAR_PS/services/pSB",
                     "write_url" : "perfsonar03.esc.qmul.ac.uk:8570",
                     "type" : "perfsonarbuoy/bwctl"
                  },
                  {
                     "read_url" : "http://perfsonar03.esc.qmul.ac.uk:8086/perfSONAR_PS/services/traceroute_ma",
                     "write_url" : "http://perfsonar03.esc.qmul.ac.uk:8086/perfSONAR_PS/services/traceroutecollector",
                     "type" : "traceroute"
                  },
                  {
                     "read_url" : "http://perfsonar03.esc.qmul.ac.uk:8085/perfSONAR_PS/services/pSB",
                     "write_url" : "perfsonar03.esc.qmul.ac.uk:8569",
                     "type" : "perfsonarbuoy/owamp"
                  },
                  {
                     "read_url" : "http://perfsonar03.esc.qmul.ac.uk:8075/perfSONAR_PS/services/pinger/ma",
                     "type" : "pinger"
                  }
               ],
               "description" : "UKI-LT2-QMUL Test Host"
            }
         ],
```

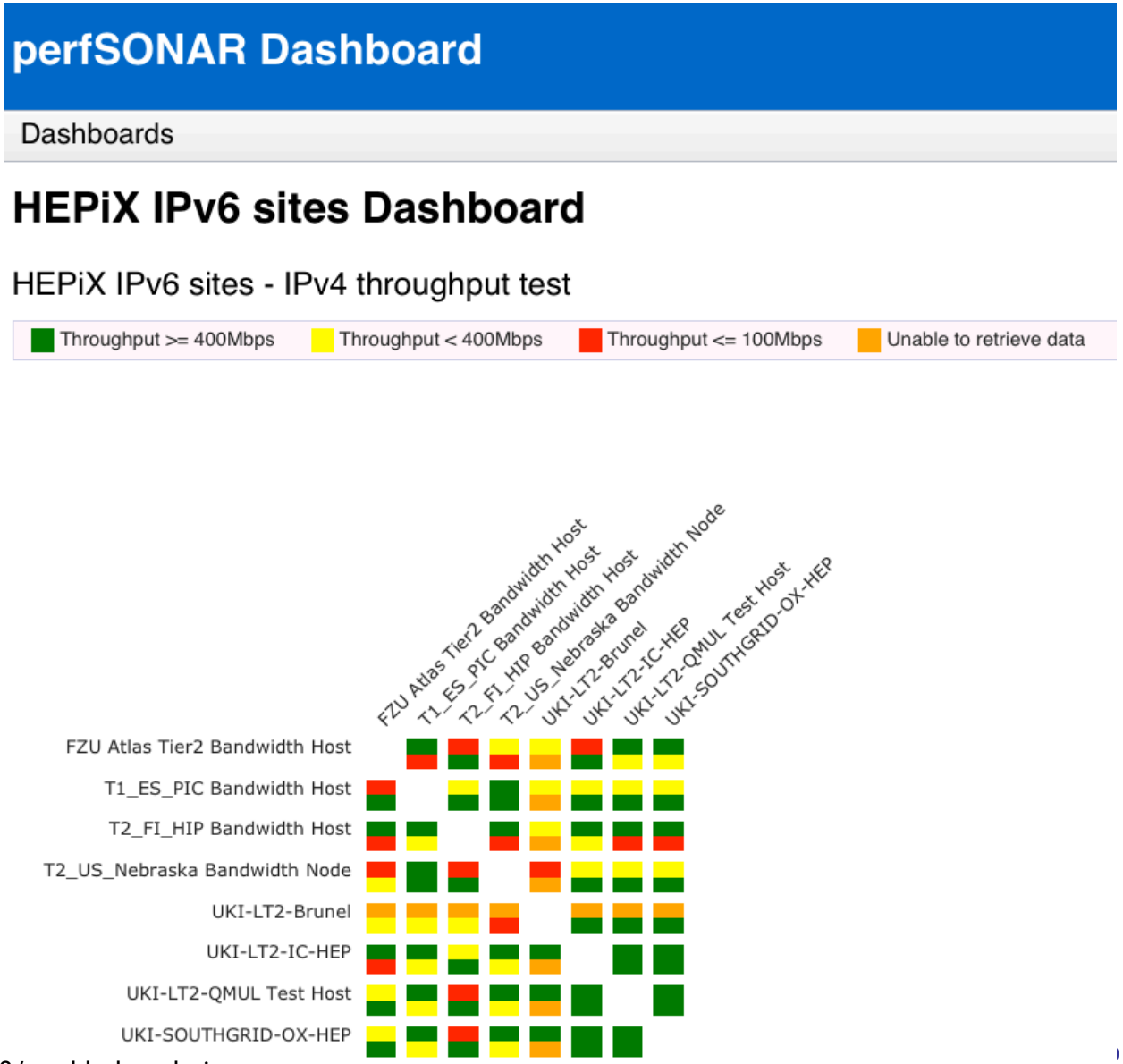
HEPiX IPv6 mesh: test definition

- Tests include hostnames with their -v4 and -v6 suffixes
- There is an issue with displaying data on maddash dashboard from hosts that don't have these. Attempted workaround is to use the host's IPv4 or IPv6 IP address explicitly
- Set 'ipv4_only' or 'ipv6_only' flags

```
{
    "members" : {
        "members" : [
            "2001:630:10:f00e::1009",
            "ps02-b-v6.ipv6.farm.particle.cz",
            "netmon00-v6.grid.hep.ph.ic.ac.uk",
            "perfsonar03-v6.esc.qmul.ac.uk",
            "t2ps-bandwidth-v6.physics.ox.ac.uk",
            "2001:67c:1148:202::2",
            "2600:900:6:1101:21b:21ff:fe96:a3d4",
            "2001:948:48:1::f502:1"
        ],
        "type" : "mesh"
    },
    "parameters" : {
        "force_bidirectional" : "1",
        "protocol" : "tcp",
        "tool" : "bwctl/iperf",
        "duration" : "30",
        "type" : "perfsonarbuoy/bwctl",
        "interval" : "21600",
        "ipv6_only" : "1"
    },
    "description" : "IPv6 throughput test"
},
```

Imperial College Maddash dashboard

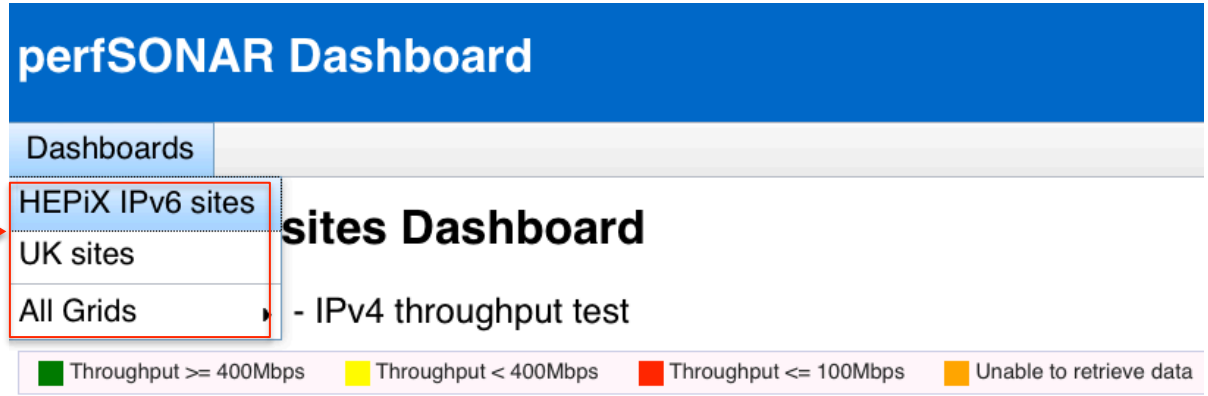
- Currently eight sites in the mesh
  - FZU
  - T2_FI_HIP
  - PIC
  - Brunel, Imperial, QMUL, Oxford
  - UNL
- Measuring:
  - throughout
  - latency and loss
  - traceroute
  - ping

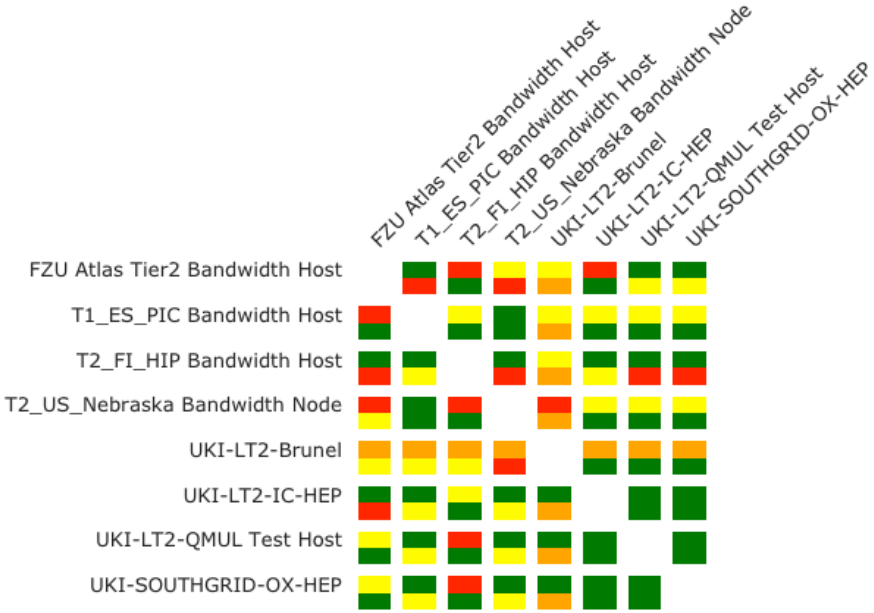


http://netmon02.grid.hep.ph.ic.ac.uk:8080/maddash-webui

Imperial College Maddash dashboard

List of dashboards





http://netmon02.grid.hep.ph.ic.ac.uk:8080/maddash-webui

Dashboard

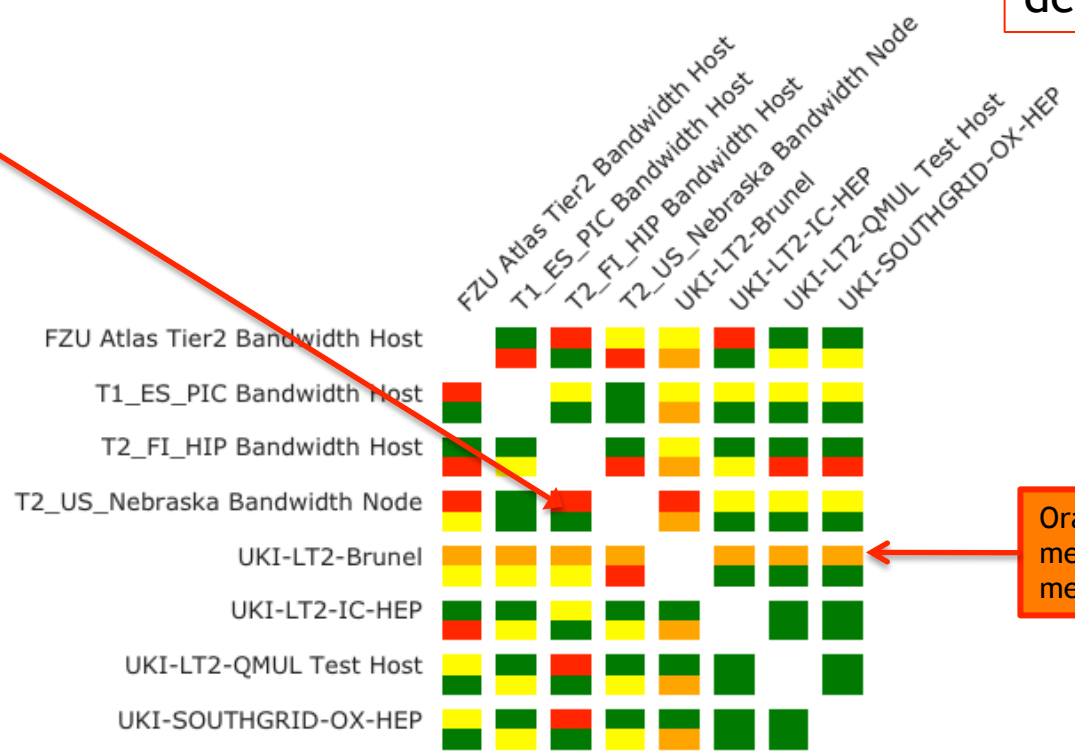
Rate thresholds

Throughput >= 400Mbps | Throughput < 400Mbps | Throughput <= 100Mbps

destination

Hover to get rates from both measurement archives of sites involved

Click to drill down (next slide)



source

Orange square means "no measurement"

Drill down to time series graphs

netmon00-v6.grid.hep.ph.ic.ac.uk to perfsonar03-v6.esc.qmul.ac.uk (Throughput)

Status: OK **Last Checked:** June 05, 2014 05:14:02 AM BST **Next Check:** June 05, 2014 13:14:02 PM BST

Summary | History | Check Details

▾ Current Results

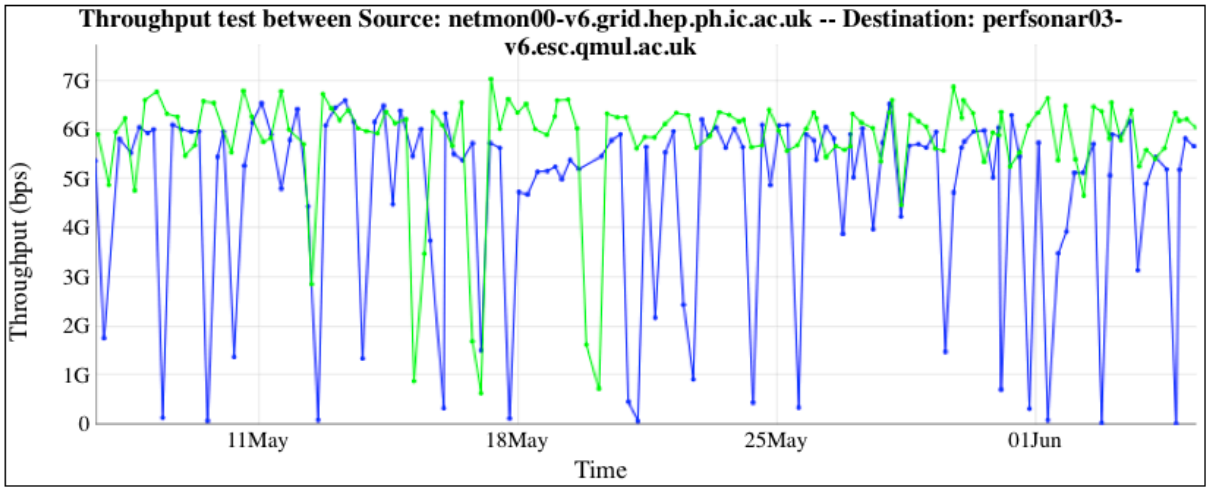
Current Status: OK
Result of last check: OK
Message For Current Status: Average throughput is 4.341Gbps

▸ Statistics

▾ Graph

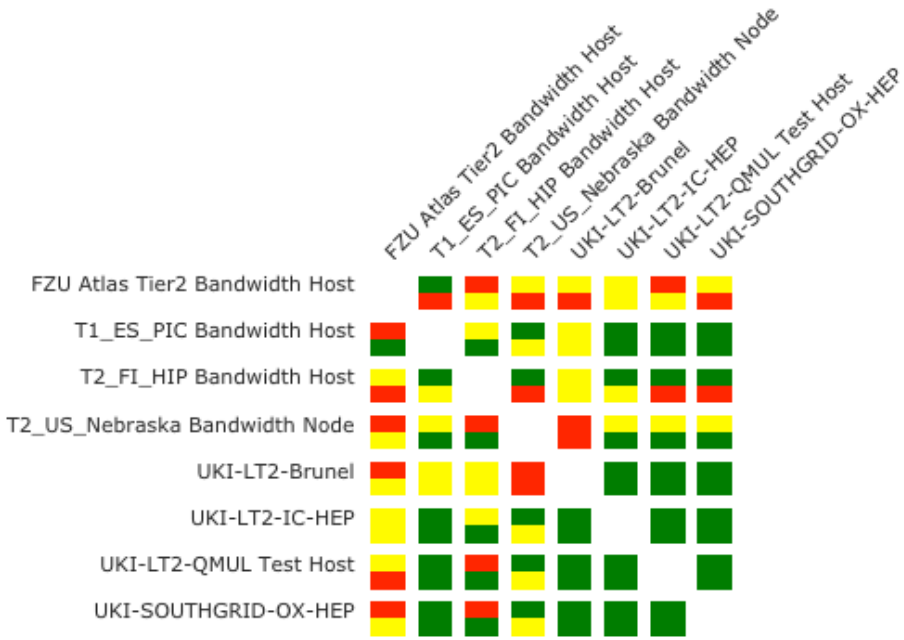
perfSONAR BWCTL Graph

perfSONAR



Throughput

IPv4



IPv6

Throughput >= 400Mbps | Throughput < 400Mbps | Throughput <= 100Mbps | Unable to retrieve data | Check has not yet run

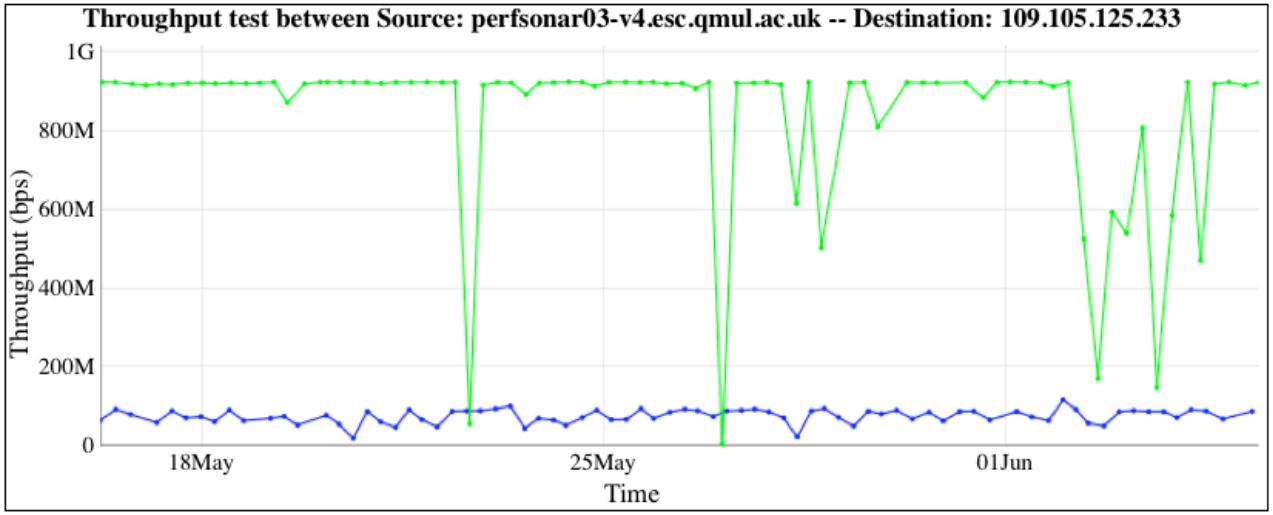
Asymmetry between QMUL and T2_FI_HIP

Graph Key

Src-Dst throughput

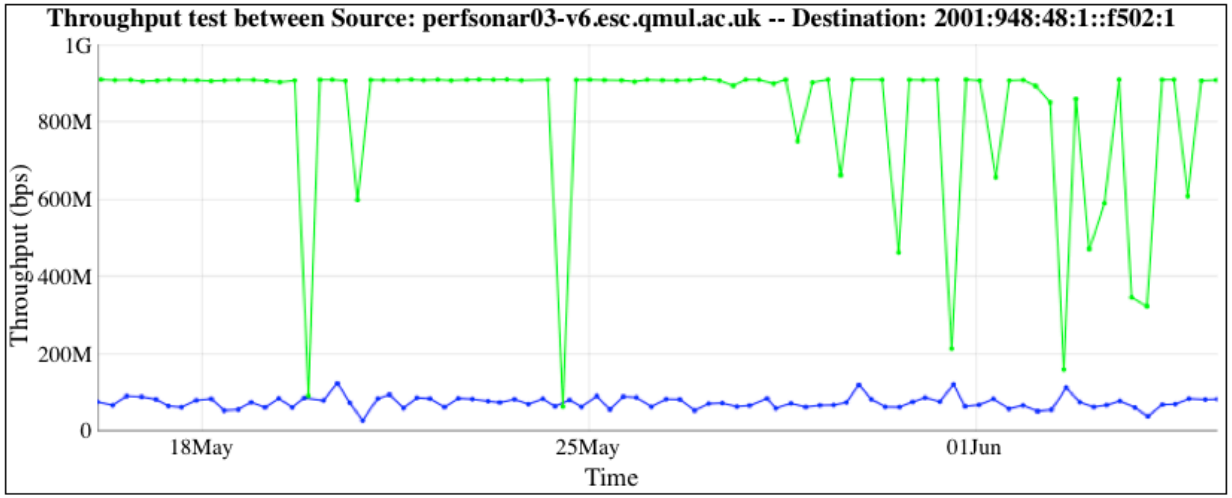
Dst-Src throughput

IPv4



QMUL to T2_FI_HIP slower over both IPv4 and IPv6…

IPv6

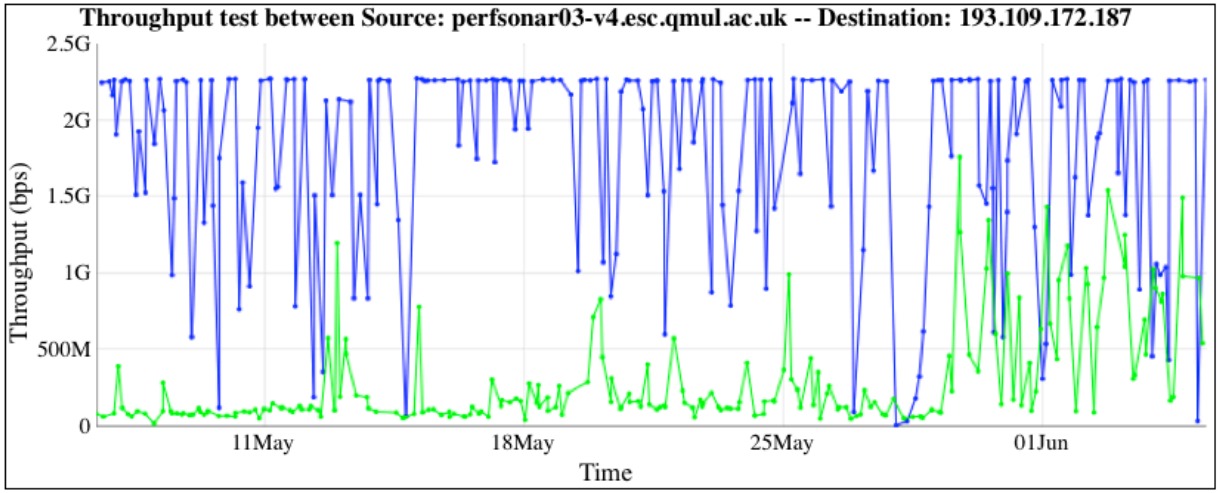


Asymmetry between QMUL and PIC

Graph Key

Src-Dst throughput
Dst-Src throughput

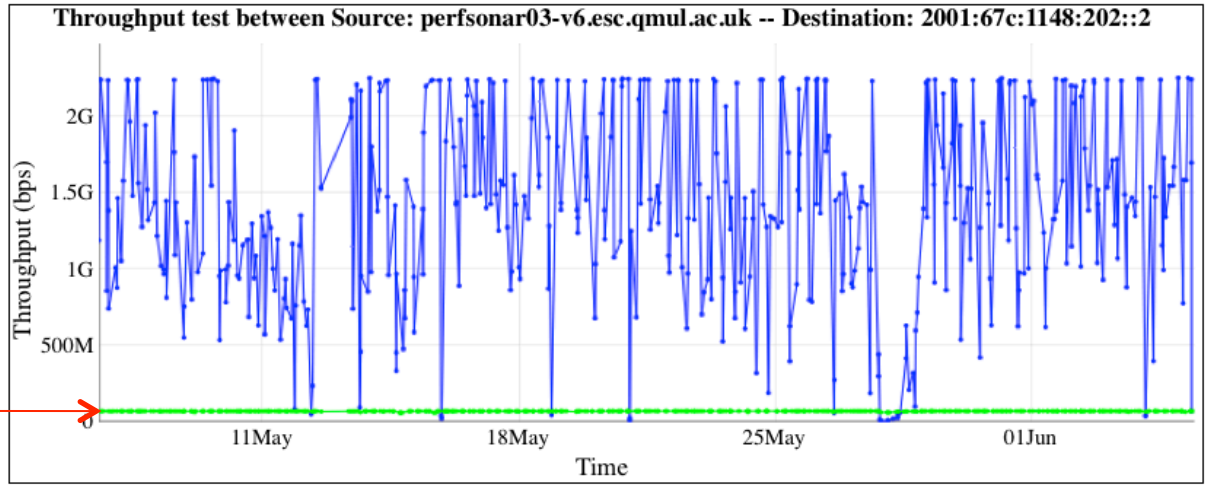
IPv4



PIC to QMUL slower over IPv6. Both using jumbo frames….

IPv6

0.07 Gbps



ICMPv6 at Brunel

netmon00-v6.grid.hep.ph.ic.ac.uk to 2001:630:10:f00e::1009 (Throughput)

Status: UNKNOWN **Last Checked:** May 28, 2014 13:51:07 PM BST **Next Check:** May 28, 2014 21:51:07 PM BST

Summary | History | Check Details

Current Results

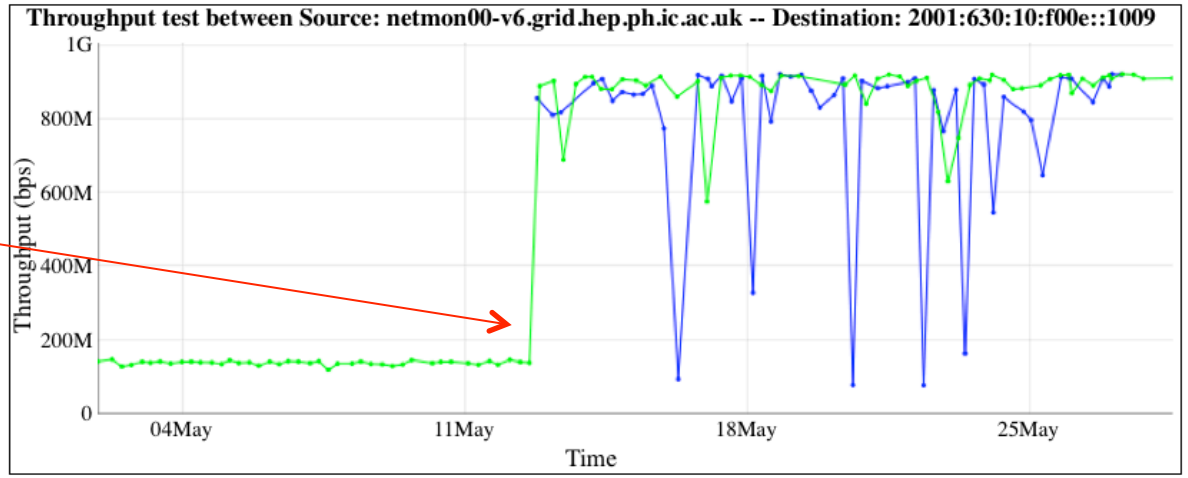
Current Status: UNKNOWN
Result of last check: UNKNOWN
Message For Current Status: No throughput data returned for direction where src=netmon00-v6.grid.hep.ph.ic.ac.uk dst=2001:630:10:f00e::1009

Statistics

Graph

No IC to Brunel IPv6 results until ICMPv6 unblocked

ICMPv6 unblocked



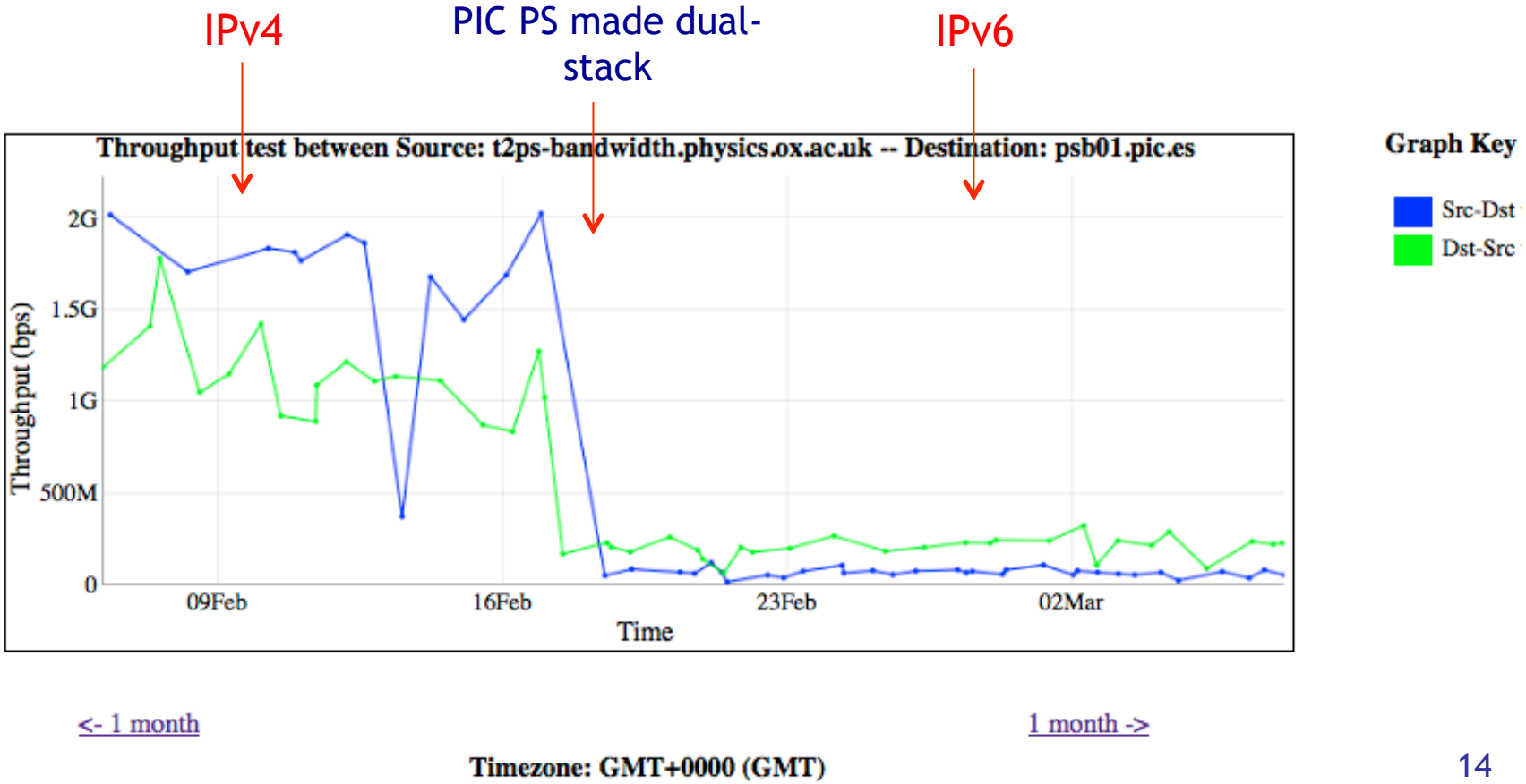
Graph Key

Src-Dst throughput
Dst-Src throughput

dc2-grid-ps-00.brunel.ac.uk has IPv6 address 2001:630:10:f00e::1009

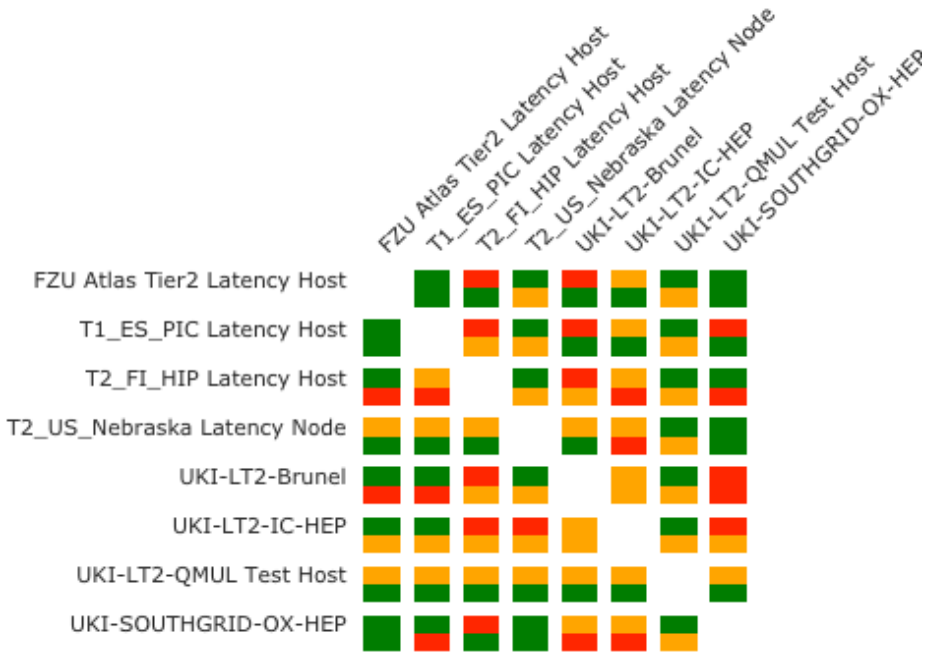
Dual-stack perfSONAR

- If the 'ipv4_only' or 'ipv6_only' flags are unset then dual-stack perfSONAR hosts favour IPv6 by default
- For example Oxford to PIC suffered a 'drop' in measured rate as PIC switched their perfSONAR host from IPv4-only to dual-stack and IPv6 rather than IPv4 rate is shown in the graph

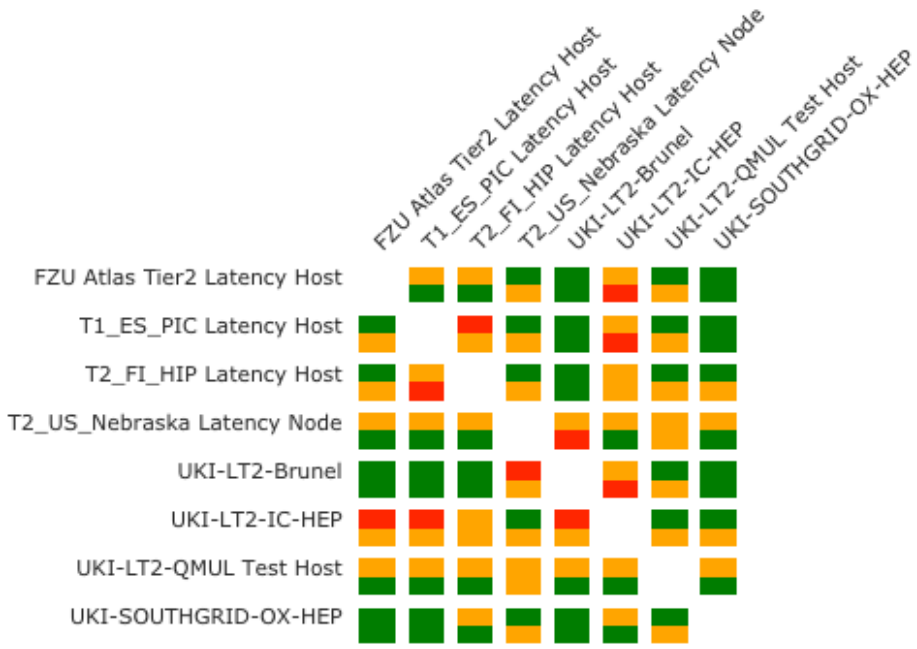


Loss

IPv4



IPv6



Loss rate is <= 0 | Loss rate is >= 0 | Loss rate is >= 0.01 | Unable to retrieve data | Check has not yet run

Latency and loss time series plot

ps01-l-v6.ipv6.farm.particle.cz to t2ps-latency-v6.physics.ox.ac.uk (Loss)

Status: OK **Last Checked:** June 09, 2014 15:05:13 PM CEST **Next Check:** June 09, 2014 15:35:13 PM CEST

Summary | History | Check Details

Current Results

Current Status: OK
Result of last check: OK
Message For Current Status: Loss is 0.000%

Statistics

Graph

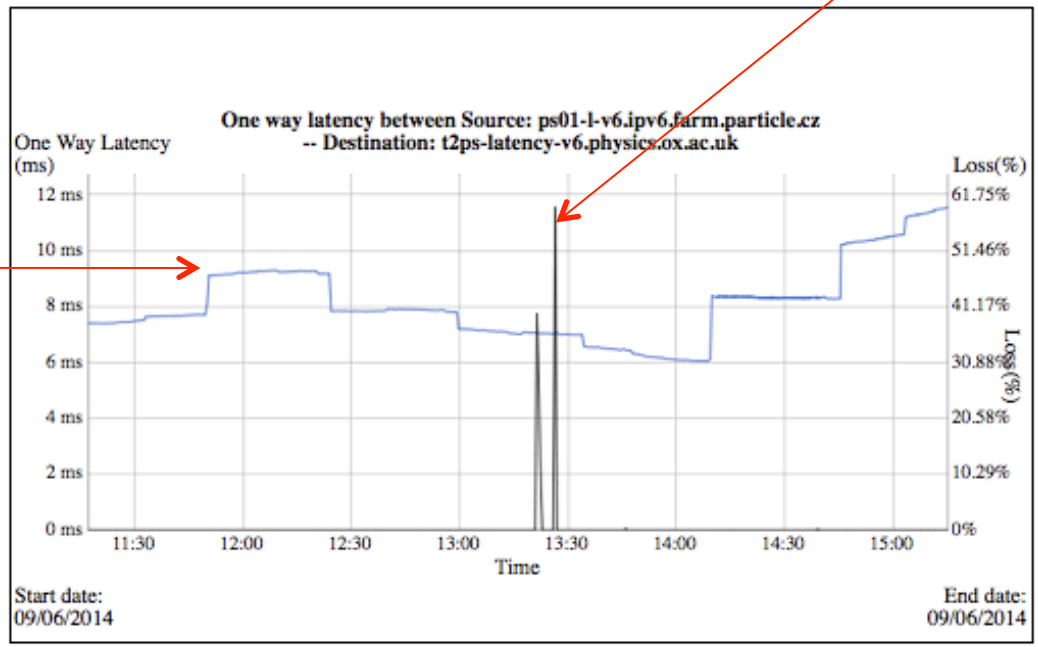
perfSONAR One Way Latency

perfSONAR

☑ Scale Y axis from 0 ☐ Show Reverse Direction Data

Graph Key (Src-Dst)

- ☐ Max delay
- ☑ Min delay
- ☑ Loss



<- 4 hours

Timezone: GMT+0200 (CEST)

loss

latency

traceroute

- Also collecting IPv4 and IPv6 traceroute data
- Can be useful for identifying asymmetric routing
- Routes between Imperial College and Nebraska are shown below

Select endpoints available on http://localhost:8086/perfSONAR_PS/services/traceroute

netmon02-v4.grid.hep.ph.ic.ac.uk (146.179.247.184) ----> hcc-ps01.unl.edu (129.93.239.148)

Do not de-duplicate results Submit query

Topology beginning at Tue May 27 00:24:00 2014 (UTC +1)

Hop	Router	IP
1	hep-outside-hsrp1-slave.net.ic.ac.uk	146.179.246.253
2	te0-4-0-1.londsh-rbr1.ja.net	146.97.137.157
3	be2.londic-rbr1.ja.net	146.97.66.34
4	ae24.londpg-sbr1.ja.net	146.97.37.197
5	ae29.londhx-sbr1.ja.net	146.97.33.1
6	janet.mx1.lon.uk.geant.net	62.40.124.197
7	ae0.mx1.ams.nl.geant.net	62.40.98.81
8	ae0.mx1.fra.de.geant.net	62.40.98.128
9	abilene-wash-gw.mx1.fra.de.geant.net	62.40.125.18
10	et-9-0-0.115.rtr.chic.net.internet2.edu	198.71.45.56
11	ks-96-xe-11-3-3-100.greatplains.net	164.113.255.249
12	164.113.255.10	164.113.255.10
13	hcc-ps01.unl.edu	129.93.239.148

IPv4

Select endpoints available on http://localhost:8086/perfSONAR_PS/services/traceroutеMA

netmon02-v6.grid.hep.ph.ic.ac.uk (2001:630:12:580:216:3eff:fe7f:153) ----> hcc-ps01.unl.edu (2600:900

Do not de-duplicate results Submit query

Topology beginning at Tue May 27 00:26:35 2014 (UTC +1)

Hop	Router	IP
1	2001:630:12:580::2	2001:630:12:580::2
2	2001:630:0:9001::199	2001:630:0:9001::199
3	2001:630:0:1001:10::1	2001:630:0:1001:10::1
4	ae24.londtw-sbr1.ja.net	2001:630:0:10::23d
5	ae29.londtn-sbr1.ja.net	2001:630:0:10::1d2
6	ae0.lond-gw-ixp4.ja.net	2001:630:0:10::152
7	40ge1-3.core1.lon2.he.net	2001:7f8:4::1b1b:1
8	100ge1-1.core1.nyc4.he.net	2001:470:0:2cf::2
9	100ge7-2.core1.chi1.he.net	2001:470:0:298::1
10	wiscnet.v219.core1.chi1.he.net	2001:470:0:f2::2
11	2001:4e0:0:300c::2	2001:4e0:0:300c::2
12	2600:900:0:1::2	2600:900:0:1::2
13	hcc-ps01.unl.edu	2600:900:6:1101:7a2b:cbff:fe68:6238

IPv6

Summary

- Prototype perfSONAR dashboard allows differences between IPv4 and IPv6 network performance to be identified
- For sites wanting to get started with IPv6, perfSONAR hosts are a good place to start: let me know and I can add your hosts to the HEPiX IPv6 mesh