



HEPiX IPv6 Working Group

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1 July 2011

UK HEP Sysman meeting



Outline

- Background
- HEPiX IPv6 Working Group
- HEP IPv6 site status
- IPv6 World Day (8 Jun 2011)
- Working Group plans
- Summary



Some history

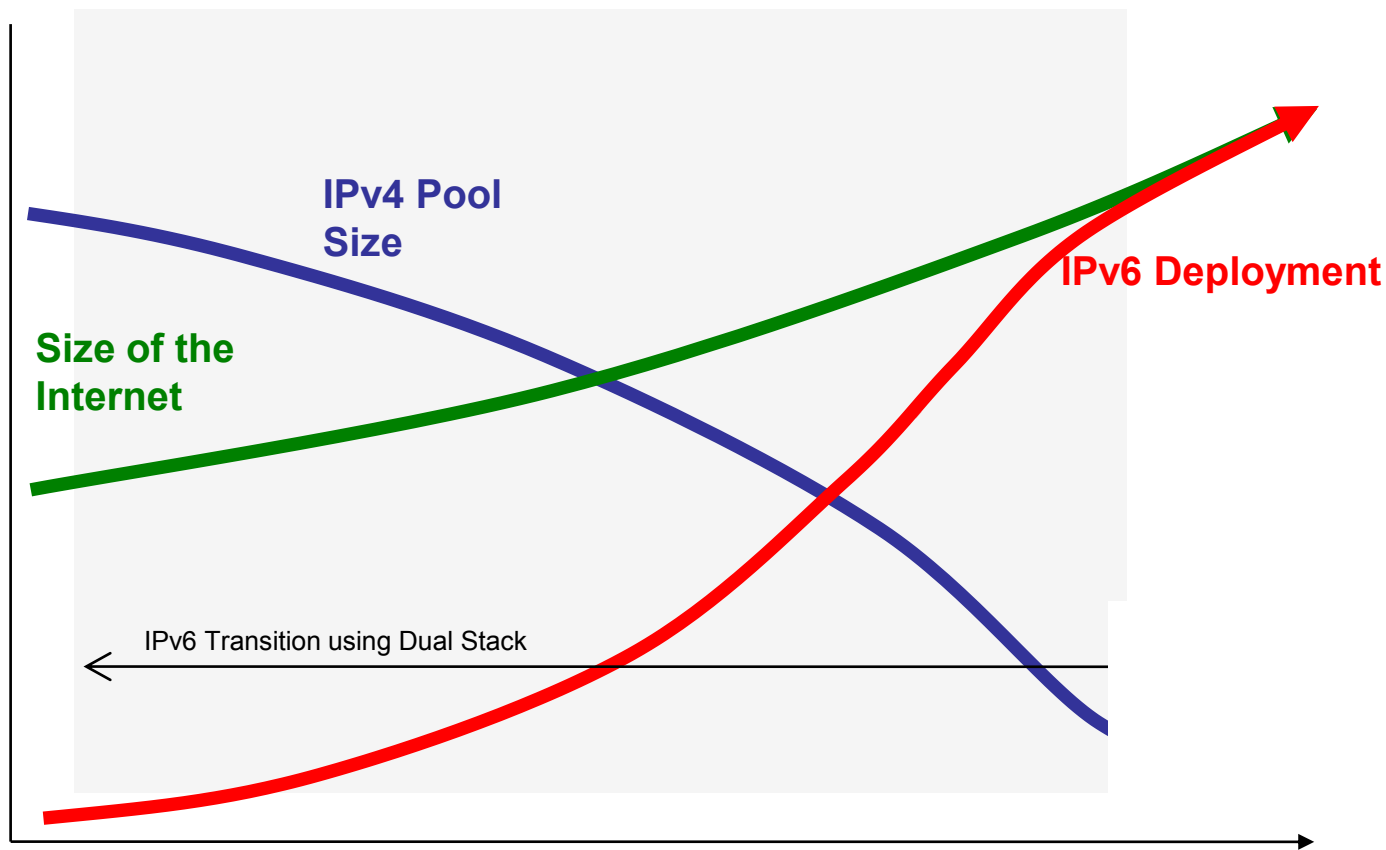
- HEP UK joined global HEP/Space Phase IV DECnet (87-89)
- HEP DECnet/OSI Phase V transition (OpenVMS, LEP era)
 - European routing migration (90-93)
 - Phase IV was 16-bit addressing!
 - One of the early UK HEP Sysman activities
- 1993 – SuperJANET moved to IP over ATM (from X.25)
- CIDR (93) and NAT (94) saves IPv4
- IETF IPng BOF meets in July 94 – RFC1752 (Jan 95)
- IPv6 - RFC2460 (Dec 1998)
- IPv6 address allocation starts July 1999
- O/S and router support from ~2000
- Many NRENs support IPv6 (~2003 onwards)

What's the problem?

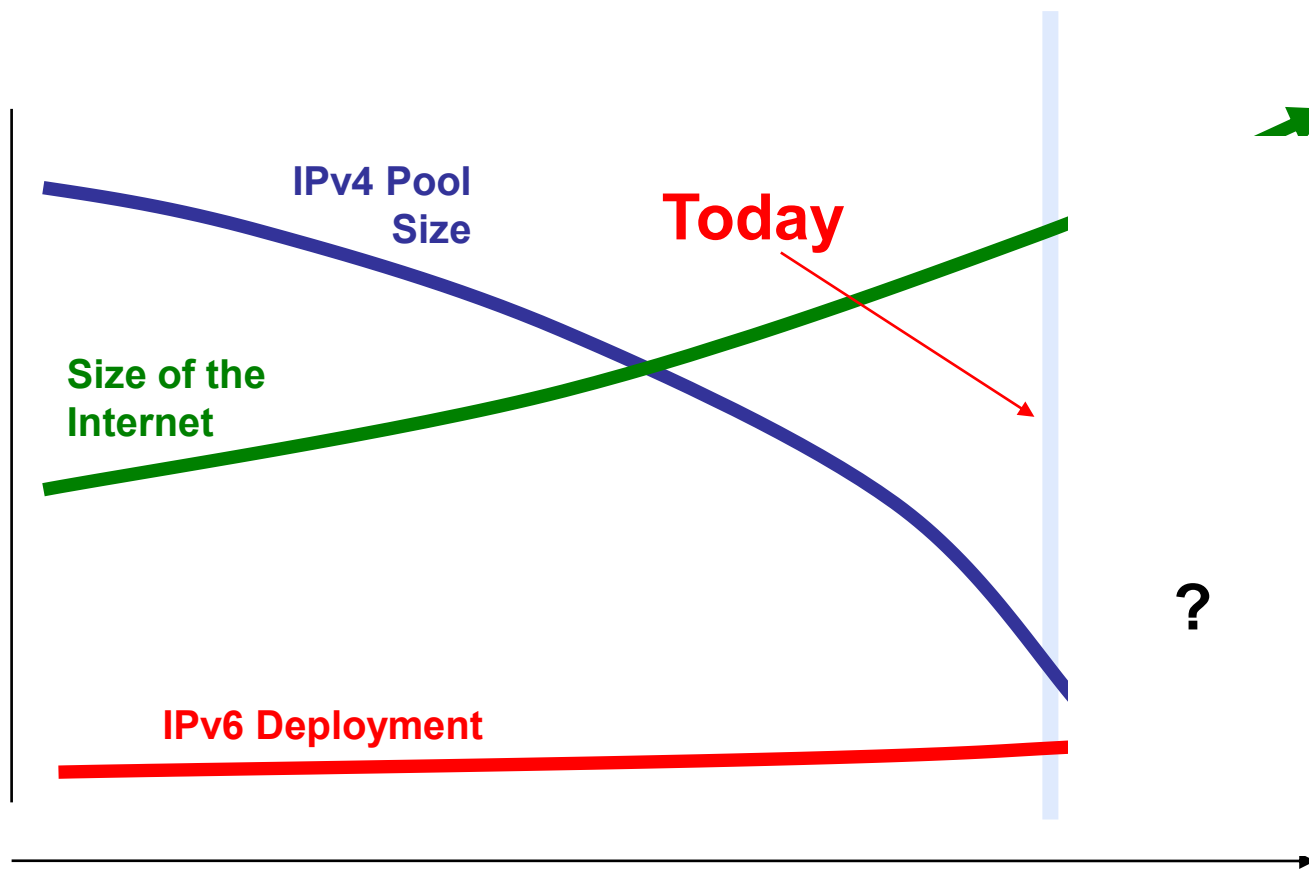


This is how we pictured the transition **15 years** ago:

*Dave
Wilson,
HEAnet
(Ireland)
TNC2010*



This is where we are **now (2010)**:



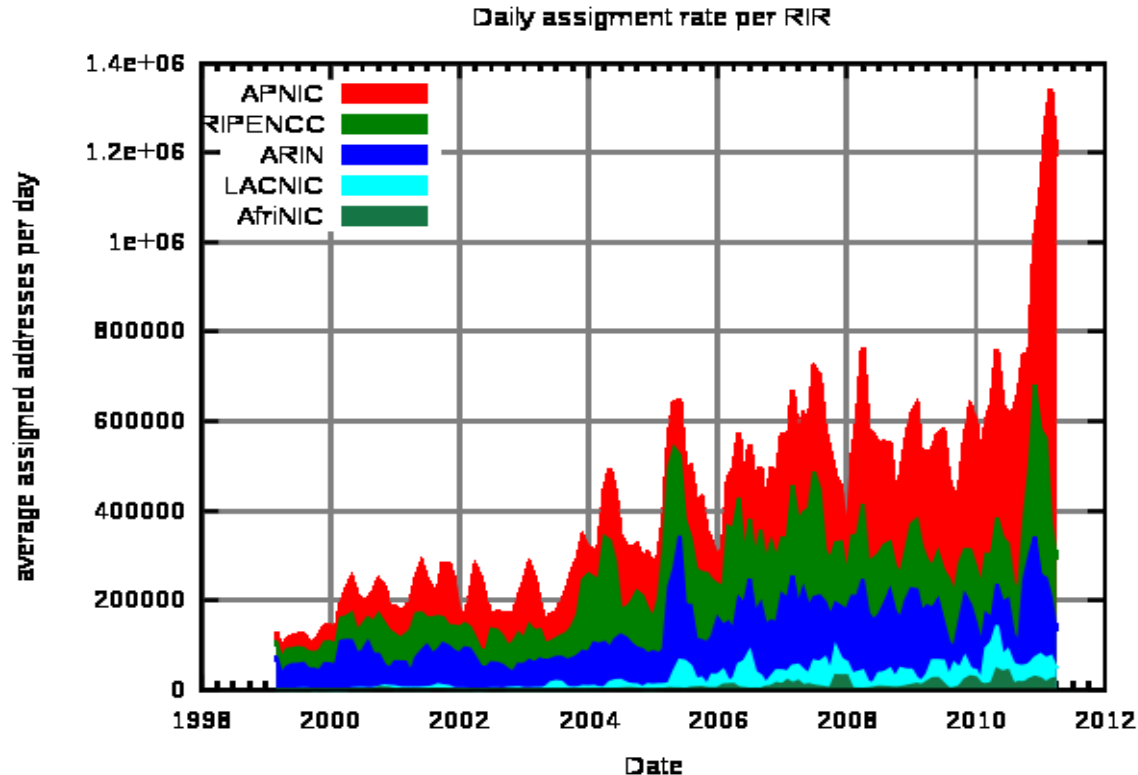


IPv4 Addresses (Jul 2011)

- From Geoff Huston (<http://ipv4.potaroo.net>)
- IANA Unallocated Address Pool (Global)
Exhaustion happened: **03-Feb-2011**
- Projected RIR Address Pool Exhaustion Dates:
 - APNIC: **19-Apr-2011** (happened)
 - RIPENCC: **26-Jan-2012** (Europe)
 - ARIN: **13-Nov-2013**
 - LACNIC: **26-Jun-2014**
 - AFRINIC: **20-Jul-2014**



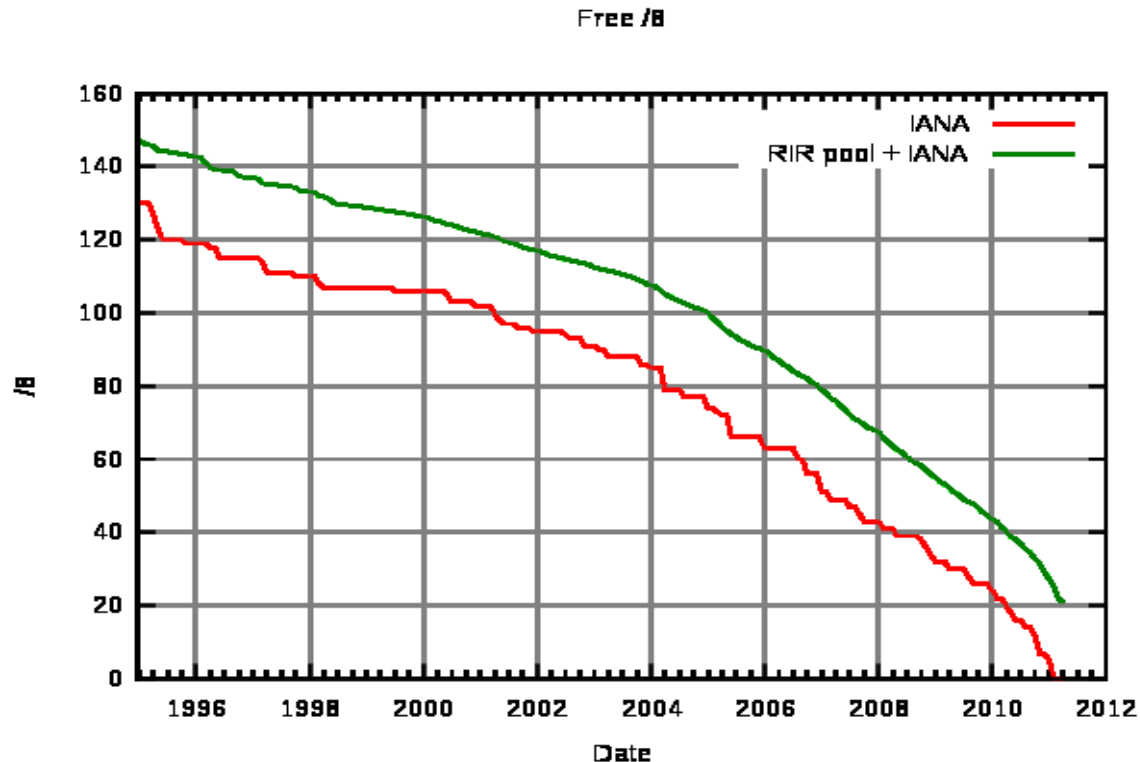
IPv4 address assignment rate



<http://en.wikipedia.org/wiki/File:Rir-rate.svg>



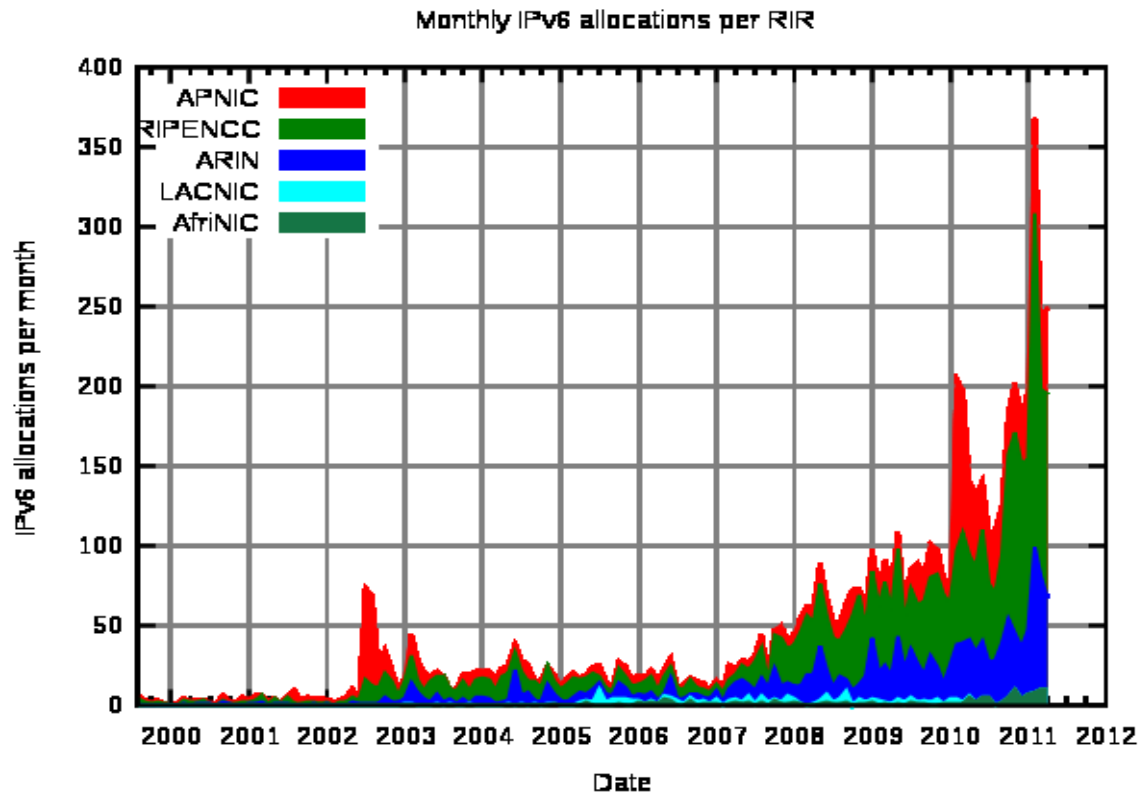
IPv4 Free /8 blocks



<http://en.wikipedia.org/wiki/File:Ipv4-exhaust.svg>



IPv6 allocation rate



<http://en.wikipedia.org/wiki/File:Rir-ipv6-allocation-rate.svg>



US Federal transition to IPv6

<http://www.cio.gov/Documents/IPv6MemoFINAL.pdf>

- committed to the operational deployment of IPv6
- Enable successful deployment and expansion ... such as Cloud Computing, Broadband, SmartGrid...
- Reduce complexity and increase transparency of Internet services by eliminating the architectural need to rely on NAT
- Etc., etc.
- Memo (28 Sep 2010) from federal CIO (OMB) to all Executive Depts and Agencies (i.e. Including DOE)



Timelines – US Federal

- Upgrade public/external facing servers and services (e.g. web, email, DNS, ISP services, etc) to operationally use native IPv6 by the end of FY 2012
 - 30 Sep 2012
- Upgrade internal client applications that communicate with public Internet servers and supporting enterprise networks to operationally use native IPv6 by the end of FY 2014
 - 30 Sep 2014



HEPiX and IPv6

- IPv6 talks at Cornell HEPiX (Nov 2010)
 - And earlier HEPiX talks ...
- HEPiX Questionnaire on IPv6 (DPK, Sep 2010)
 - See my Cornell HEPiX talk for details
- IPv6: Backbone networks are the most advanced
- Sites are not seeing any pressure (yet)
 - When will WLCG see IPv6-only sites?
- The problem areas (for HEP)
 - Applications (nobody looking at this)
 - Monitoring, System and Network tools, Security, etc.



HEPiX IPv6 WG

- Group approved and work now started
 - I am leading the group
 - video conferences started in April 2011
 - members being identified
 - email list configured
 - 1st face to face meeting held 22 Jun 2011
- <http://indico.cern.ch/categoryDisplay.py?categId=3538>
- Main agenda points on 22nd June
 - Site reports (US DOE, DESY, INFN, CERN)
 - IPv6 World Day (8 June)
 - Plans for 2011 and beyond



HEP IPv6 status

- US DOE, CERN, DESY, INFN
 - Plans well underway, testbeds starting
 - No work yet on HEP applications
- Glasgow and Manchester are members
 - Planning a tunnel between sites
 - To join the HEPiX testbed
- LHC shutdown in 2013
 - The *earliest* opportunity to make transition

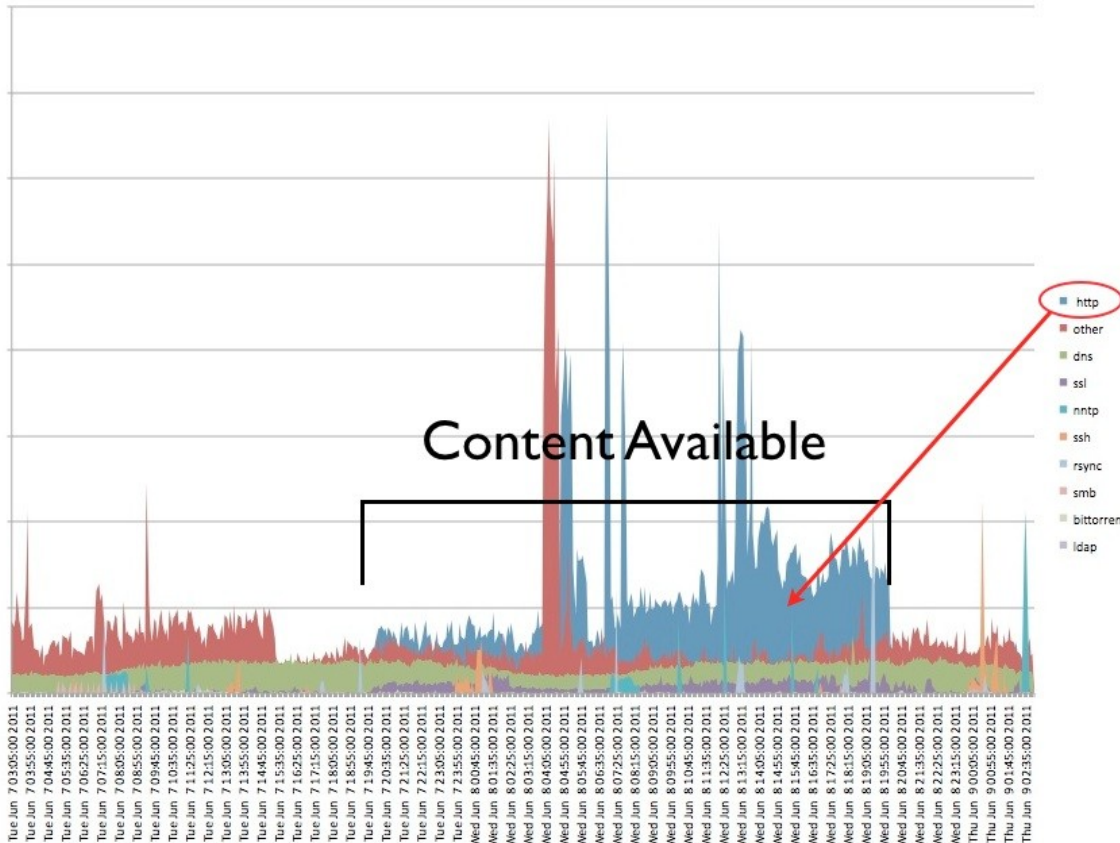


IPv6 world day

- 24 hour period (8 June 2011)
 - Test flight of IPv6
- Google, Facebook, Yahoo & many others
 - Main web sites registered with AAAA record in DNS and reachable by native IPv6 routing
- <http://www.worldipv6day.org/>
- <http://www.ipv6.ac.uk/category/world-ipv6-day/>
- <http://test-ipv6.com/> (to test your own client)



Some traffic stats (IPv6 day)

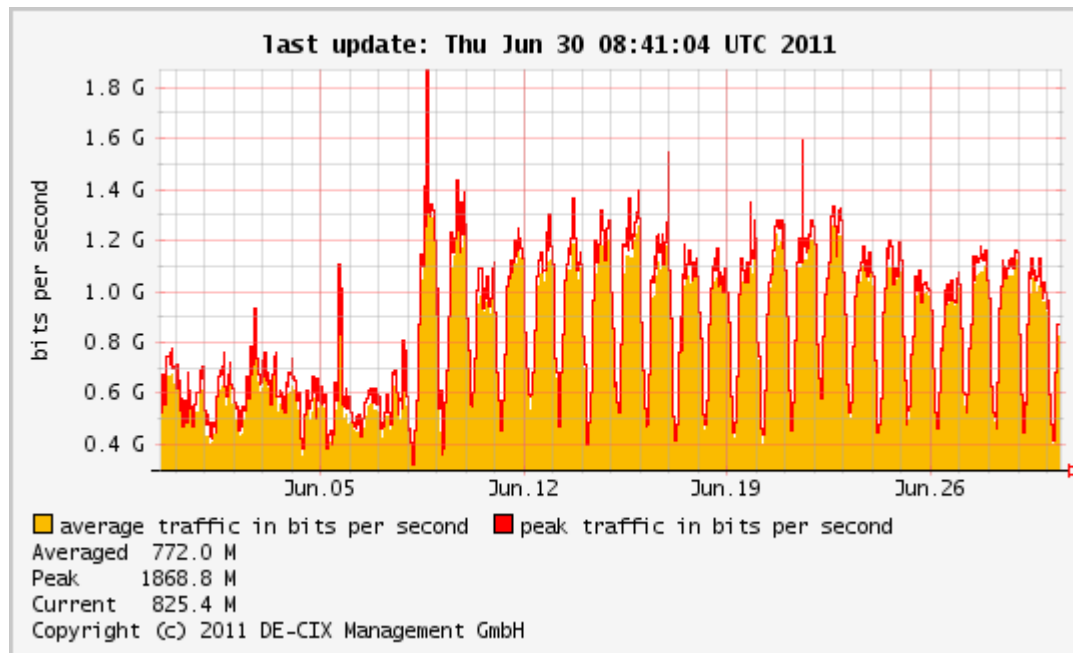


- Application breakdown for native IPv6 traffic from our six carrier partners (Arbor Networks)
- Total IPv6 traffic still very small (but ~double the norm)



More traffic stats

- German Internet Exchange (de-cix.net)



- IPv6 traffic
- again small fraction of total traffic
- but the increase stays there?



HEPiX IPv6 WG – mandate (1)

- Phase 1 during 2011 is to consider whether and how IPv6 should be deployed in HEP especially for WLCG
 - Readiness and Gap analysis
- HEP applications, Middleware, Security issues, System management and monitoring tools, End to end network monitoring tools
- Run a distributed HEP testbed
 - to help explore all the above issues
- Initial report by end of 2011
 - Interim at HEPiX – end of October



IPv6 WG mandate (2)

- If we agree there should be a Phase 2! (deployment phase) ...
- Propose a timetable and analyse resources required
- Implementation plan and configuration advice will be required (e.g. advice on end system and firewall configuration - during transition period)



Tasks for 2011

- Phase 1 report
 - Impact, Costs, Gap analysis and Roadmap
- Distributed IPv6 testbed
- Gap analysis (see next slide)
- When we will have any IPv6 only sites?
- Security study needs to start in 2011
 - Testbeds need to be secured
 - as today in IPv4
- Information/experience sharing
 - Including general services



Gap Analysis 2011

- What is in scope?
 - All WLCG services run on Tier 0/1/2/3
 - Assume dual stack services
 - Not clients (assume they can continue IPv4)
 - The most common management and monitoring tools
 - The most common batch systems, storage systems
- What does IPv6-ready mean?
 - Works when contacted by a IPv6-only device
- How to do the analysis? Possible approaches...
 - “Ask the developers”
 - Code analysis
 - Testing
- WLCG service endpoints – full list and IPv6 readiness
 - Everything checked today by SAM/NAGIOS (i.e. publicly available)



Testbed – getting started

- Interested sites
 - CERN, DESY, INFN, Manchester, Glasgow, Caltech, KIT, EPFL, ...(more will come!)
- Milestone
 - One dual stack test node on public IPv4 and IPv6 networks at each site
 - Running SL5 (with valid X.509 host cert)
 - by end of August 2011
- Standard connectivity tests etc
 - Then end to end Grid tests (jobs, data, ...)



Summary

- HEPiX IPv6 working group has started
- Looking to widen expertise and participation
- Lots of work to do and limited resources
- Volunteers welcome!