

# The HEPiX IPv6 Working Group

David Kelsey

HEPiX, Prague

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# Outline

- IPv4 to IPv6
- The HEPiX IPv6 Working Group
- IPv6 testbed and testing
- WLCG software and tools IPv6 survey
- Managing large sites – addressing etc.
- IPv6 security
- Recommendations and future plans

# IPv4 Addresses

- From Geoff Huston (<http://ipv4.potaroo.net>)
- IANA Unallocated Address Pool (Global)  
Exhaustion happened:     **03-Feb-2011**
- Projected Regional (RIR) Address Pool Exhaustion Dates:
  - APNIC:                   **19-Apr-2011** (Asia Pacific - happened)
  - RIPENCC:                 **12-Aug-2012** (Europe)
  - ARIN:                    **21-Jun-2013** (North America)
  - LACNIC:                 **29-Jan-2014** (South America)
  - AFRINIC:                **31-Oct-2014** (Africa)

# IPv6 elsewhere

## IPv6 World Day (8 Jun 2011)

- Many major players successfully turned on and tested IPv6 for 24 hours
  - Including Google, Facebook, Yahoo! ...
- But then turned it off again!

## In the future...

- US Federal Government requires all their outward facing public services to be running IPv6 by 30 Sep 2012 (and clients by Sep 2014)

# World IPv6 Launch Day



- <http://www.worldipv6launch.org/>
- 6 June 2012 “The Future is Forever”
- ISPs, home routing equipment vendors, web companies all coming together
- Permanently enable IPv6 by 6<sup>th</sup> June 2012

# HEPiX IPv6 Working Group

Created in April 2011 with aims:

- Consider whether/how IPv6 should be deployed in HEP
  - especially WLCG (Worldwide Large Hadron Collider Grid)
- 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
- We meet face to face 4 times a year
  - And by video conference in between

# WG membership

- Currently active (meetings, testbed, mail discussion):
  - CERN, DESY, FNAL, FZU, GARR, Glasgow, INFN, KIT, Manchester, RAL, SLAC, USLHCNet (Caltech)
  - CMS, ALICE and LHCb (ATLAS to come)
- ~50 on the mail list

# IPv6 Testbed and testing

- We have deployed a distributed testbed
  - CERN, DESY, FZU, GARR, INFN, KIT and USLHCnet
- <https://w3.hepix.org/ipv6-bis/doku.php?id=ipv6:testbed>
- See Francesco's talk today
- GridFTP & FTS
- Future testing of Storage implementations
  - DPM
  - dCache, CASTOR, STORM



# Software & Tools IPv6 Survey

- An “Asset” survey is now underway
  - A spreadsheet to be completed by sites and the LHC experiments
  - Includes **all** applications, middleware and tools
  - Tickets to be entered for all problems found
- If IPv6-readiness is known, can be recorded
- Otherwise we will need to investigate further
  - Ask developer and/or supplier
  - Scan source code or look for network calls while running
  - Test the running application under dual stack conditions

# Software with IPv6 problems

- Need to check many things
  - Break when installed on a dual-stack node?
  - Does it bind to both stacks?
  - Is IPv6 preferred?
  - Can it be configured to prefer V4 or V6?
- Already found a few problems
- OpenAFS, dCache, UberFTP
- FTS & globus\_url\_copy (see Francesco's talk)

# Managing IPv6 at large sites

- Best practices are still far from clear!
- Large sites (e.g. CERN and DESY) wish to manage the allocation of addresses
  - Do not like autoconfiguration (SLAAC)
- Wish to filter out Router Advertisements
- DHCPv6 very attractive
  - BUT IETF still discussing
  - Will the ‘route’ options be there or not?

# IPv6 security

- Are operational security teams ready for IPv6? No!
- Challenges include
  - Address format has multiple forms, many addresses per host and addresses difficult to remember
  - IPv6 standards contain many suggestions - implementation optional
  - Required security features, like RAGuard and SEND, are a long way from full deployment
  - Incomplete and immature implementations
  - Many vulnerabilities expected
  - Log parsing tools must all change
  - Dual stack and tunnels cause problems – e.g. packet inspection
- Must test that things which are not supposed to work do not

# Recommendations & future

- Should we deploy IPv6? Answer: Yes! When we are ready
- Aim to implement Dual Stack on all WLCG services
  - Avoid complications of tunnels, proxies, gateways etc.
- Perform full asset survey (Spring 2012)
  - Identify show-stoppers & quantify effort and resources required to fix
- Expand testbed gradually during 2012
  - work with EGI and EMI
  - Considering merging of EGI and HEPiX testbeds later this year
  - All WLCG services
  - Perform more extensive functionality and performance tests
- Must consider operational impact
  - including security and monitoring

# Future plans (2)

- Review status at end of 2012
- Produce implementation plans for 2013 and/or later
- Need to perform tests on the production infrastructure
  - involve WLCG Tier 1 centres
- Plan several HEP IPv6 “Days” (for 2013?)
  - turn on dual stack for 24 hours on production infrastructure and test/observe
- Earliest date for production of IPv6-only systems is (currently) Jan 2014

# Further info

- HEPiX IPv6 wiki

<https://w3.hepik.org/ipv6-bis/>

- Working group meetings

<http://indico.cern.ch/categoryDisplay.py?categId=3538>

# Summary

- The HEPiX IPv6 working group functioning well
- **MUCH** work still to be done during the next year or two & effort is difficult to find
  - Further volunteers welcome to join
  - Please contact me
- not able to support IPv6-only systems in WLCG before 2014
  - Decision on timetable to be made by end 2012