Science & Technology Facilities Council

GridPP
UK Computing for Particle Physics

HEPiX IPv6 Group

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Outline

- Some history
- US Federal directive
- Status of IPv4 address exhaustion
- The HEPiX IPv6 Questionnaire
- The HEPiX IPv6 sub-group

Some history

- HEP DECnet/OSI Phase V transition
  - European routing migration (early 90's)
  - Phase IV was 16-bit addressing!
- CIDR (93) and NAT (94) saves IPv4
- IPv6 - RFC2460 (Dec 1998)
- IPv6 address allocation starts July 1999
- O/S and router support from ~2000
- Many NRENs support IPv6 (~2003)

History (2)

- I sent questionnaire on IPv6 status and plans at end of Sep 2010
  - To HEPiX Board and later to full list
- 28 Sep 2010
  - Memo from US Federal CIO
  - To all CIOs – Exec Departs & Agencies
- US DOE Labs clearly involved

US Federal transition to IPv6

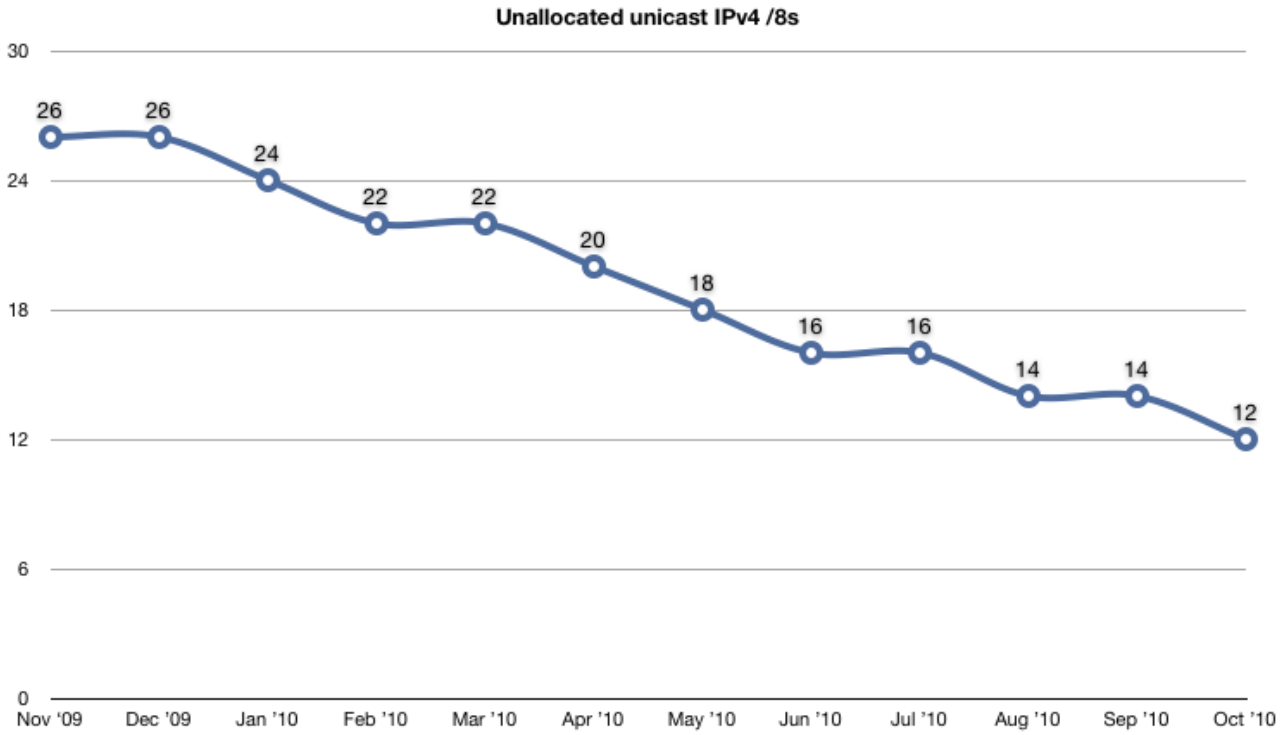
http://www.cio.gov/Documents/IPv6MemoFINAL.pdf

- 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
- 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

IPv4 address exhaustion

- From Geoff Huston (*http://ipv4.potaroo.net*)
- **Projected IANA Unallocated Address Pool (global) Exhaustion: 02-Mar-2011**
  - Only 7/256 (/8) addresses are unallocated
  - < 3%
- **Projected RIR Unallocated Address Pool (regional) Exhaustion: 2-Dec-2011**

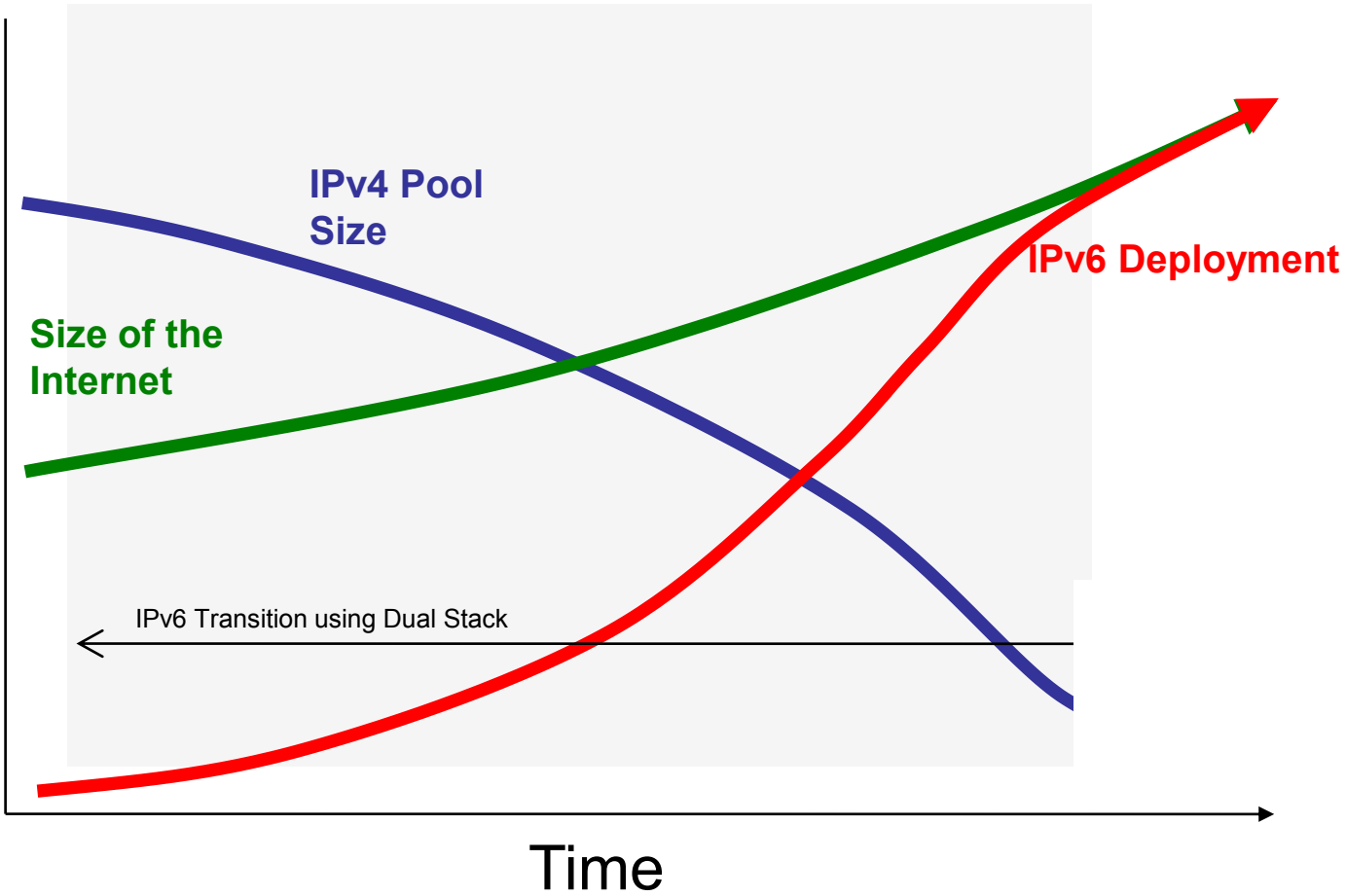
V4 address allocation last year



What's the problem?

This is how we pictured the transition 15 years ago:

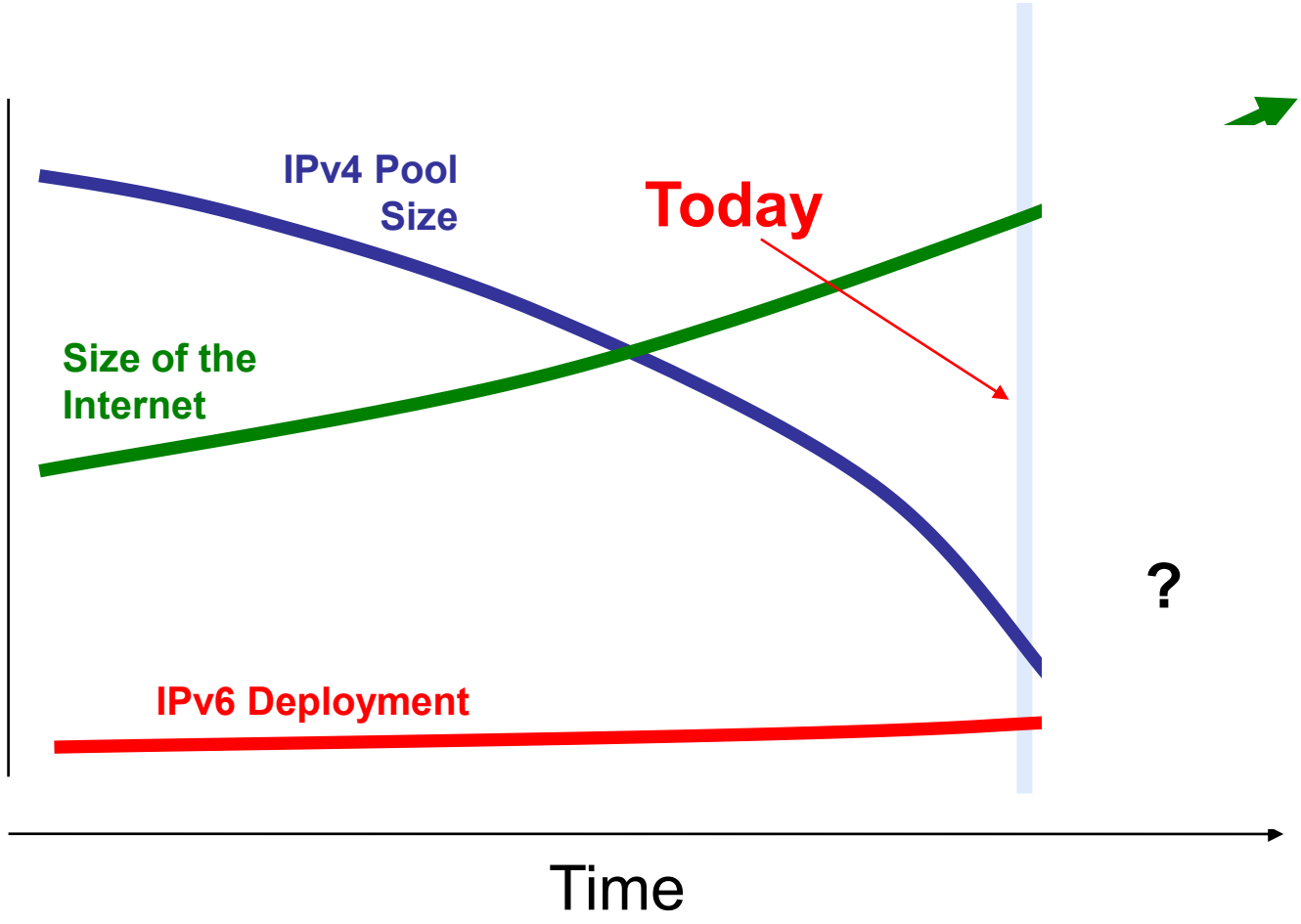
Dave Wilson, HEAnet (Ireland)
TNC2010



Geoff Huston, www.potaroo.net

Transition plan

This is where we are now:



Geoff Huston, www.potaroo.net

HEPiX Questionnaire

Many thanks to the 18 responders:

- Guillaume Cessieux (IN2P3), Andrew Daviel (TRIUMF), Phil DeMar (FNAL), Carlos Friacas (Portugal), Denise Heagerty (CERN), Jean-Michel Jouanigot (CERN), Andy Kowalski (JLAB), Pierrick Micou (IRFU), Francesco Prelz (INFN), Fazi Qi (IHEP, China), Sabah Salih (Manchester), Reinhard Strebler (KIT), Robin Tasker (RAL & DL), Steven Timm (FNAL), Rosette Vandenbroucke (Belgium), Mattias Wadenstein (Umea), Stephan Wiesand (DESY), Knut Woller (DESY)

Conclusions

- IPv6: Infrastructure is the most advanced
  - NRENs have been “ready” for years
- Sites are not seeing any pressure (yet)
  - So, not much is happening
  - But the US directive will make a difference
- The big problem areas
  - Applications
    - 3rd party and homegrown (“we” have to work on these)
    - Very much like Y2K (survey, plan, upgrade, replace)
  - Technical transition details
    - Lack of maturity of tools, other concerns (e.g.security)

HEP and IPv6?

- IPv6-only systems will (soon?) arrive
  - Certainly will affect general Grids and Clouds
    - e.g. FermiCloud decided to support IPv6, ...
  - When will WLCG/HEP have to support IPv6-only systems?
- The range of applications in one community (e.g. HEP) is more constrained than trying to solve problems for everyone
- Different from the HEP DECnet/Phase V coordination
  - Then we spent most of our efforts on the routing, addressing and naming issues
  - Now I think we have to concentrate more on applications and tools
  - But we did learn that analysis and planning is essential and takes lots of time!

HEP Coordination

- In addition to applications
  - Work with Site and National networking experts
  - Security concerns
  - Monitoring
  - Network Management (end to end, not backbone)
- Positive benefits of learning together and sharing the work
- It will all take much time
  - We are already late!

HEPiX IPv6 sub-group

- Phase 1 should be to do a full (gap) analysis of the problem (during 2011)
  - Applications important to HEP
    - Analyse IPv6 compliance
  - Security implications
  - System and network tools etc.
- Create and operate an HEP distributed testbed
- Propose a timetable for Phase 2 (if we agree we need to do this)
  - Upgrades, implementation, deployment
- Must include an effort/resource requirements analysis