Comments by Robert Hutchinson, networking products architect
submitted to
The National Telecommunications and Information Administration
U.S. Department of Commerce
regarding
The Continued Transition of the Technical Coordination and Management of the Internet's Domain Name and Addressing System: Midterm Review of the Joint Project Agreement

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ICANN is boldly claiming they have "Achieved" security and stability in the area of IP Addressing (pp 33-34 of comments filed by ICANN's Chairman).

One of ICANN's primary responsibilities is the distribution of IP address space, via the IANA and RIR organizations. The distribution of IP address space allows the internet to grow, by adding new networks, so this is function is vital to the health of the Internet. ICANN's current plan for handling the IPv4 to IPv6 transition is not inadequate to the needs of the market, and therefore ICANN's claim that they have "Achieved" security and stability in the area of IP addressing , is not supported by a careful look at ICANN's role in the IPv4 to IPv6 transition.

The last time a major revision to the IP protocol occurred, the internet was a tiny fraction of today's Internet. And unlike the move from IPv3 to IPv4 in the early 1980s, versions 4 and 6 of the protocol will interoperate during and after the transition for years.
For the current version of Internet Protocol, IPv4, the address space is nearly distributed. This "exhausting" of the IPv4 address space is often cited as the primary driver – urging the market to begin transitioning their network to IPv6 ASAP.

IPv6 has been in development since the early 1990's and the current version of IPv6 has been worked on continuously since about 1997. My point here is that designing IPv6, building IPv6 networking equipment, testing it for interoperability and planning network transitions to support IPv6 is a task that has already taken a decade, and will probably take another decade to complete.

ICANN recently made an agreement with the RIRs to distribute IPv6 addresses, but the IPv6 addresses and IPv6 protocols enhancements are not capable of supporting a commercial IP network. Even though IPv6 has been under development for more than fifteen years, many technical protocol specifications drafted by the IETF are in the process of being implemented by network equipment providers, but this process of translating specification into products and ensuring interoperability with IPv4 and IPv6 is many years from completion.

IPv4 address space will be completely allocated by 2011, using the existing IANA/RIR processes and various consumption projections [See IANA Allocations – Projections chart below. Showing various IPv4 allocation completion dates 2008 or 2011-2012]. The period between 2011 and 2014, when IPv4 addresses are no longer available, will force new networks to be addressed using IPv6 only. The new networks will be disproportionately located in developing economies. Because IPv6 technology may not be ready in time, the new networks may not be built. Existing

IPv4 networks will be advantaged in all markets until 2014 – when maturing IPv6 technology, applications and competitive demand shift consumer demand in favor of IPv6.

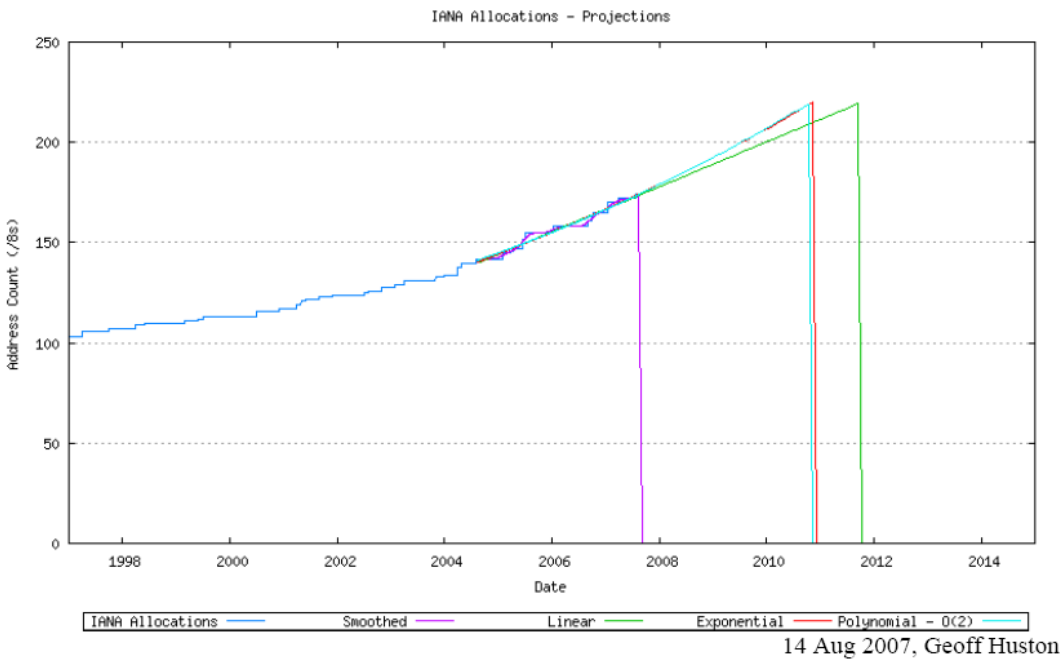
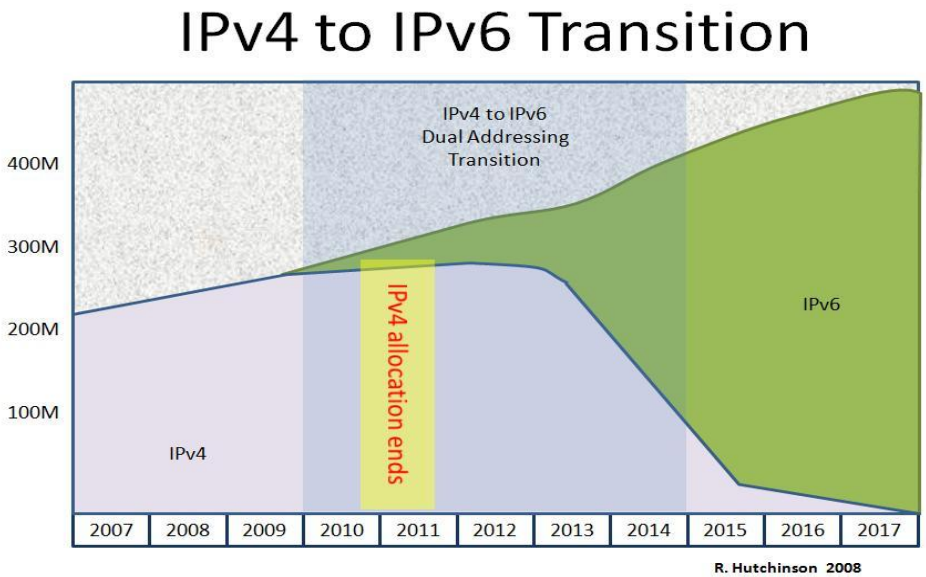


Figure 1: IPv4 Address Allocation

Large scale IPv6 deployment cannot begin until protocol development is complete and IPv6 is supported widely by network equipment providers. Today - Basic TCP/IP protocol over IPv4 and IPv6 works. Dual Stack IPv4/IPv6 is free in Microsoft Vista and Linux.



The adoption of IPv6 by carrier networks and ISPs is a function of a complex mix of technology, costs and competition:

- IPv6 requires that existing routers and switches be replaced or upgraded, which will cost billions of dollars. NEP vendor solutions will begin this year for many new router/switch products as a checklist item. The US government is requiring IPv6 capability in all network routing equipment in 2008.
- IPv6 consumes more bandwidth to perform the same work as IPv4, requiring additional investments in network capacity.
- IPv6 delivers negligible "short term" user benefit. This could change if Microsoft, Apple or others develop new "IPv6 Market Driver" products that exploit the advantages of IPv6.
- Network management programs [monitoring, security, billing, error detection etc] require upgrading to map and support IPv6 and combined IPv4/IPv6 operations.

Given the huge investment and technology impact moving from IPv4 to IPv6, IPv4 must exist in parallel with IPv6 for years – in fact IPv6 cannot take over from IPv4 until IPv6 technology is mature and dual stack [See IPv4 to IPv6 Transition graph above, showing the likely transition period for moving from IPv4 to IPv6 protocols].

The current allocation of IPv4 address space is not well utilized. Several proposals have been made about recovering and reallocating IPv4 space. Recovering and reusing IPv4 address space is not the simple task of getting the numbers back and redistributing them – the reused address space will increasing number of entries and fragmentation in IPv4 routing tables, and is often cited as a technical obstacle.

ICANN's current plan – to just ignore the problem – could become a public relations disaster. ICANN should be proactively managing this situation by initiating an official inquiry about how recovering and reallocating IPv4 space may be accomplished.

References:

Global Policy Proposal for Remaining IPv4 Address Space – Background Report, 29 November 2007
http://www.icann.org/announcements/proposal-ipv4-report-29nov07.htm

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The IPv6 Forum

http://www.ipv6forum.com/

Report on IPv6 interoperability testing:

http://moonv6.iol.unh.edu/project/june2007/Moonv6June07.pdf