LS4 – IPv4 Issues

1. Overview

This document responds to the ITU IPv6 Group Liaison Statement, LS 4 – "IPv4 issues". Liaison Statement 4 refers to Temporary Document TD 14, "Concerns on IPv4 Address Policy with regard to IPv6 Deployment".

The five Regional Internet Registries who form the Number Resource Organization (NRO)[1] would like to thank the Chairman of ITU IPv6 Group, Mr Mohammed Al Khamis, for the opportunity to share their views on the TD 14 paper with the members of the group.

2. Putting efforts to maximize use of IPv4 addresses in context

Although the IANA IPv4 pool was exhausted on 3 February 2011, the Regional Internet Registries (RIRs) still hold unallocated IPv4 address space,[2] and in many cases, RIR communities have developed policies to ensure that some blocks of IPv4 addresses will be available to new networks for many years to come. This will help to ensure that new networks can reach both the IPv4 and IPv6 Internets as the global adoption of IPv6 proceeds. At the same time, some believe that placing too much focus on extending the lifetime of the IPv4 protocol (through address sharing and other mechanisms) may delay uptake of IPv6, as well as increase the cost of running IPv4-based networks[3].

It is clear that IPv6, with its much larger address space, will allow the Internet to continue to grow. There is a risk that efforts to extend the life of available IPv4 pools will decrease the need for networks to move to IPv6 and extend the time it takes to transition to IPv6. Achieving a successful global migration to IPv6, however, will require a concerted effort on the part of all Internet stakeholder groups, with support in the interim transition period for existing IPv4 transfer, reclamation, and reservation strategies developed by the Internet community.

It is important to note that IPv6 delegation and deployment rates have increased exponentially since 2009 (see Appendix). As more network operators have begun preparations for deployment of IPv6, there has been a marked increase in requests for IPv6 addresses from the RIRs. Given the rapid pace of change in Internet technologies and operations in general, and the change in allocation rates over the past year in particular, it would be difficult to develop any coordinated governmental policy on extending the lifespan of IPv4 in time for it to have any effect.

---

[1] The five RIRs are AfriNIC, APNIC, ARIN, LACNIC, and the RIPE NCC. Four of the RIRs who form the NRO are ITU sector members: AfriNIC, APNIC, ARIN, and the RIPE NCC.

[2] "Free Pool of IPv4 Address Space Depleted": http://www.nro.net/news/ipv4-free-pool-depleted

[3] The Internet technical community has identified a range of issues with technologies like Carrier Grade NATs, as detailed in "Issues with IP Address Sharing": http://tools.ietf.org/html/draft-ford-shared-addressing-issues-02

3. Efforts to manage IPv4 exhaustion gracefully

3.1 IPv4 transfers

RIRs have recognized and permitted IP address transfers for many years now, for instance in cases of mergers and acquisitions of ISP companies or network infrastructures.

More recently, policies adopted by RIR communities have permitted IPv4 transfers between networks outside this merger/acquisition model, and allowed IPv4 addresses to be transferred between unrelated organizations, providing that the recipient network can justify the need for the addresses. For more information on IPv4 transfer policies, see "Transfer of Custodianship" in the "RIR Comparative Policy Overview":

> http://www.nro.net/documents/rir-comparative-policy-overview-2010-04#1-3-2

There is also discussion underway in RIR communities regarding if and how inter-region (that is, inter-RIR) transfers could be more efficiently dealt with in RIR policies, allowing unused or underutilized addresses in one region to be redeployed to networks that need them in another region.

3.2 IPv4 blocks put aside for networks in the near future

Most RIRs have adopted policies that limit access to the final blocks of IPv4 address space, to preserve a supply for new networks that may require it in future. These policies are intended to ensure that IPv4 space remains available, in small blocks, during the transition to a fully IPv6-based Internet.

For more information on these policies, see "Use of Final Unallocated IPv4 Address Space" in the "RIR Comparative Policy Overview":

> http://www.nro.net/documents/rir-comparative-policy-overview-2010-04#2-6

3.3 IPv4 reclamation

Over the last few years, the RIRs and the IANA have worked to reclaim unused IPv4 addresses.

IANA was able to reclaim a number of /8s originally allocated as "Class A" blocks and redistribute them to the RIRs for allocation.[4]

RIRs reclaim resources in cases where address holders cease to use them. For example as a result of business closure or bankruptcy, or where address holders cannot be contacted and resources have fallen into disuse. Such resources are then made available for allocation to other networks, or they may be returned to the IANA for distribution to other RIRs (this being an active topic of policy development in most regions at present).

---

[4] "Class A" blocks were distributed by the IANA prior to the establishment of the RIR system.

For more information, see "Recovering Unused Resources" in the "RIR Comparative Policy Overview":

> http://www.nro.net/documents/rir-comparative-policy-overview-2010-04#1-3-3

4. Conclusion

The document presents an up-to-date overview of issues that are currently being actively discussed in the policy forums of most or all RIR communities.

The objectives summarized in TD 14 are shared by all five RIRs and the wider Internet technical community: to continue to effectively utilize and manage IPv4 space during the IPv6 transition period, while providing all available incentives to encourage IPv6 deployment.

ITU members, like all Internet stakeholders, are welcome to participate in RIR policy development processes to refine IPv4 transfer and other IP address management policies. We encourage anyone with an interest in these matters to join the discussions at their relevant RIR.
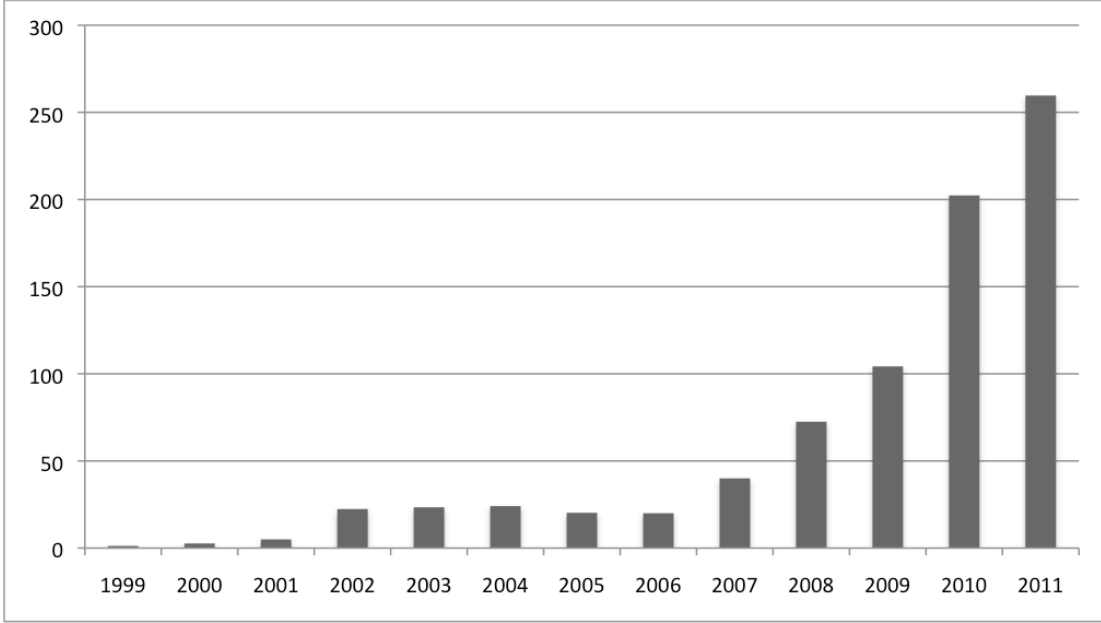
5. Appendix: IPv6 deployment and delegation trends

Global percentage of IPv6-enabled networks over time
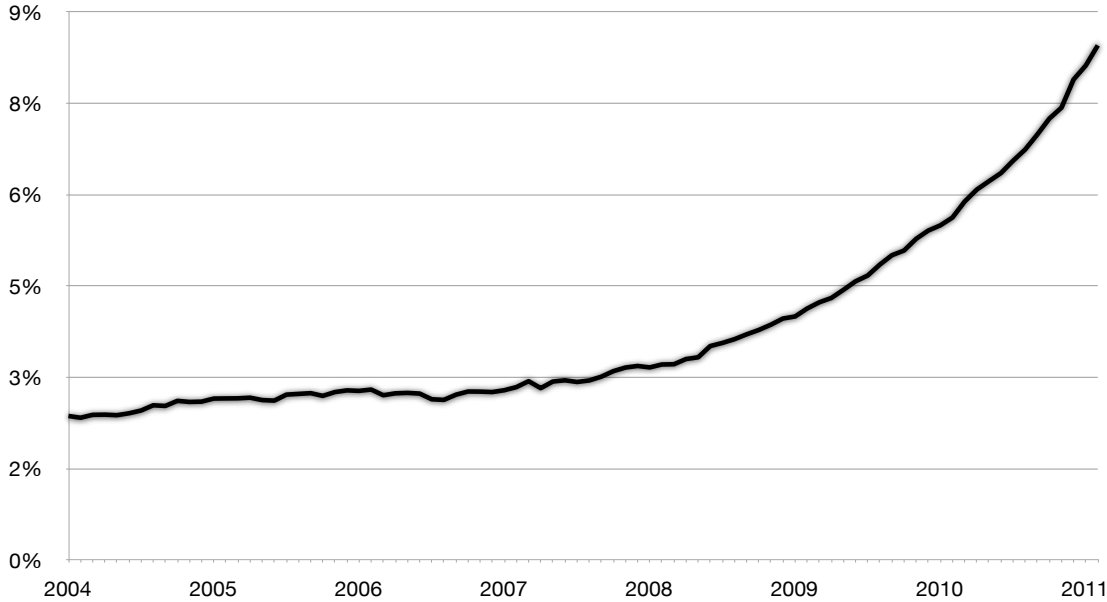
Latest version of this graph available at: http://v6asns.ripe.net/v/6

Average yearly per-month IPv6 delegations made by RIRs, 1999-2011

Original data used available at: http://www.apnic.net/apstats