Analysis of the impact of IPv4 transfer policies; Issues and solutions

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Introduction

- IPv4 addresses are becoming scarce
  - Unallocated Address Pool Exhaustion:
    Projected IANA: 31-Jan-2011
    Projected RIR: 29-Feb-2012
    http://www.potaroo.net/tools/ipv4/index.html
  - RIRs have agreed that IANA will transfer the final /8 blocks (one each) to RIRs when normal allocations reach the point where there are only enough.
- What will happen when RIRs will finish their IPv4 addresses?

Introduction …

- Unfortunately, at the current IPv6 adoption rate, RIRs will run out of IPv4 addresses before everybody has migrated to IPv6
- There will continue to be organizations that will be looking for IPv4 addresses
- At the same time, there are organizations who have IPv4 addresses that they do not use
  - There is no hard data how much there are
  - There is no data either on how many of these organization will give away their addresses
- ARIN, RIPE, APNIC are discussing policy changes to permit transferring address blocks between parties as an alternative to returning them to the RIR.
- AfriNIC will also need to discuss on such a policy
- The Internet Society is collecting perspectives and data for considered input to the global discussion

RIR Transfer Policy discussion

- RIRs operate under consensus policy rules that entail extended discussion
- ARIN, RIPE, APNIC have had policy proposals on address transfers in discussion for over a year.
- APNIC's proposal has the fewest restrictions on transfers, limiting the frequency of transfers, which discourages speculation.
- RIPE recently adopted the restriction in ARIN's proposal that transfers meet existing allocation justifications.
- Details here: http://ispcolumn.isoc.org/2008-11/transfers.html

RIR policy conditions on transfers

	APNIC	ARIN	RIPE
Be a member of the RIR	X	X	X
Prior RIR approval (need must be justified)		X	X
Min Block size	/24	Current	Current
Block must be empty of End User assignments			X
Type of address space	All	All	Only PA
Transferring Org cannot receive space within the next 24 months	X		
Recipient Org can not transfer the space within the next 24 months			X
Non-permanent transfers			X

Allow transfers or not?

- There is no practical way to limit transfers
  - http://rosie.ripe.net/ripe/meetings/ripe-57/presentations/uploads/Tuesday/Address%20Policy%202/upl/van_Mook-2007-08_v3.fx3k.pps
  - A /16 is worth $175,000.
- Opposition to transfer policy
  - Transfers imply address markets with unknown risks of volatility and regulation.
  - Unfairness that current address holders would profit.
- Support of transfers
  - Scarce resources become valuable, and will be traded, either openly or secretly.

ISOC Observations

- Because transfers will occur, they should be registered
- Registration is required to preserve the integrity of the routing infrastructure
- RIRs are not inclined to operate managed address markets, but need to acknowledge transfers
- Extending availability of IPv4 addresses through transfers could bridge to deployment of IPv6

Importance of registration

- Registration is required to preserve the integrity of the routing infrastructure
- The integrity of the routing infrastructure depends on who can inject routes into the global route table.
- Ongoing problems with illegitimate routes being injected into the global routing infrastructure must be solved.
- We cannot envision any way to solve this without knowing the current legitimate holder of address prefixes.
- The IETF working group on Secure Inter-Domain Routing is considering a routing public-key infrastructure that would rely on valid address holding records.

Roles of RIRs

- It's important that RIRs register transfers
- Some have argued that there is value in RIRs managing address markets
  - Open and transparent pricing
  - Assigning addresses to encourage routing hierarchy
- However there are also significant risks to this approach
  - Volatility and charges of unfairness
  - Private market makers may appear
- The risks are probably not worth the benefits
  - Factors such as multi-homing and traffic engineering have already de-aggregated the global route table to a large extent
  - Markets, regardless who operates them, also bring the likelihood of regulation from national bodies not previously party to address allocation policy

Conclusion

- The belief that network operators would deploy IPv6 in parallel (dual stack) with IPv4 while there were sufficient IPv4 addresses was wrong.
- There was no economic incentive for operators to prepare for a future while there were sufficient addresses.
- Extending availability of IPv4 addresses through transfers can bridge to deployment of IPv6
- Exposing the economics of scarcity could incent operators to deploy IPv6