



Confronting the Reality of Emotional Denial and Grief

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Tony Hain

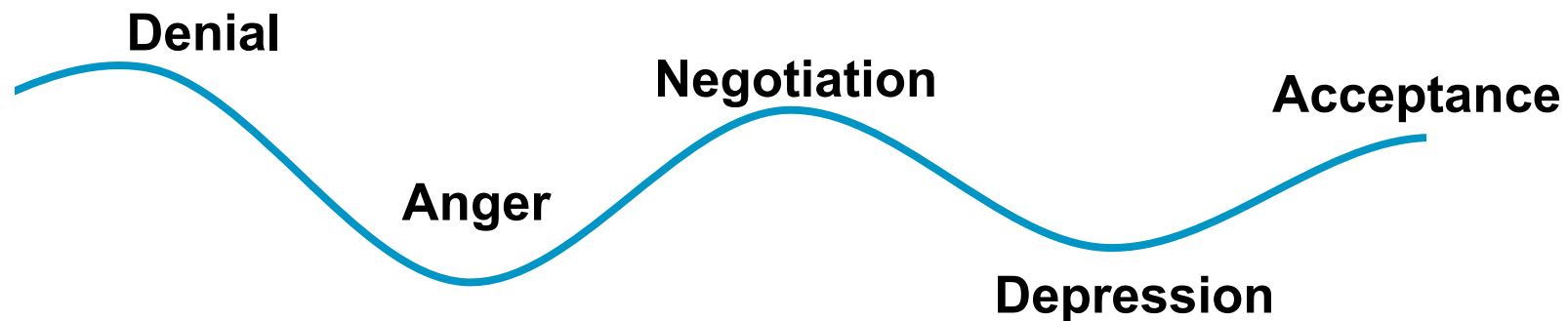
Technical Leader - IPv6

IPv6 Forum Fellow

ahain@cisco.com

Reflection

IPv4 to IPv6 transition and the stages of grief



For many,

IPv4 knowledge is their justification of value in the market.

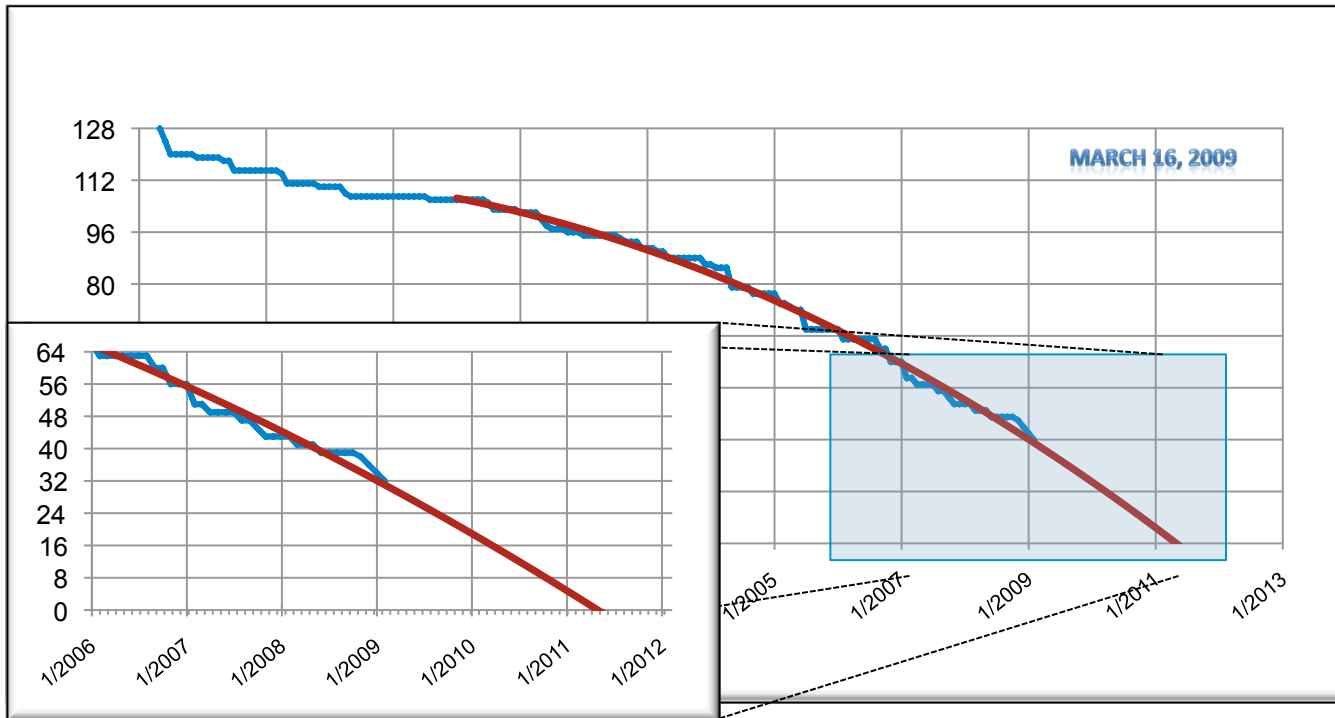
As demand for that knowledge withers, and demand for the unfamiliar IPv6 grows, people progress through the stages of grief in a futile attempt to avoid the inevitable.

Denial - Perspectives



- *Most Network Managers will not ask for IPv6 until they run into a problem getting IPv4 space.*
It is simple human nature to ignore a problem until it becomes a crisis.
- *Consumers will not ask for IPv6, until the price they pay for a single IPv4 address exceeds the cost of a new home gateway, and the press tells them what to call it.*
- *Application Developers will not make the necessary changes to deliver version-agnostic code until they see that the market is changing.*
Network managers need to drive awareness as the application community will not directly feel the impact of IPv4 free-pool exhaustion, and consumers will not know what to ask for.

Denial & the data



Update to: http://www.cisco.com/web/about/ac123/ac147/archived_issues/ipj_8-3/ipj_8-3.pdf

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**Whatever happens, today's IPv4 Internet will continue to run –
It just stops growing**

(OECD report <http://www.oecd.org/dataoecd/7/1/40605942.pdf>)

Day 2011-12-24 Last RIR depleted

**Make your own IPv4
exhaustion estimate.**

Developed by Stephan Lagerholm

<http://www.lagerholm.com/~stephan/cgi-bin/ipv6/predict.cgi>

http://www.infoweapons.com/pdfs/When_Will_IPv4_Addresses_Run_Out_ver00_rev06.pdf

Anger - IPv6-only events



- Distraught 'IPv4 experts' are having difficulties:

IPv6-only exposes IPv4 dependencies in applications and middleware.

“Thunderbird and Firefox disable IPv6 dns by default”

Failures when translating between versions exposes the invalid assumptions that some ISPs have been making.

“Linux NAT-PT (napt) has stability issues and wedges”

Provisioning model assumptions are exposed by new ways of handling addressing.

“it's a real pain in the ass to get DHCPv6 working”

“why doesn't the RA include the DNS service”

Typing ‘ : ’ instead of ‘ . ’ in a literal address exposes how resistant people are to change. (banging on keyboard and yelling ::

“why do we have to type colon instead of dot like in a real address”

Anger - Unbalanced Impacts



- The IPv4 address shortage will disproportionately harm the access providers relative to the content providers due to their imbalanced needs for additional addresses.
- If content providers require growth beyond the availability of IPv4, they can deploy IPv6, and then wait for the access providers to connect the content customers.
- Trading smaller and smaller blocks will cause the global IPv4 routing table to explode, and numerous small blocks make it difficult for large service providers to acquire enough space to sustain the business needs.
- Shortage driven IPv4 address block hijackings will become routine, which in turn will result in the routing table being politicized and access to content sites will be problematic.

Negotiation - Alternatives



- *“The Class-E space (240/4) ...”*

Existing deployed end systems will not accept configuration into, or even talk to that space if a new endpoint tried to use it. Only useful for an entirely new walled-garden deployment.

- *“Carrier based nat (CGN) ...”*

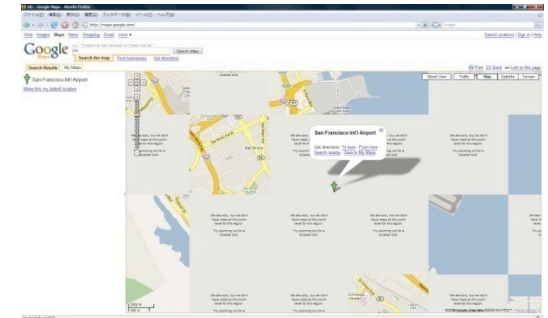
nat at the edge ‘works’ because protocols like UPNP open holes to allow applications through. UPNP is a link-scope protocol with no security functions by design, so nat in the core will fail for applications that rely on UPNP.

the private IPv4 address space is not big enough for some CGN deployment models which include multiple addresses per device and coordination with external content partners.

Depression - CGN breaks AJAX Apps



Google Maps limited to 10 parallel connections

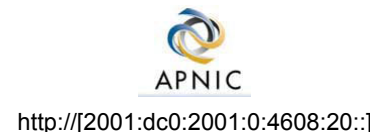
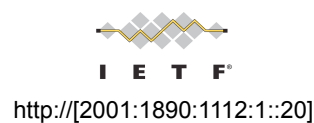
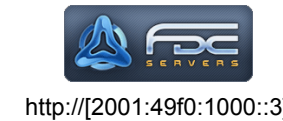
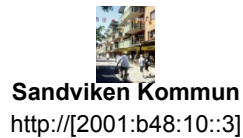


Source: Shin Miyakawa, Ph.D. NTT Communications Corporation

- Google Maps opens ~ 70 parallel connections
- iTunes store has been shown to open as many as 300 parallel connections
- New apps that have not emerged yet ???
- IPv4/nat multiplexes multiple users through the port range, so 64k divided by 300 parallel connections results in ~200 customers per ISP based nat address (assuming each customer is only allowed to run one simultaneous instance of iTunes or similar apps). Restricting the number of connections impacts utility of the app. Consensus wisdom before deployment is to plan on at most 8 customers per public IPv4 address.
- Services generally don't allow connections from the same host to span multiple public side addresses, so when a port pool is exhausted, the subsequent connections on another address will cause the application to fail.
- Reuse of port pairs can't be guaranteed with a high rate of churn in the port pool, so the likelihood of matching src/dst port pairs to popular sites will expose the probability of TCP sequence number overlap between unrelated connections, and/or a port sitting in TCP Time-Wait at the server.

Acceptance - IPv6 enabled web sites

(growing list at sixy.ch)



Summary

- The good news is that there are IPv6 enabled content sites. The bad news is that they are mostly niche & fit on one slide.
- Content and application developers need to be aware that the carriers will be connecting the eyeballs via IPv6, and/or breaking IPv4 connectivity to all but basic web & email through CGN deployments.
- Business continuity requires the ability to operate and grow after the IPv4 free-pool is exhausted. Self-defensive technologists are resisting change, while CIOs are indecisive due to conflicting viewpoints. Recognizing that 'fear of losing market value' is behind this impasse, will allow everyone to confront reality and take steps to move forward.