

IPv4 address is being “*sold out*” How to craft the Internet beyond?

Global IPv6 Summit in Beijing 2008

MAEMURA Akinori, Chair of the Executive Council

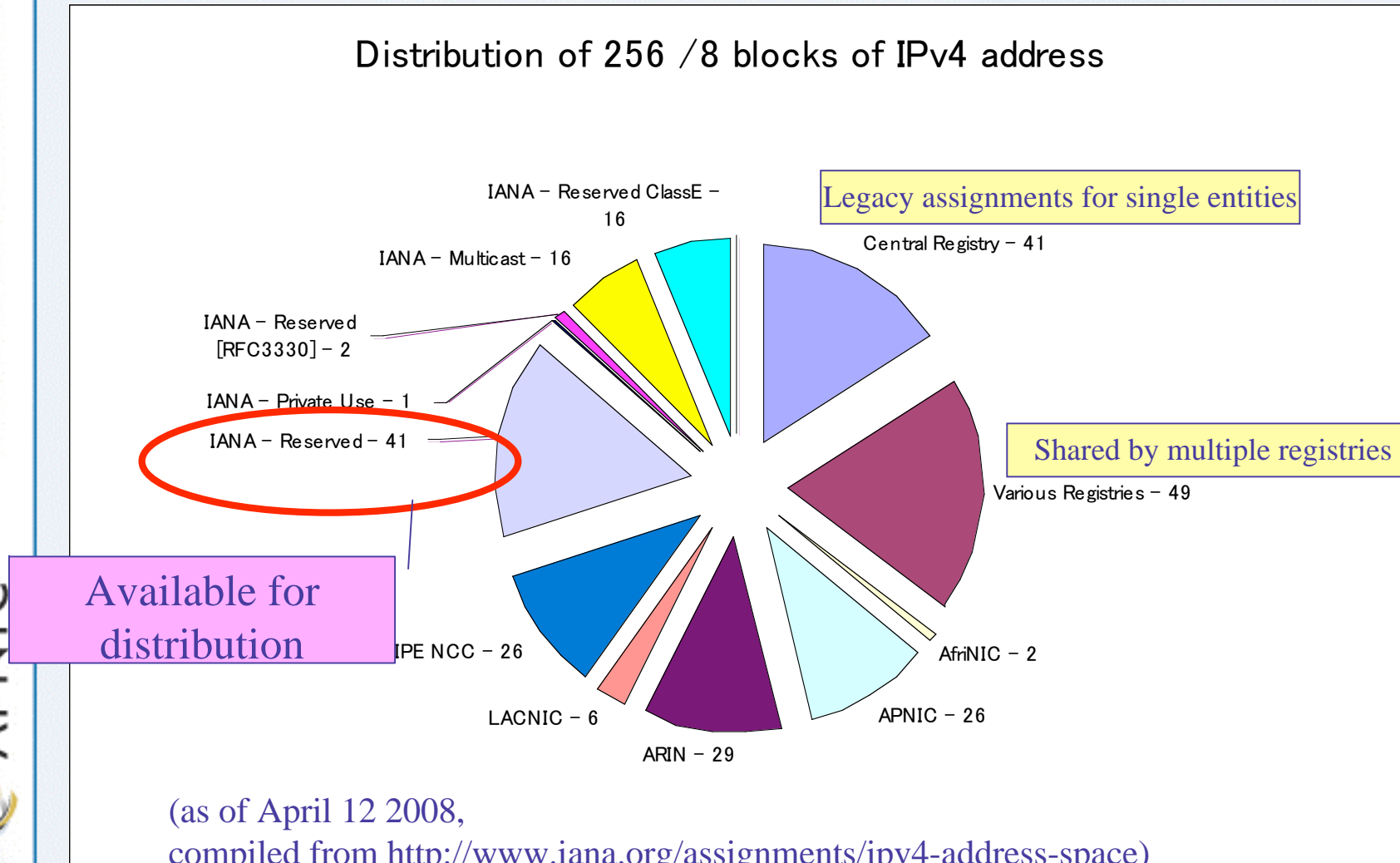
Paul Wilson, Director General

APNIC

IPv4 address distribution

Current distribution of the whole IPv4 address space

Distribution of 256 /8 blocks of IPv4 address



Available for distribution

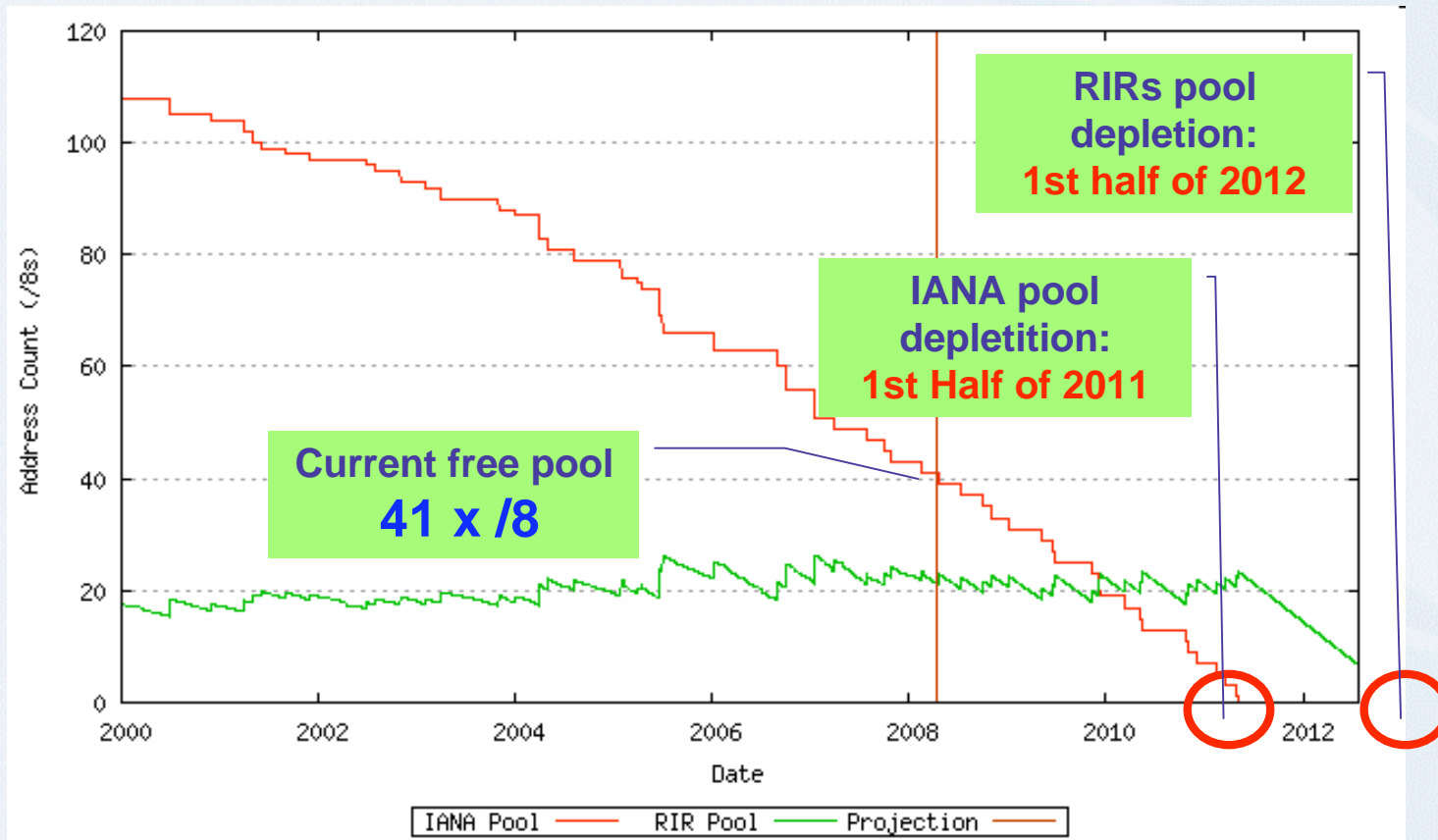
Legacy assignments for single entities

Shared by multiple registries

(as of April 12 2008,
compiled from <http://www.iana.org/assignments/ipv4-address-space>)



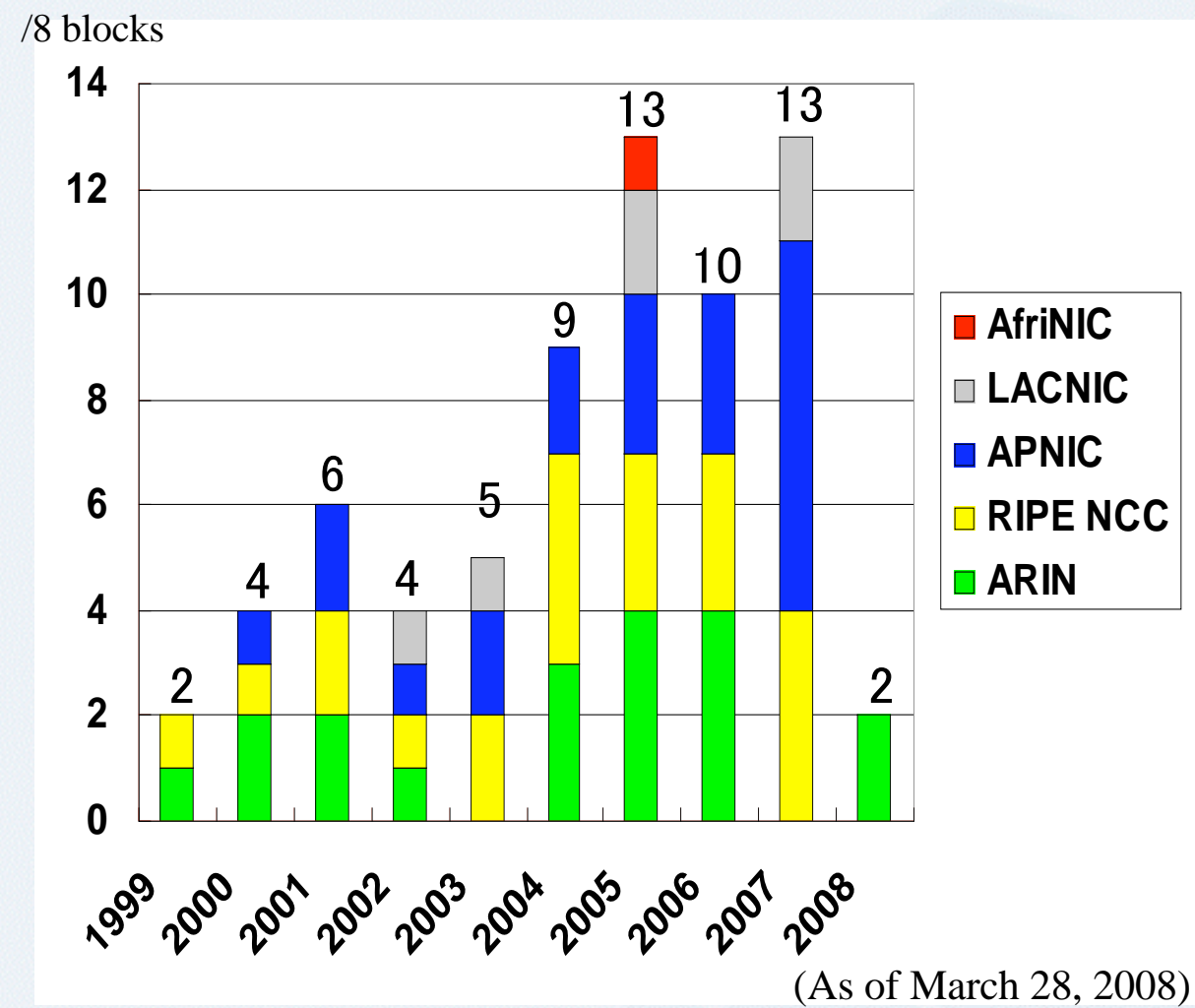
Projected lifetime of IPv4 addresses



Geoff Huston "IPv4 Address Report" (<http://www.potaroo.net/tools/ipv4/>), as of April 12



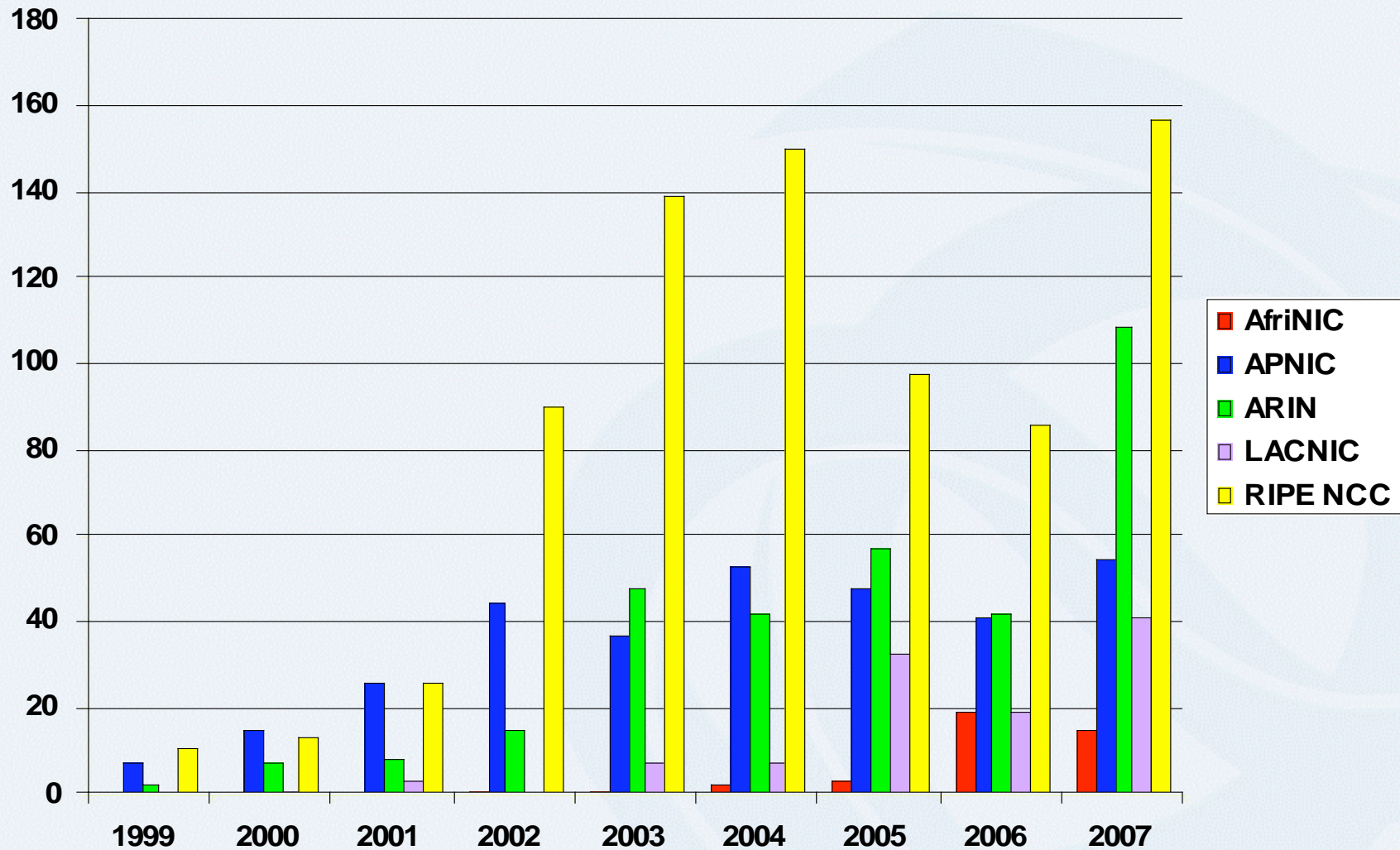
History of IANA's distribution of IPv4 /8 blocks to RIRs



IPv6 address distribution

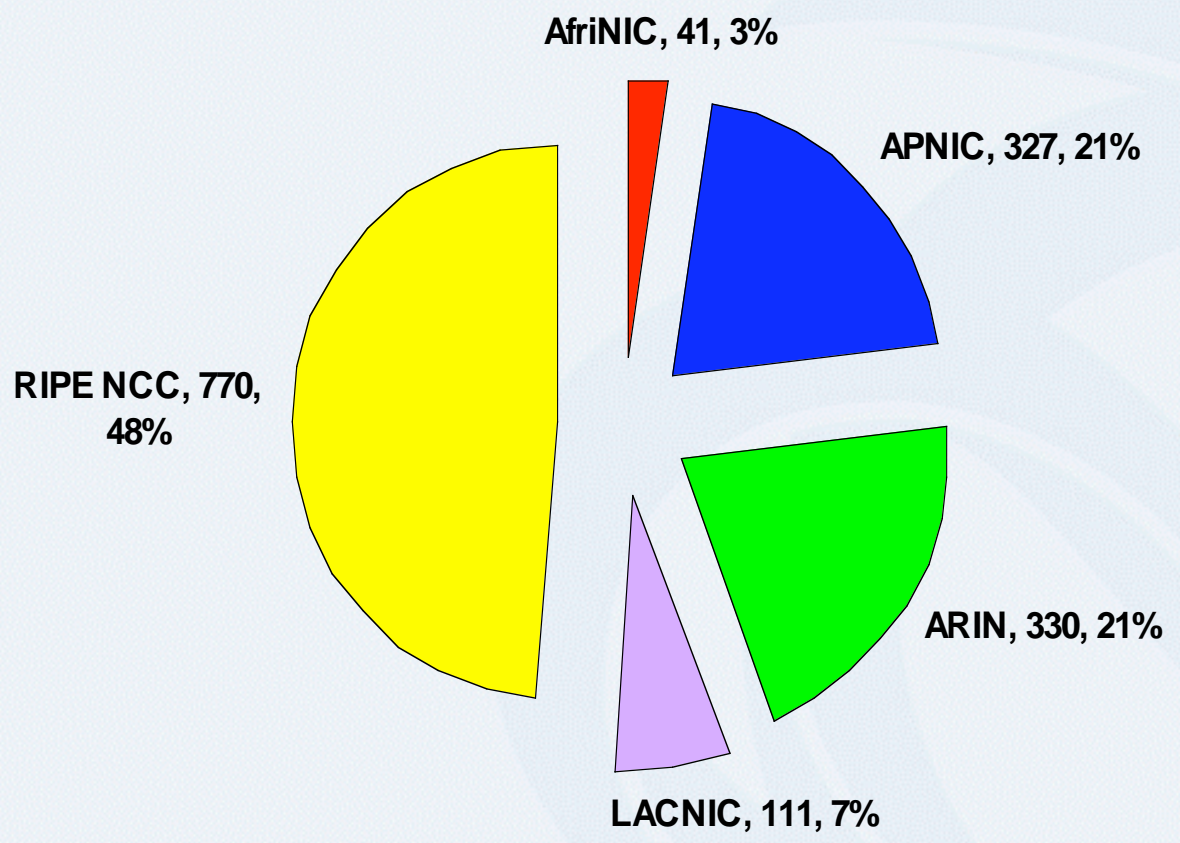
IPv6 Allocations RIRs to LIRs/ISPs

Yearly Comparison



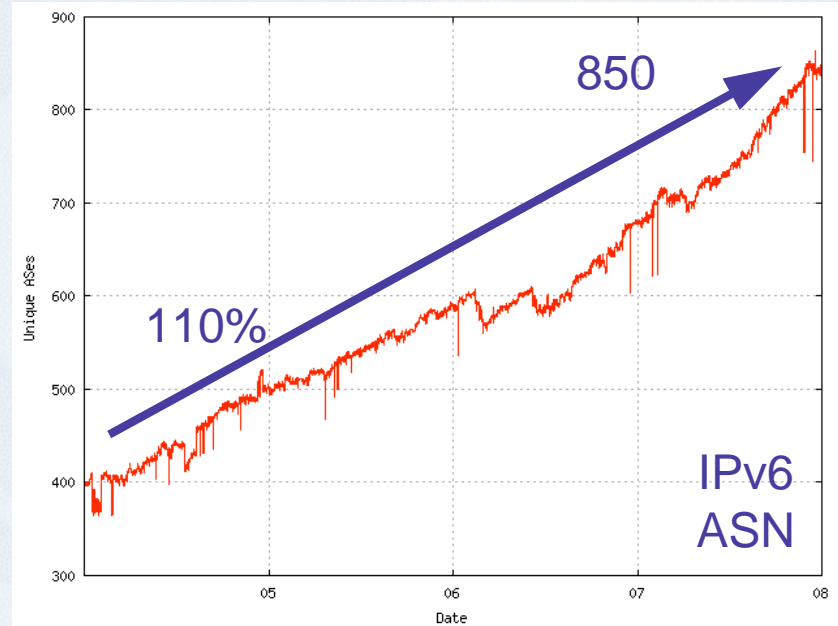
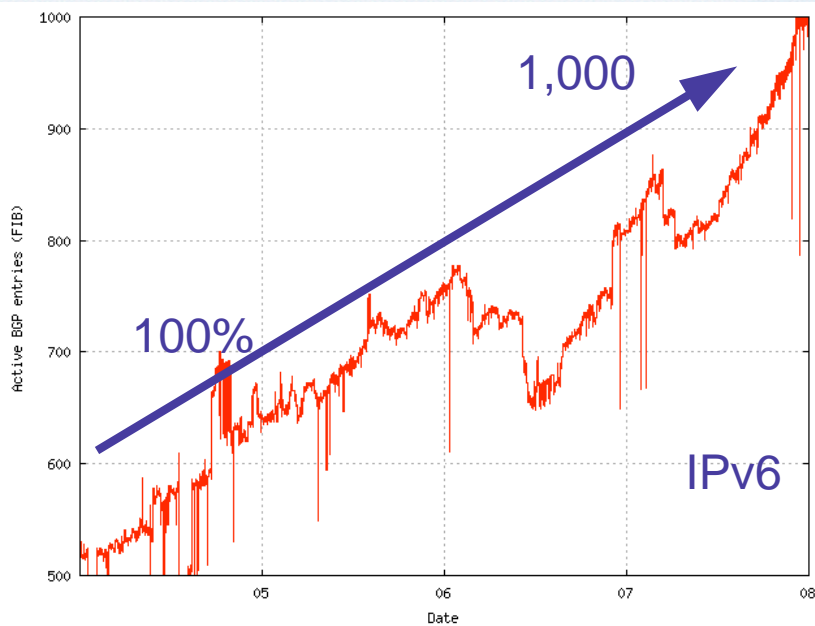
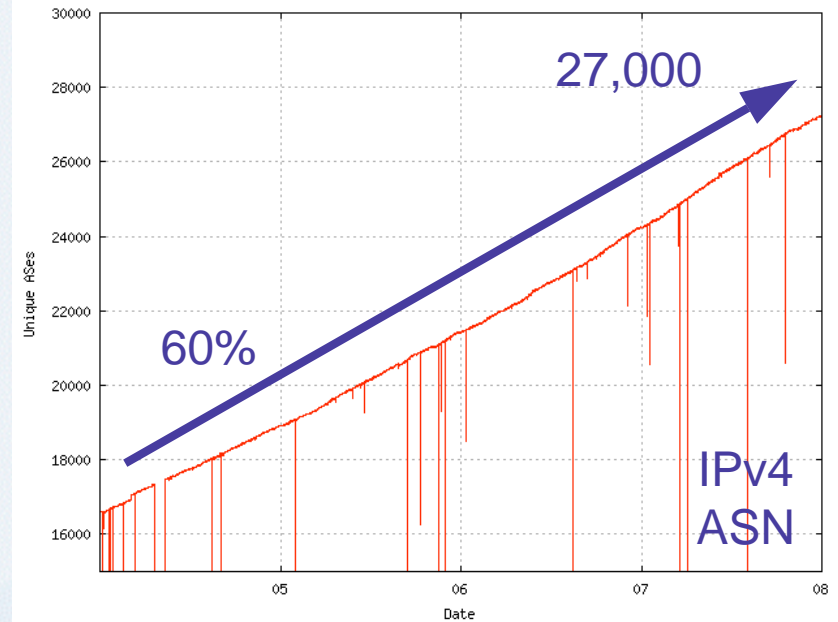
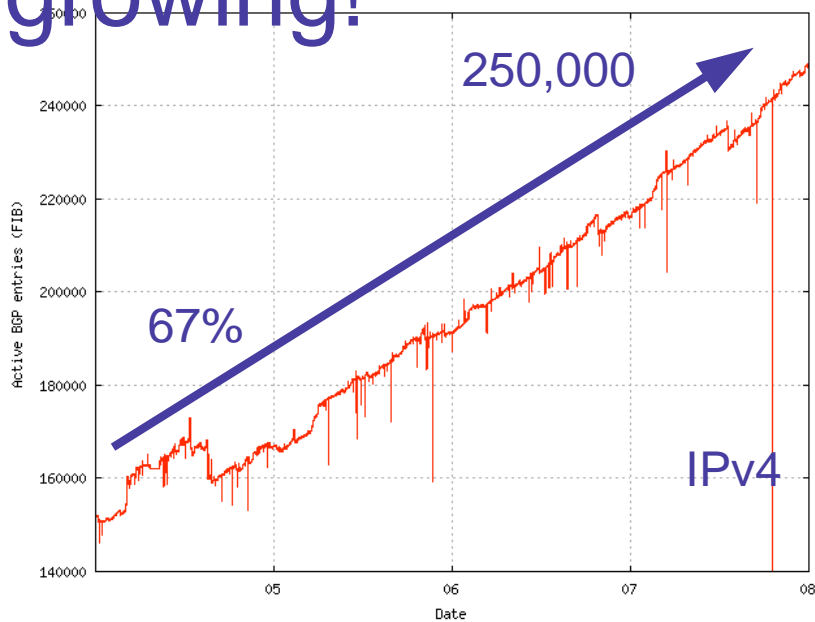
IPv6 Allocations RIRs to LIRs/ISPs

Cumulative Total (Jan 1999 – Dec 2007)



Is IPv6 actually in use?

Yes, it IS, far less than IPv4 but growing!



What are beyond the *depletion*?

How can we expand the Internet after the IPv4 address depletion?

- Procuring global IPv4 address by any means
- Deploying IPv6 for new users
- Using NAT not to use global IPv4 addresses

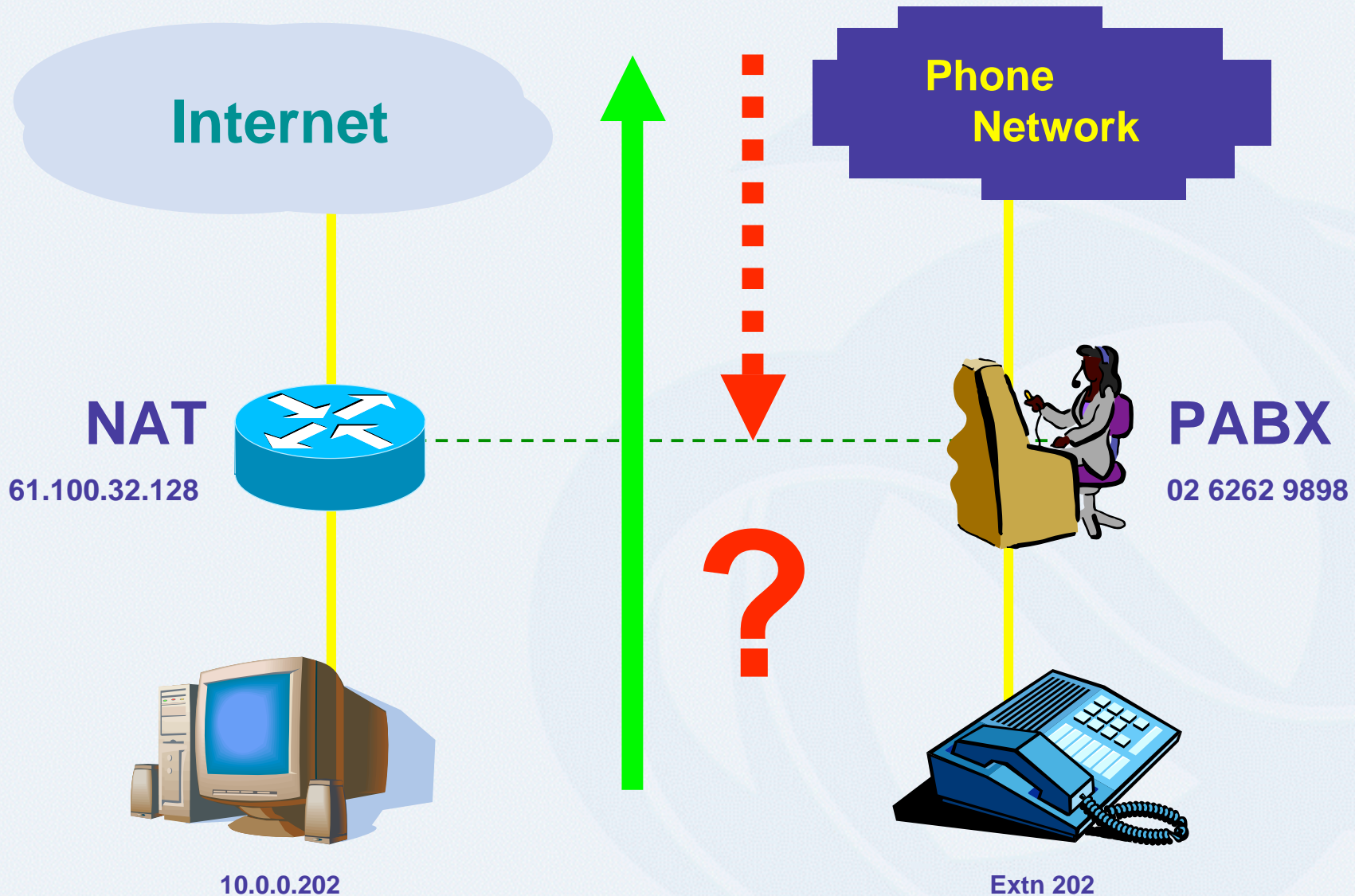
Is IPv4 address any longer available?

Not so longer, not always

- The current free pool is being depleted in 2010—2012
- Re-circulated IPv4 address will not always be supplied
 - Returning unused IPv4 address DOES COST. Available space by reclamation will be QUITE LIMITED.
 - A market for second-hand IPv4 address *might* emerge, but the supply is not committed

Why not IPv6?
and
Is NAT great enough?

NAT: allow a client access to the Internet without a global IP address



The Internet == InterNAT

- Everything now engineered for NAT
 - Client-initiated transactions
 - Application-layer identities
 - Server agents for multi-party rendezvous
 - It seems to work.
- Who bears the cost?
 - End users buy the NATs
 - Applications developers do the hard work
 - ISP costs are externalised
 - But, it does cost a lot.

Where is the ISP Industry?

- Telco consolidation...
 - Intense competition in the ISP industry has finished
 - The focus has shifted away from the ISP and away carriage services and towards to content services
- Commoditization...
 - Mass market access deployment has marginal rates of return on capital
 - ISP products remain undifferentiated – triple play, NGN and IMS based products have so far failed to achieve visible takeup
- Stasis...
 - Low margins and poor capital return have created a sluggish industry that is unresponsive to change
 - Resistive to efforts to evolve the IP level service model

The problem with IPv6?

- Technical
 - IPv6 is stable and well tested
 - But transition issues are still to be resolved
- Business
 - NAT has worked too well
 - Existing industry based on externalizing the costs for address scarcity, and insecurity
 - Lack of investor interest in more infrastructure investment: Short term vs long term
 - IPv6 promotion - too much too early?
 - IPv6 is not “wired” but “tired”

The result...

- Short term business pressures result in deferral of IPv6 investments
- Insufficient linkage between the added cost and complexity of NAT-based applications and the costs of deploying IPv6
- An evolutionary adoption proves difficult in today's environment
 - ...or in the foreseeable future?

Then, don't we need to deploy IPv6?

Yes, we do.

- Why?
- Simply, servers cannot be connected via NATs
 - Internet Users benefit from cool services on servers. Not from the network itself

Applicability of countermeasure pairs at a client and a server

clients \ servers	IPv4 Existing and newly procured	NAT+IPv4 private	IPv6	Applicability at clients
IPv4 Existing and newly procured	No problem (Native)	Not applicable	Not good (translator in client side)	Difficult to procure new IPv4 addresses
NAT+IPv4 private	Good (NAT in client side)	Not applicable	Not good (translator in client side)	Questionable in scalability
IPv6	Not good (translator in client side)	Not applicable	No problem (Native)	Problem to access to IPv4 servers
Applicability at servers	Difficult to procure new IPv4 addresses	Not applicable for servers	Problem to retain the access from IPv4 clients	

Frequently Heard but Questionable Arguments – 1&2

- *IPv4 address depletion? I don't care since I'll make much more use of NAT*
- *IPv4 address depletion? I don't care since I've already got more than sufficient IPv4 address space.*
- You must care. Your customers will have more and more destinations which they cannot get through.

Frequently Heard but Questionable Arguments – 3

- *IPv6? Yet no one uses. Why and for whom should we deploy it? The cost will never be justified.*
- It is not a brand-new service only to extend your business. IPv4 address depletion is a CRYISIS, and IPv6 is the only sustainable countermeasure.

The IPv6 revolution, not a mere countermeasure for a crisis

The IPv4 revolution

- The 1990's – a new world of...
 - Cheaper switching technologies
 - Cheaper bandwidth
 - Lower operational costs
 - The PC revolution, funded by users
- The Internet boom
 - The dumb (and cheap) network
 - Technical and business innovation at the ends
 - Many rewards for new services and innovation

An IPv6 revolution...

- The 2000's – a new world of...
 - Commodity Internet provision, lean and mean
 - Massive reduction in cost of consumer electronics
 - A network-ready society
- The IPv6 boom?
 - “Internet for Everything” instead of *Everyone*
 - Serving the communications requirements of a device-dense world
 - Device population some 2–3 orders of magnitude larger than today's Internet
 - Service costs must be cheaper by 2-3 orders of magnitude – per packet

IPv6 – From PC to IPOD to iPOT

- A world of billions of chattering devices



- Or even trillions...

In conclusion...

The IPv6 Challenge

- IPv6 for IPv4 address depletion
 - IPv4 will be available, not so longer, not always
 - Servers will be forced to go with IPv6. NAT will not work for them.
 - Clients will need access to IPv6 servers
- Still too few compelling benefits to drive new investments in existing services, but notice that crisis will cost, but come suddenly.
- A value-to-volume shift will help “The IPv6 Internet for everything”

Thank you

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