Supporting Internet Growth and Evolution:
The Transition to IPv6

Bali IPv6 Summit, Bali

9 June 2010

Sanjaya
Services Director, APNIC

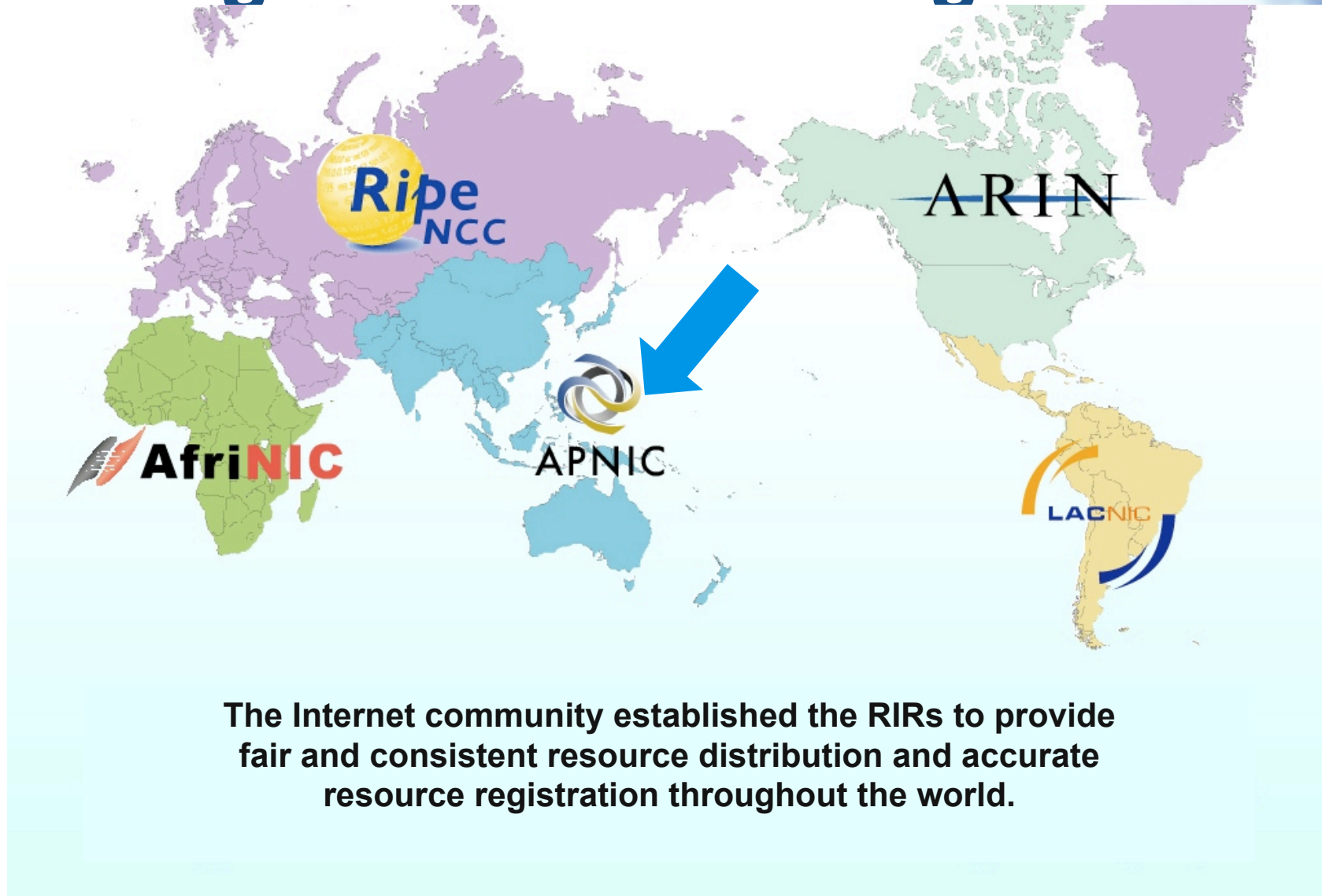Asia Pacific Network Information Centre

APNIC

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Overview

- Recap
  - About APNIC
- Reality check: where are we now?
  - Transition to IPv6: statistics
  - IPv6 deployment edges
  - Resource delegations
  - Recent policy implementations
- Multi-stakeholder approach
  - APNIC's efforts
  - Way forward

Recap: About APNIC

Regional Internet Registries

Ripe NCC

ARIN
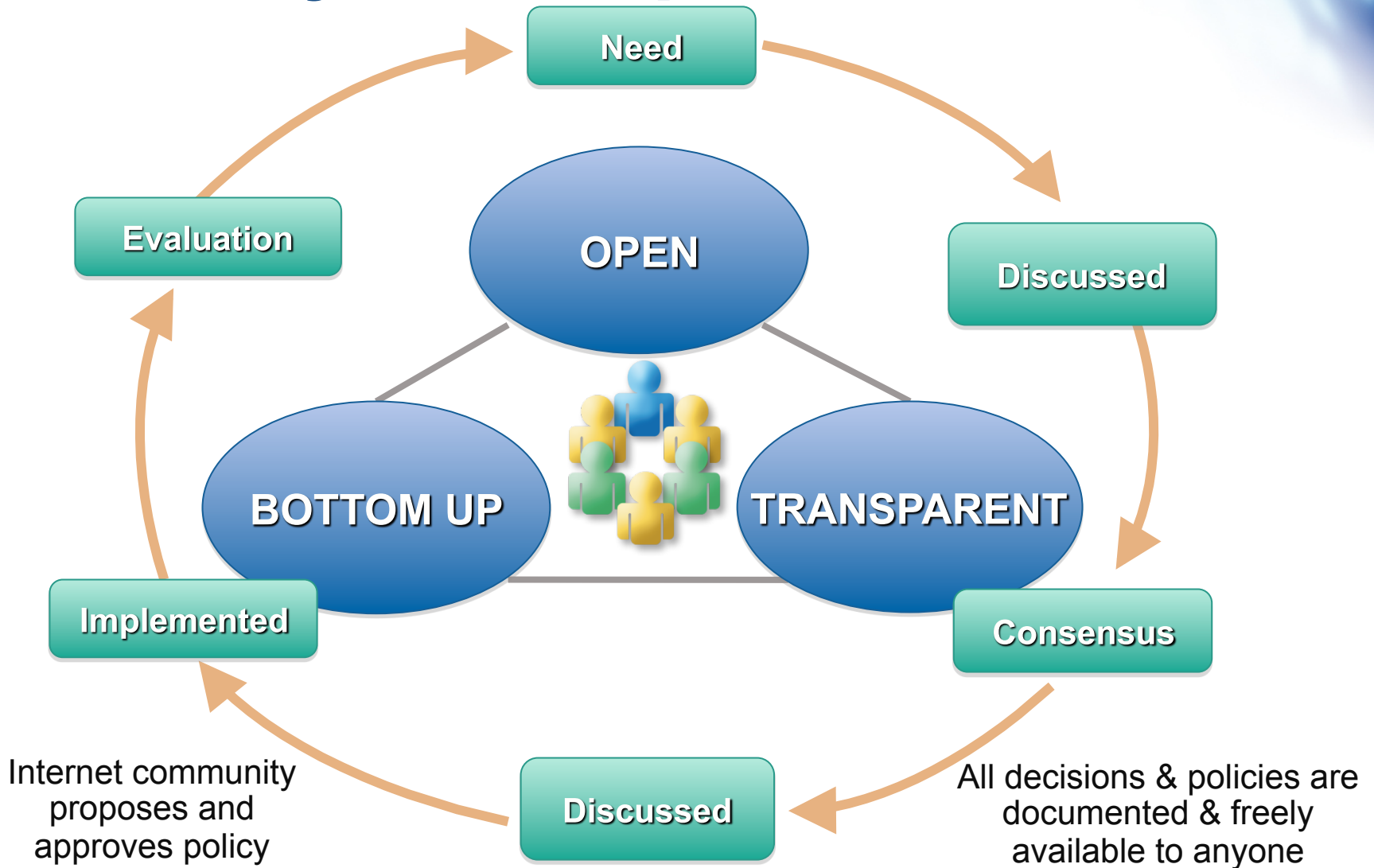
AfriNIC

APNIC

LACNIC

The Internet community established the RIRs to provide fair and consistent resource distribution and accurate resource registration throughout the world.

APNIC's Mission

- Assist the Asia Pacific community in effective resource management
  - Equitable allocation and registration services
- Provide educational opportunities
  - 77 courses in 36 locations to over 1870 participants in 2009
  - Fully equipped Training lab (IPv6 supported)
- Coordinate IP addressing policy development and public positions
- Seek public consideration of issues that benefit Members
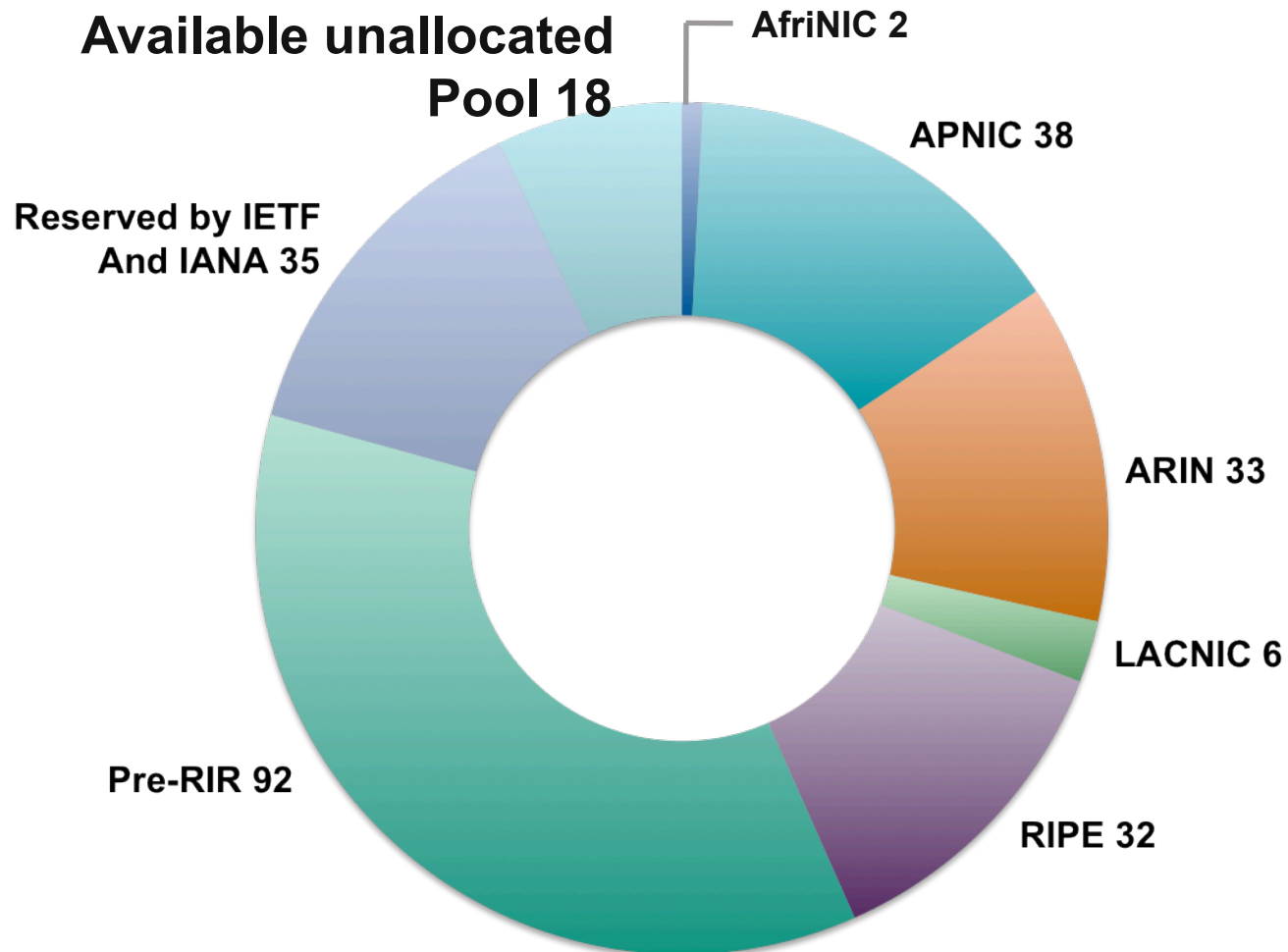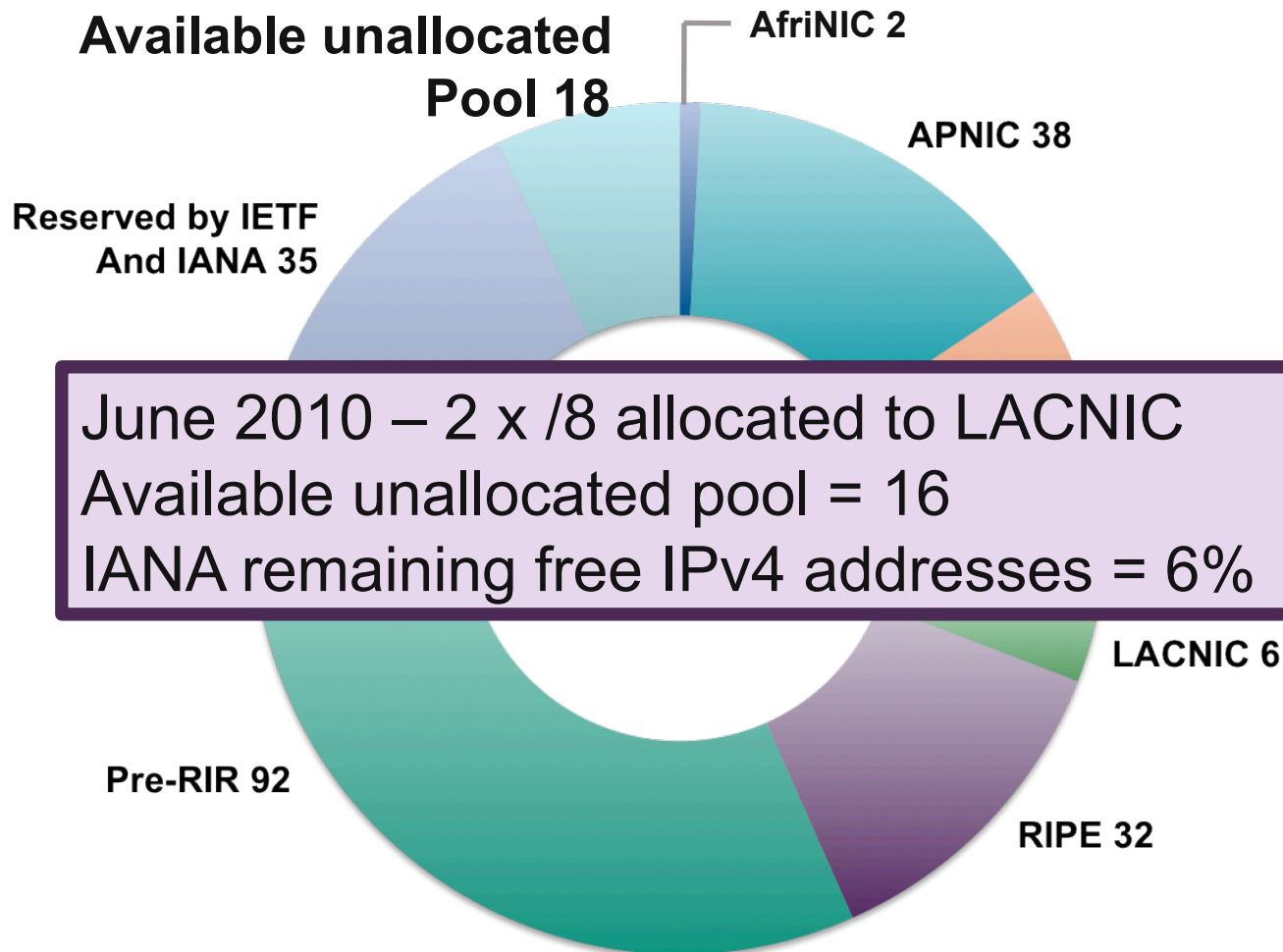
Policy Development Process

Need

Evaluation

OPEN

Discussed

BOTTOM UP

TRANSPARENT

Implemented

Consensus

Discussed

Internet community proposes and approves policy

All decisions & policies are documented & freely available to anyone

Where are we now?

IPv4 Address Global Distribution

Available unallocated Pool 18

AfriNIC 2

APNIC 38

Reserved by IETF And IANA 35

ARIN 33

LACNIC 6

Pre-RIR 92

RIPE 32

APNIC

May 2010

IPv4 Address Global Distribution

Available unallocated Pool 18

AfriNIC 2

APNIC 38

Reserved by IETF And IANA 35

June 2010 – 2 x /8 allocated to LACNIC
Available unallocated pool = 16
IANA remaining free IPv4 addresses = 6%

LACNIC 6

Pre-RIR 92

RIPE 32

APNIC

9

May 2010

IPv4 Consumption: Projection

Projected IANA exhaustion: **30/07/2011**
Projected RIR exhaustion: **15/03/2012**

http://www.potaroo.net/tools/ipv4/index.html 26 May 2010

IPv4 Consumption: Projection

Projected IANA exhaustion: 30/07/2011
Projected RIR exhaustion: 15/03/2012

When will your ISP run out of IPv4 addresses?

http://www.potaroo.net/tools/ipv4/index.html 26 May 2010
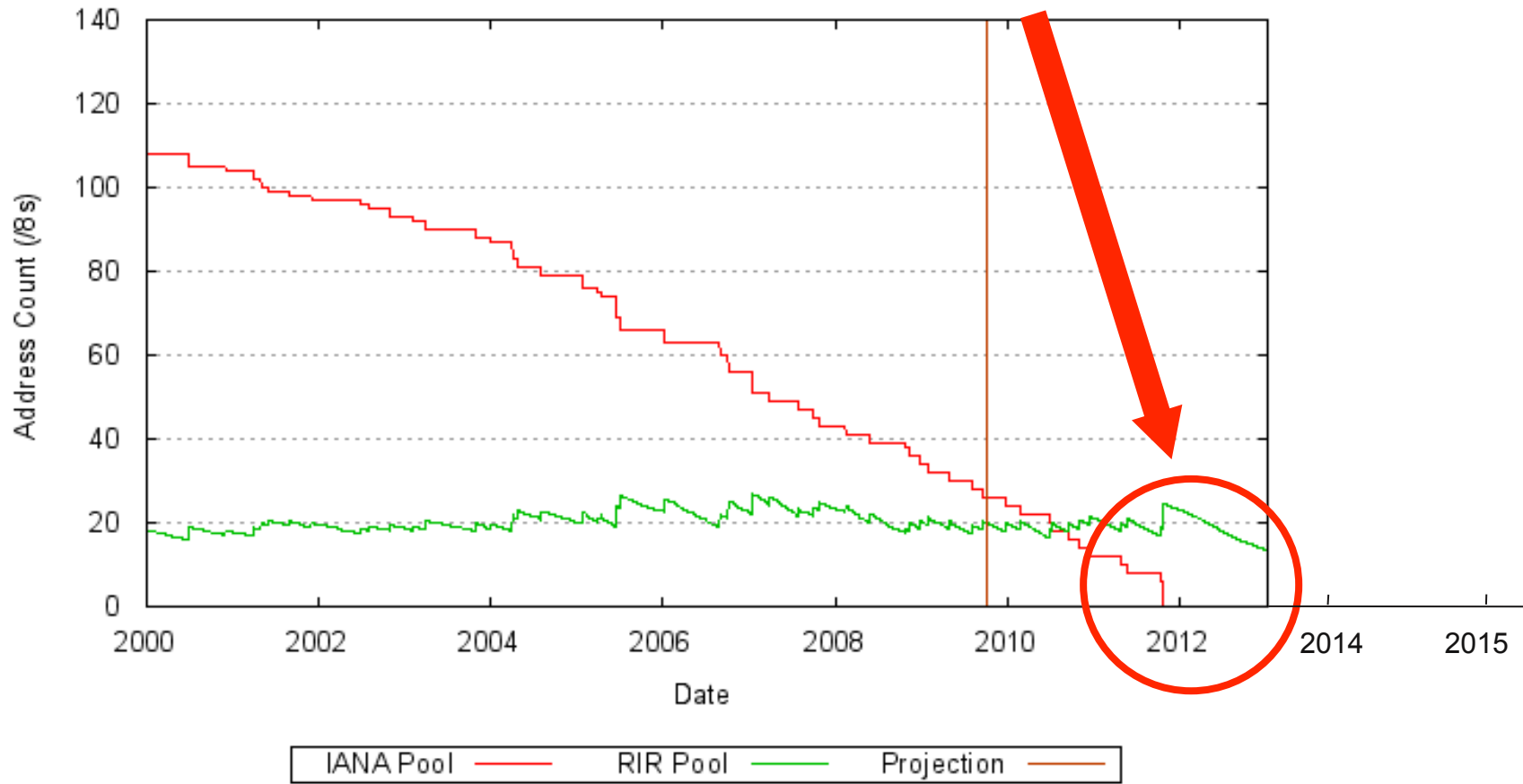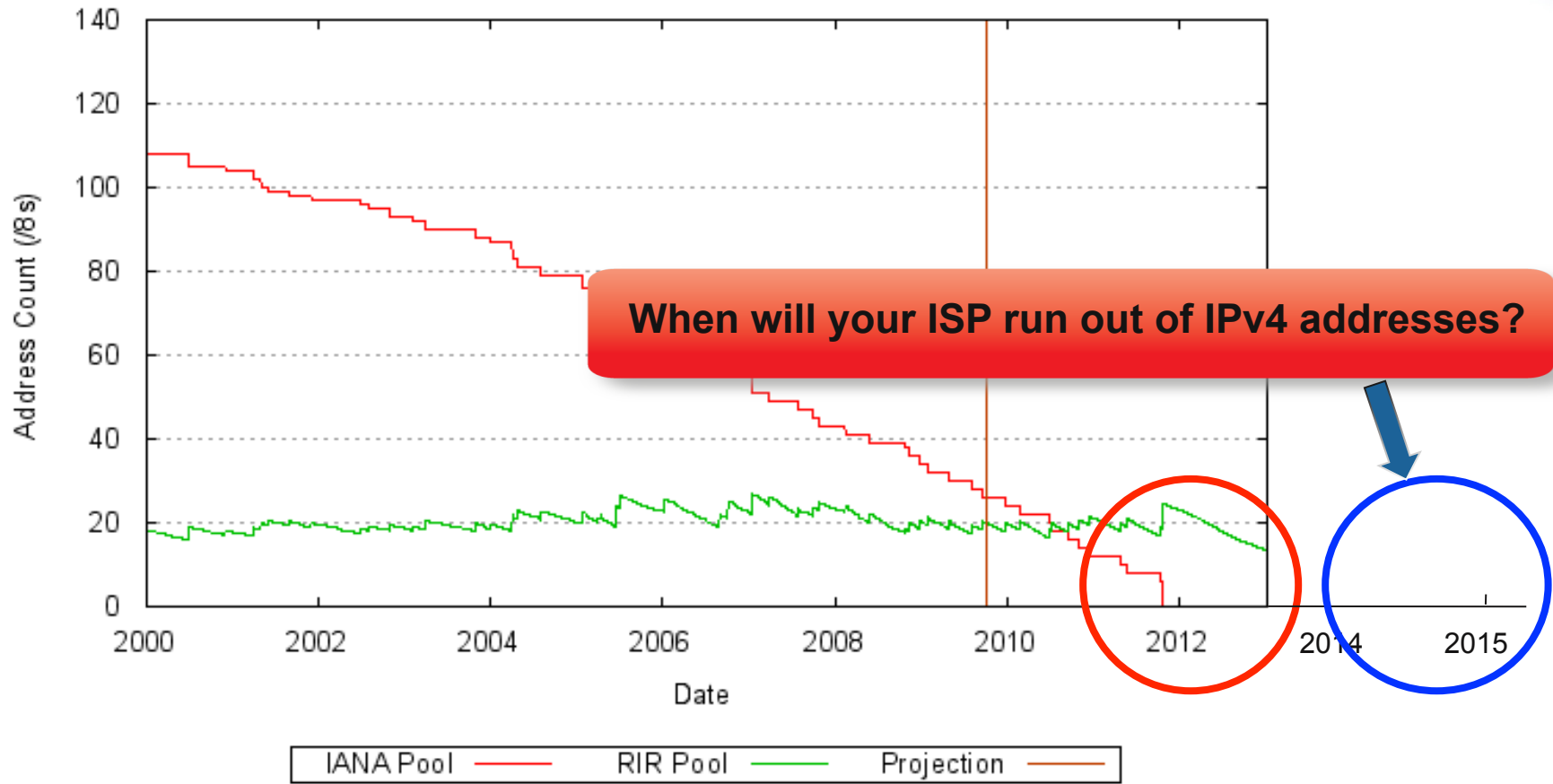
Transition to IPv6

- IPv4 address exhaustion inevitable
  - Sept 2011: IANA allocates the last /8
  - Aug 2012: APNIC first RIR to exhaust IPv4
  - Even now, some IPv4 address blocks have reachability concerns, e.g. 1/8
    - http://www.potaroo.net/studies/1slash8/1slash8.html
    - Traffic in network 1.0.0.0/8
- IPv6 should be inevitable
  - The only solution to IPv4 exhaustion
  - Protocol is 10 years old
  - Under a new spotlight for at least 18 months
- How far have we come?

Spotlights on Deployment

- IPv6 Deployment Surveys
  - APNIC & EU survey 2009
- OECD Report April 2010
  - http://www.oecd.org/dataoecd/48/51/44953210.pdf
- IETF 77 in Anaheim, March 2010
  - ISOC Panel "IPv6: Are you there yet?"
  - Leslie Daigle (ISOC), Geoff Huston (APNIC) et al
    - http://www.isoc.org/isoc/conferences/ipv6momentum

APNIC: Survey 2009

If not, why not considering IPv6?

n=118
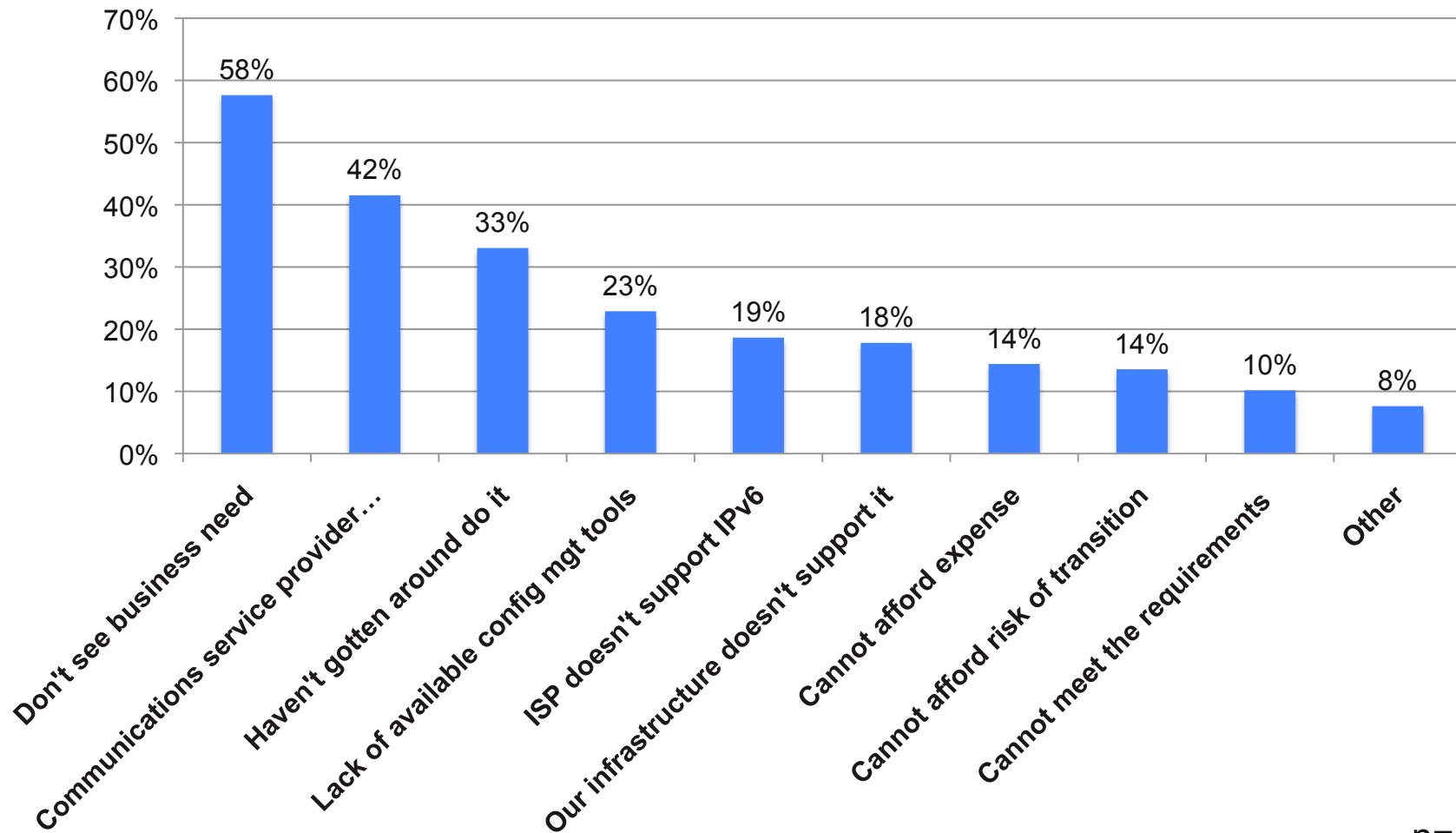
IPv6 address allocations and assignments (ISPs)

No
29%

Yes
71%

Does your organization have, or consider having an IPv6 allocation and/or assignment? (Sept 2009)
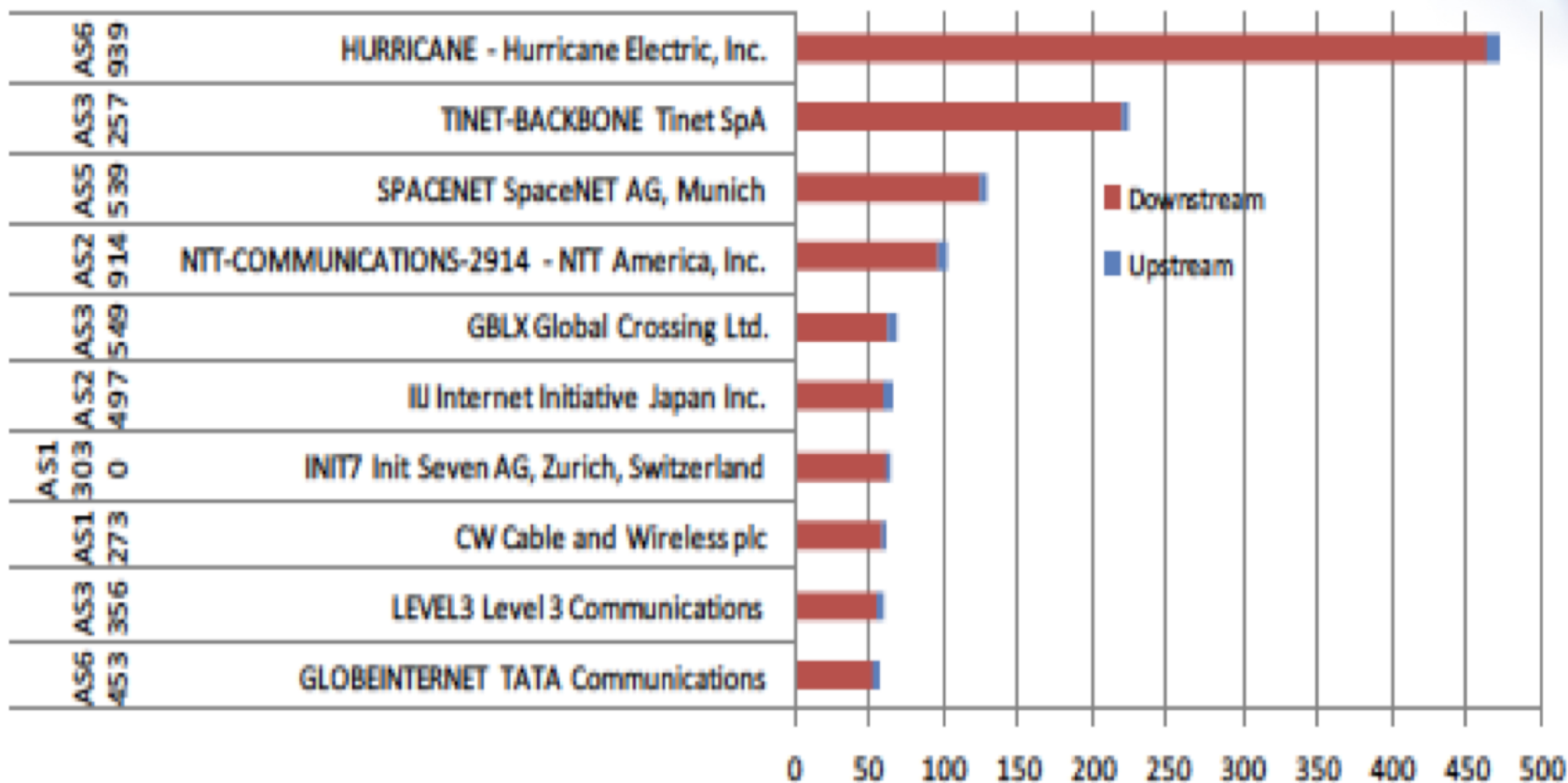
n=192

OECD: Latest Report

- Indicators of infrastructure readiness
  - Over 5.5% of networks on the Internet are IPv6-enabled (and accelerating)
  - At least 23% of IXPs support IPv6
  - Over 90% of installed OSes are IPv6-ready (and 25% on by default)
  - Approx 1% of DNS (1.5 mil names) has IPv6
    - Only 0.15% of the top 1 million Alexa websites
  - The top economies with IPv6 presence
    - Germany, The Netherlands, US, China and UK

http://www.oecd.org/dataoecd/48/51/44953210.pdf

OECD: Latest Report

Figure 17.   Top 10 networks by number of adjacencies

Source: http://bgp.potaroo.net/v6/as2.0/bgp-as-adj.txt, 1 January 2010.

http://www.oecd.org/dataoecd/48/51/44953210.pdf

OECD: Latest Report

Figure 19. **Number of ISPs offering commercial native IPv6 service per country**

Country	Number
Germany	10
United States	8
Japan*	8
United Kingdom	7
France	6
Switzerland	6
Italy	5
Netherlands	4
Korea**	3
Czech Republic	2
Slovakia	2
Austria	2
Denmark	1
Canada	1
Ireland	1
Australia	1
Estonia	1
Finland	1
Ukraine	1
Spain	1
Sweden	1
Hungary	1
Bulgaria	1
New Zealand	1

ISPs offering commercial native IPv6 service

http://www.oecd.org/dataoecd/48/51/44953210.pdf

Ratio of IPv6 to IPv4 ASes

IPv6:IPv4 ASNs

Measuring IPv6 Deployment by Geoff Huston, APNIC http://www.isoc.org/isoc/conferences/ipv6momentum/
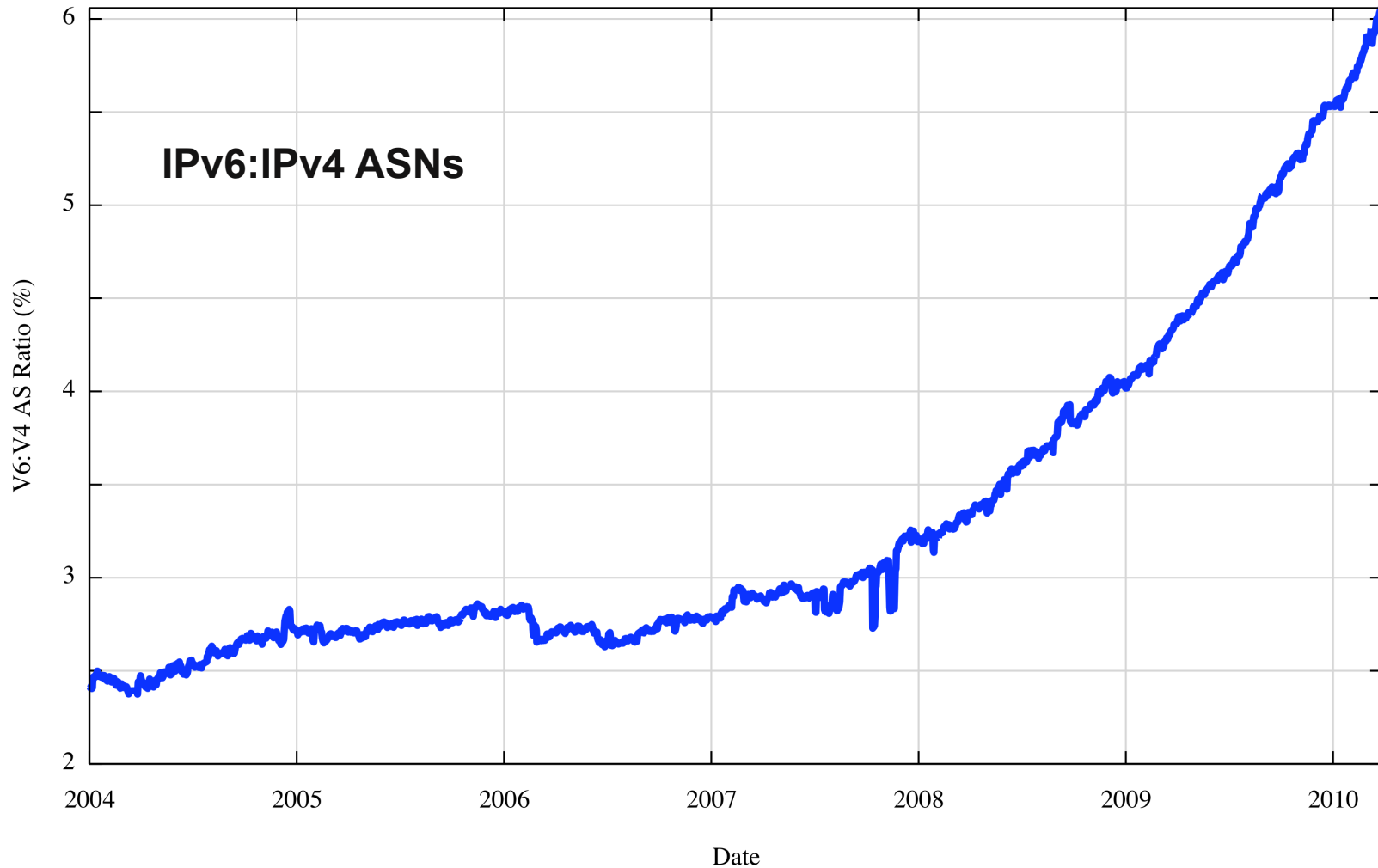
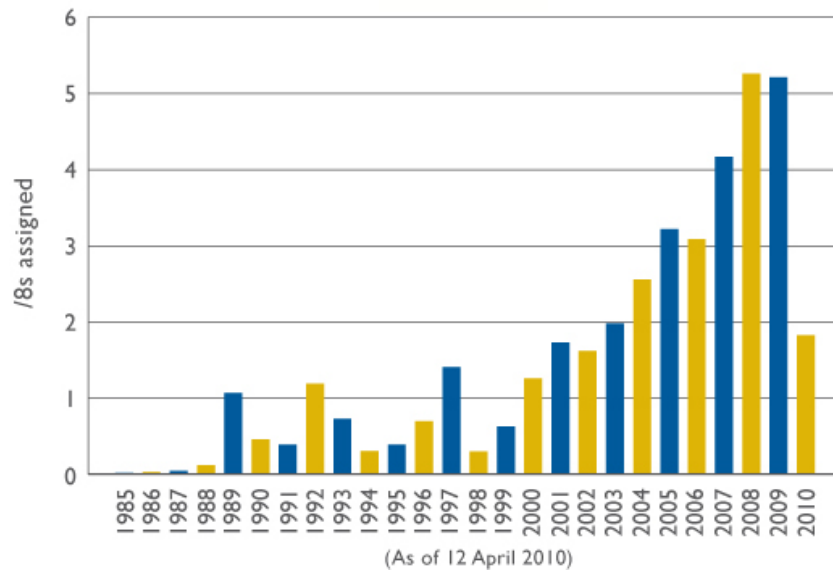# Ratio of IPv6 to IPv4 ASes
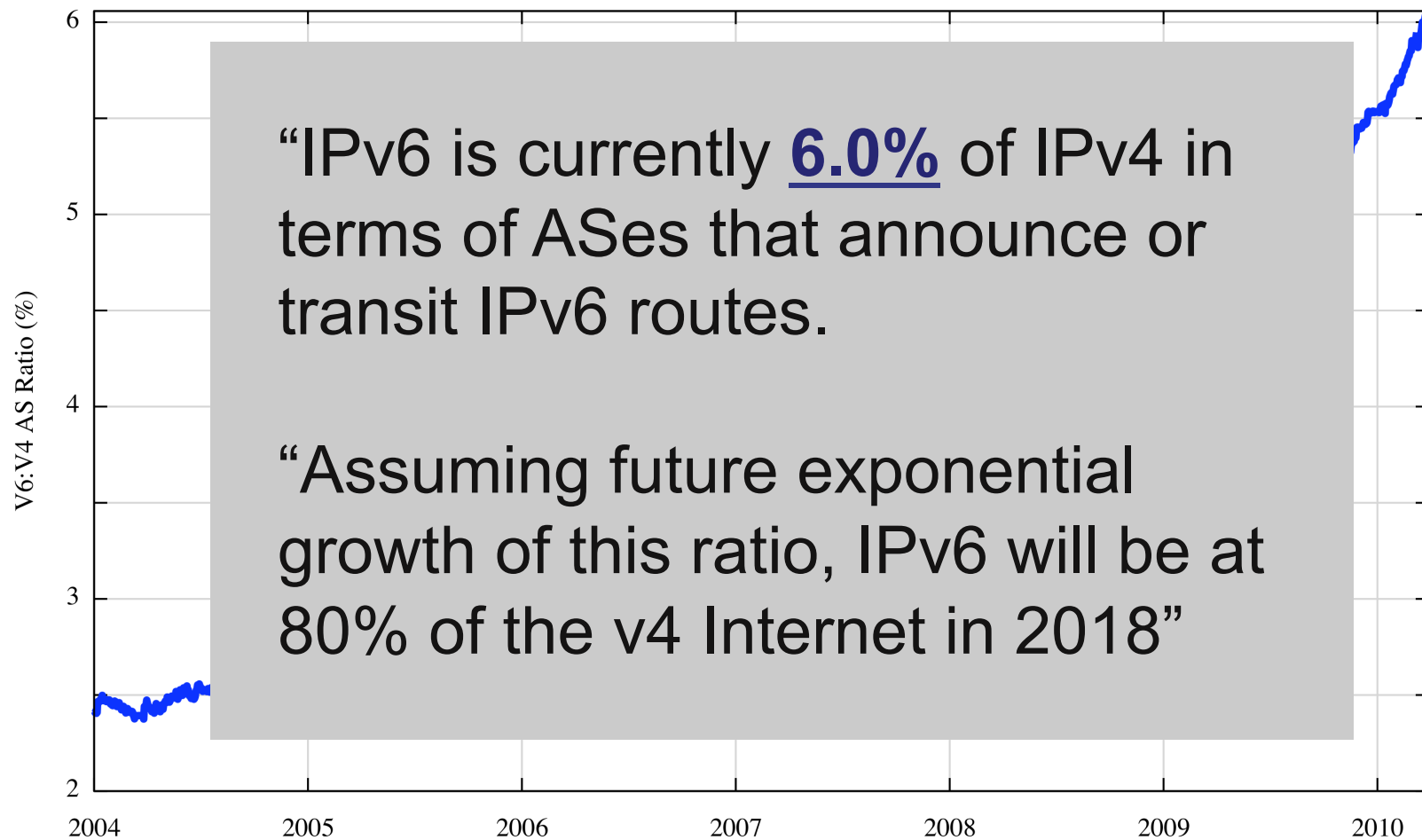
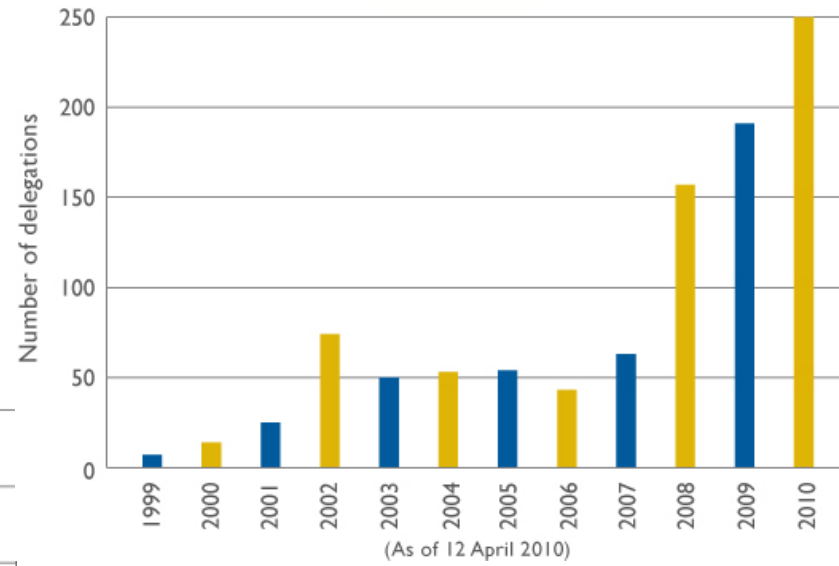**"IPv6 is currently 6.0% of IPv4 in terms of ASes that announce or transit IPv6 routes.**

"Assuming future exponential growth of this ratio, IPv6 will be at 80% of the v4 Internet in 2018"

V6:V4 AS Ratio (%) — axis labeled 2, 3, 4, 5, 6

Date: 2004, 2005, 2006, 2007, 2008, 2009, 2010

Measuring IPv6 Deployment by Geoff Huston, APNIC http://www.isoc.org/isoc/conferences/ipv6momentum/

Resource Delegations

IPv6

IPv4

Recent Policy Implementations

Proposal	Title	Overview
Prop-050	IPv4 address transfers	This policy removes APNIC policy restrictions on the transfer of registration of IPv4 address allocations and IPv4 portable address assignments between current APNIC account holders.
Prop-073	Simplifying allocation/ assignment of IPv6 to APNIC Members with existing IPv4 addresses	Kickstart IPv6: Available from the public and MyAPNIC websites as a simple, one-click application for current IPv4 address holders to obtain an appropriately sized block of IPv6 addresses.

http://www.apnic.net/policy/proposals

APNIC

Need IPv6 Addresses?
IPv6 Kickstart Policy

What next?

Challenges and Opportunities!

Sometime in 2012…

- ISPs will need addresses for new network infrastructure
  - and will receive only IPv6
- End users will start receiving IPv6 Internet services
  - With or without private IPv4 addresses
- Enterprises and businesses will get IPv6 for their new networks
- Are you ready?

ISPs

- *Note well: One day soon, you will only get IPv6 addresses for new deployments…*

- Is your infrastructure ready for IPv6?
- Can you deliver IPv6 services in 2012?
- What is your plan for IPv4 services to your customers? None? Customer NAT? CGN?
- Are your services and systems ready?
  - DNS, SMTP, web, mail, etc
  - Security, monitoring, customer admin, billing…

Enterprises and Content Providers

- *One day, your customers and business partners may only have IPv6 addresses…*

- Will your website and services be visible via IPv6 in 2012?

- Do you have an upgrade plan?

- Does your domain name have AAAA?

- Do all your service providers, integrators and vendors have their plans in place?

- Have you asked them?

Governments

- Do you have procurement criteria mandating IPv6 capabilities?

- Are your agencies ready with IPv6?

- Are your online and e-government services ready with IPv6?

- Are your Internet industries up to speed?

- Are you providing leadership?

- What else are you doing?

Others…

- System integrators and consultants
  - Can you put all the pieces together?
  - Are your people trained to answer questions?
  - Can you help your customers with their planning?

- Academics and educators
  - Is your institution ready for IPv6 in 2011?
  - Are you producing IPv6-ready graduates?
  - Have you upgraded your skills?

APNIC's Efforts

- IPv6 compliance in all our services
- ISPs, our main constituents
  - Training, education, supporting NOGs
- Outreach on IPv6
  - Enterprises and content providers
  - ccTLDs and their registrars
  - Governments
  - IGF and related meetings
  - Asia Pacific Regional IGF in HK, June 2010
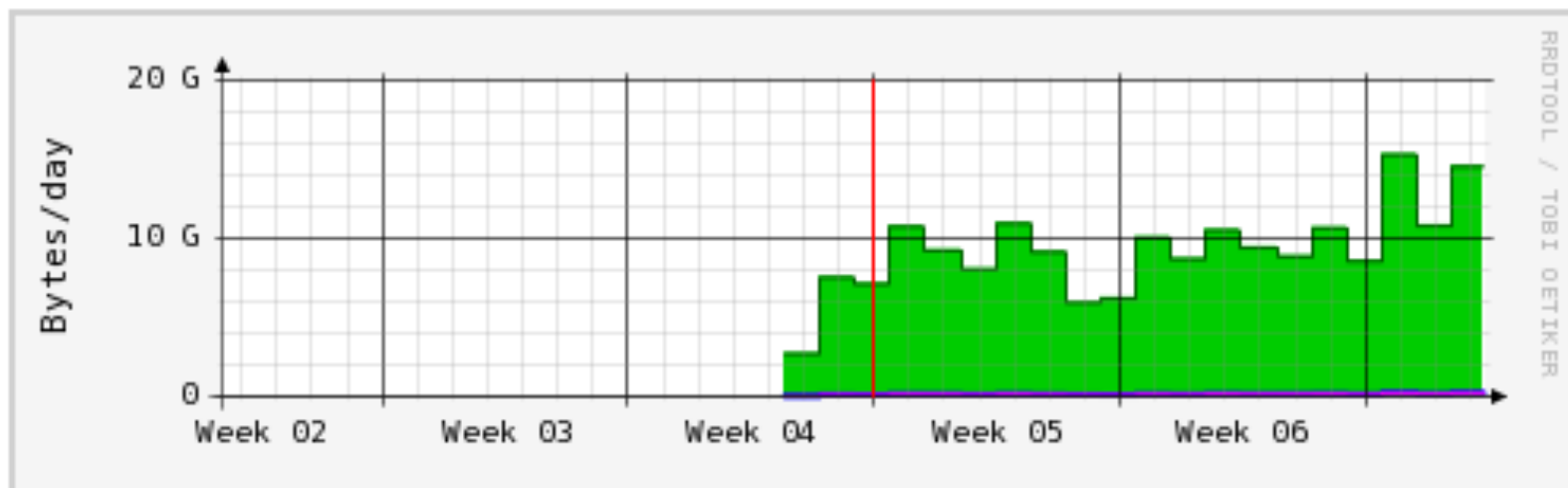 - APEC TEL, ITU, OECD, and others

In Conclusion

Chicken or Egg?

"Google has quietly turned on IPv6 support for its YouTube video streaming Web site, sending a spike of IPv6 traffic across the Internet…"
– 1 Feb 2010 Networld

- Monash University, Melbourne, Australia:

IPv6 Address Management?

- RIRs will continue providing equitable services to the Internet community
  - A stable and proven structure to manage Internet resources for the past 20 years
- Address management is not the issue in IPv6 deployment
  - Policies are stable and unrelated to deployment
  - APJII/IDNIC helps IPv6 address management
- All efforts should go to IPv6 deployment
  - In the core and at the edges

APNIC

"What's the Killer App for IPv6?"

The Internet !

Thank You!

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