Enabling the Internet to continue to expand: IPv4 address exhaustion and IPv6 transition

Thailand IPv6 Summit

31 January 2009

Bangkok, Thailand

Miwa Fujii <miwa@apnic.net>
IPv6 Programme Manager, APNIC

Questions

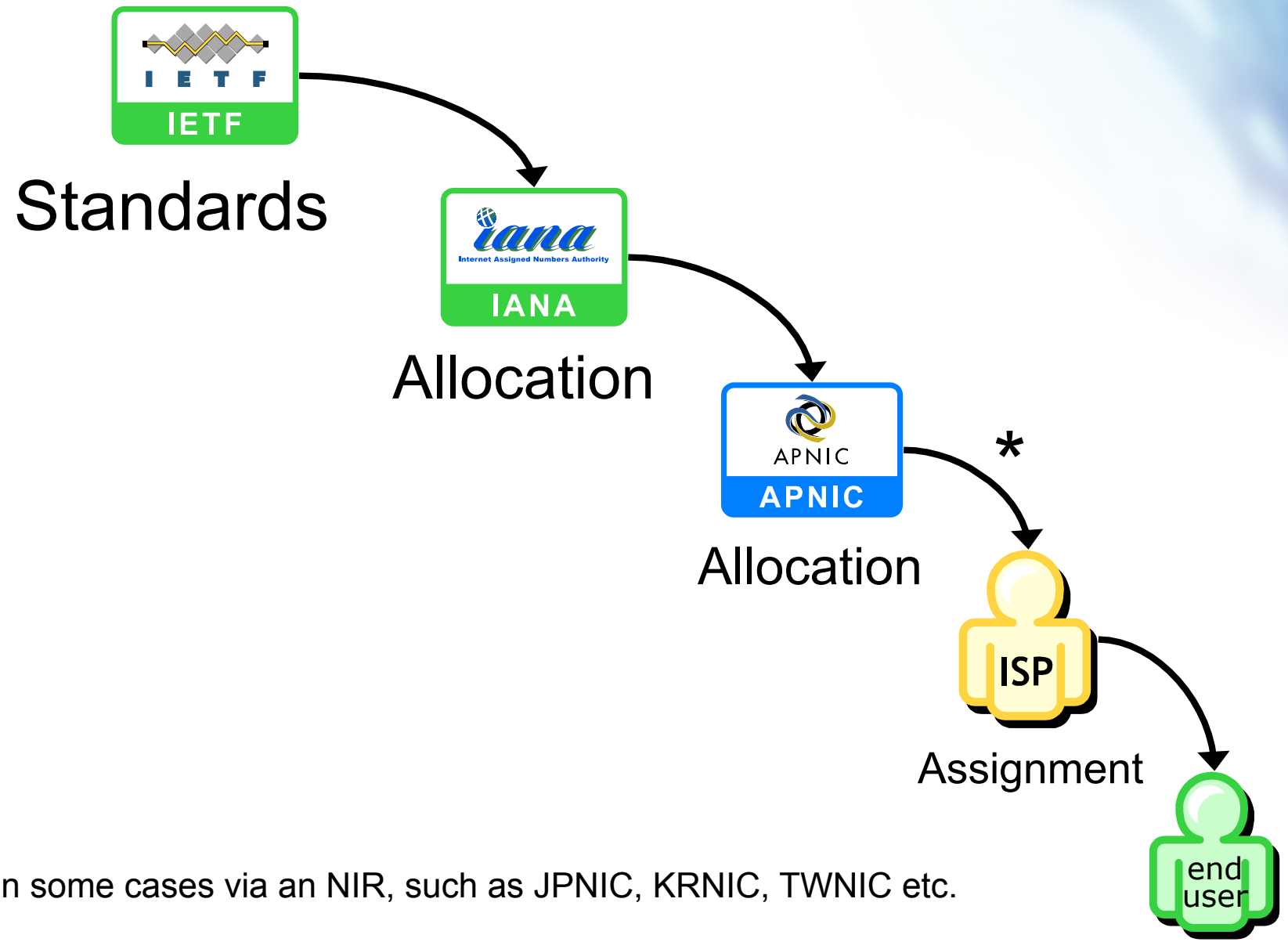
- ISPs (network engineers)?
- Data centre?
- Enterprises/Content providers?
- Application developers?
- Academics?
- Policy makers?
- Decision makers?
- APNIC members?

Overview

- IP addressing and address policies
- IPv4 address consumption
- IPv6 deployment status
- Where do we go from here?

IP addressing and address policies

Where do IP addresses come from?



* In some cases via an NIR, such as JPNIC, KRNIC, TWNIC etc.

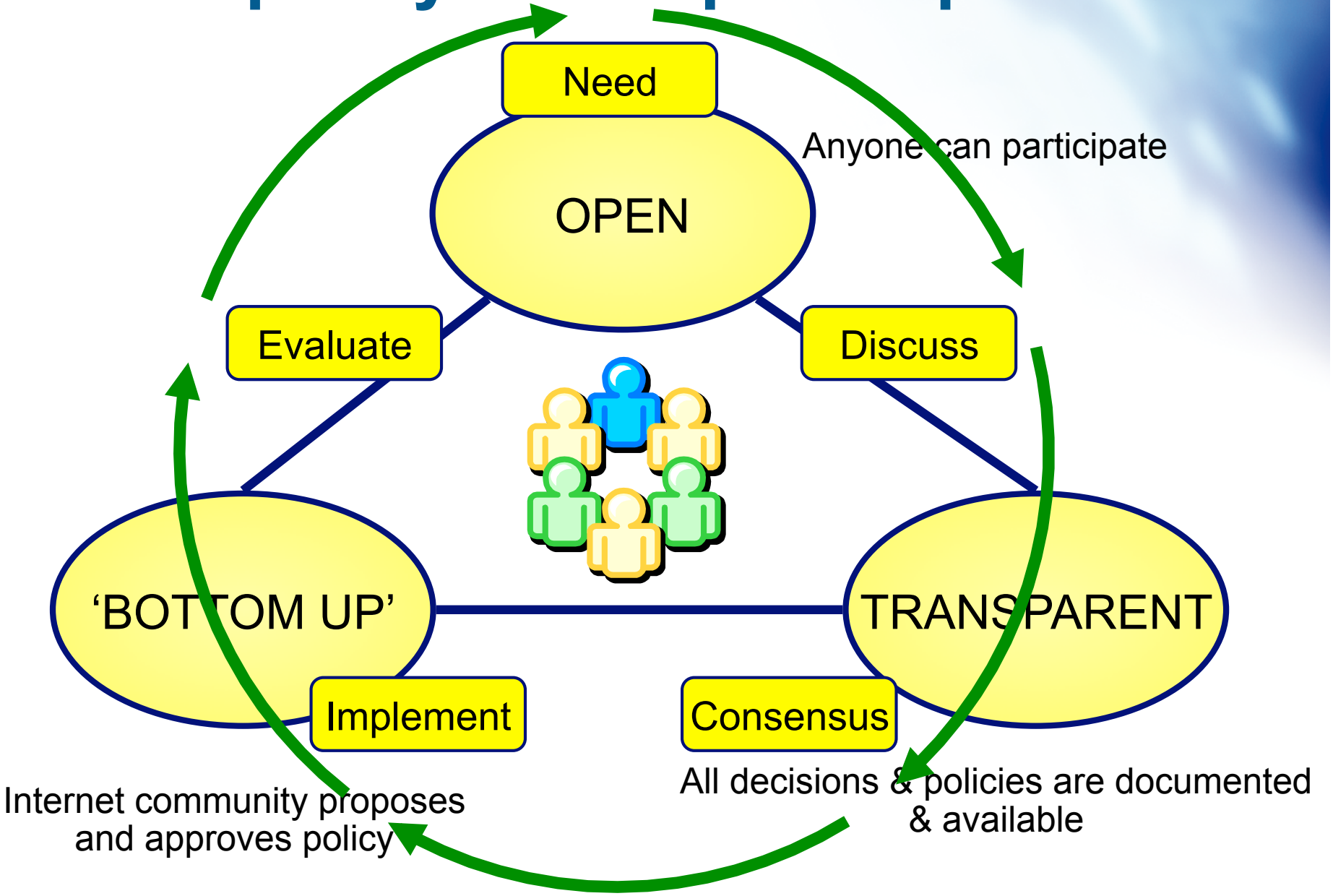
Regional Internet Registries

The RIRs are responsible for administering the fair distribution and responsible management of IP addresses and AS numbers in their respective regions,

Regional Internet Registries

- Industry self-regulatory bodies
  - Open membership-based structure
  - Non-profit, neutral and independent
  - …in the “Internet Tradition”, since 1993.
- Functions
  - Allocation and registration services
  - Training and education
  - Open policy meetings and processes
  - Encouraging IPv6 adoption and transition
- Proven success
  - “Best practice in Internet Governance”

The policy development process

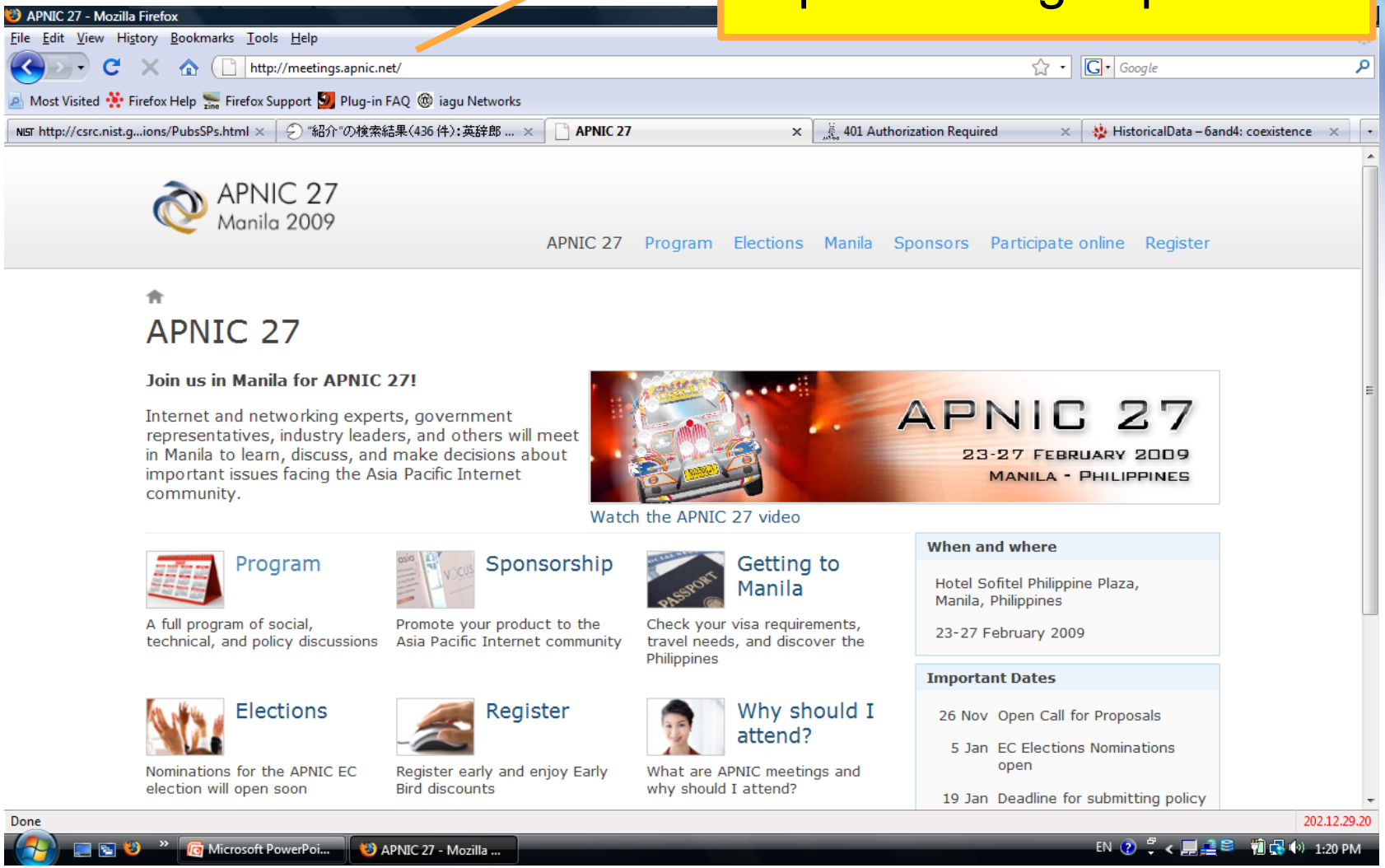


Current policy discussions

- We are experiencing an important turning point in the history of the Internet
  - Prop-50 IPv4 address transfers
  - Prop-68 Inter-RIR transfer policy
  - Prop-67 A simple transfer proposal
  - Prop-69 Global policy proposal for the allocation of IPv4 blocks to RIRs
  - Prop-070 Maximum IPv4 allocation size
- http://www.apnic.net/policy/proposals/index.html

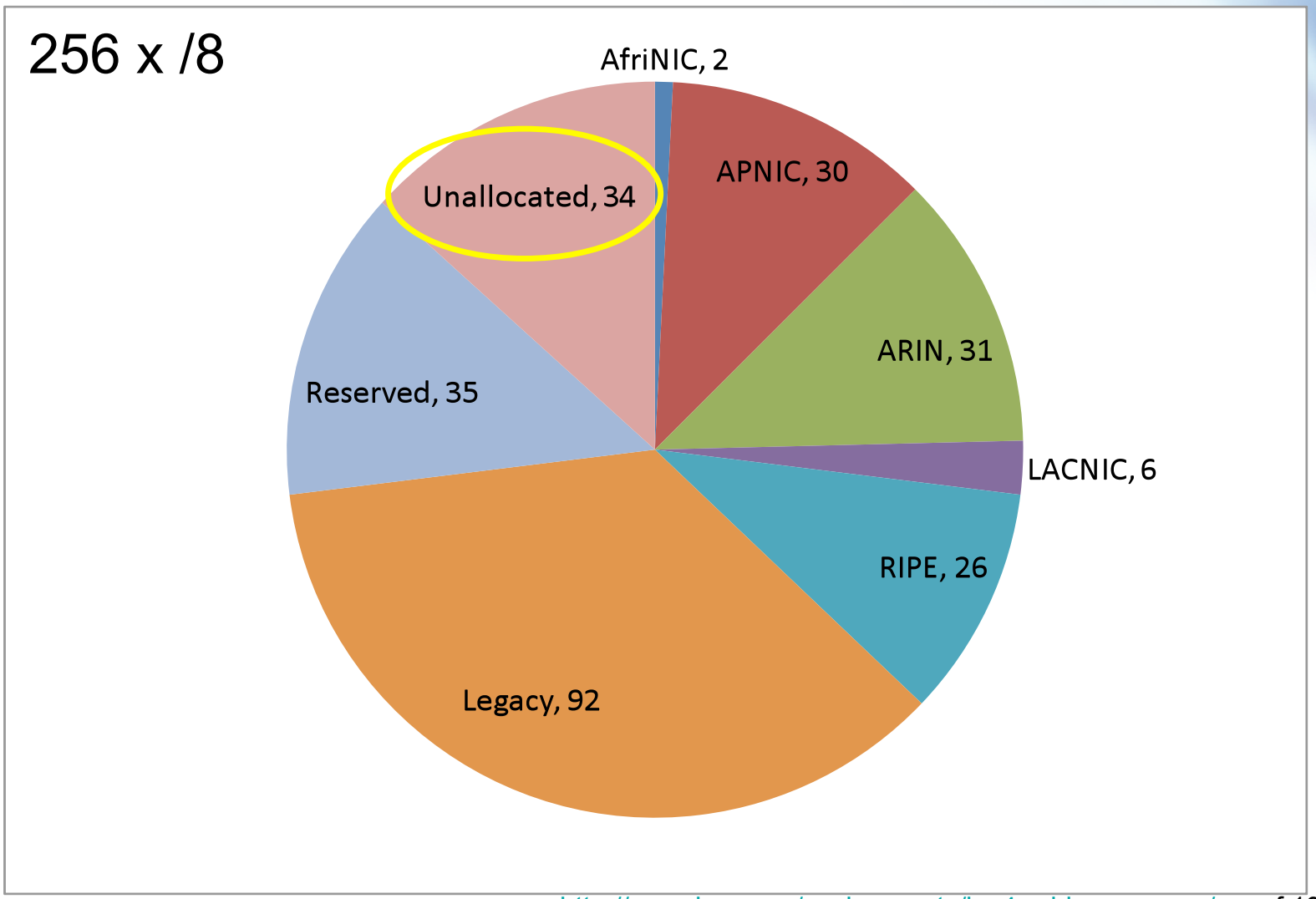
APNIC 27 (23-27 Feb 2009)

http://meetings.apnic.net/



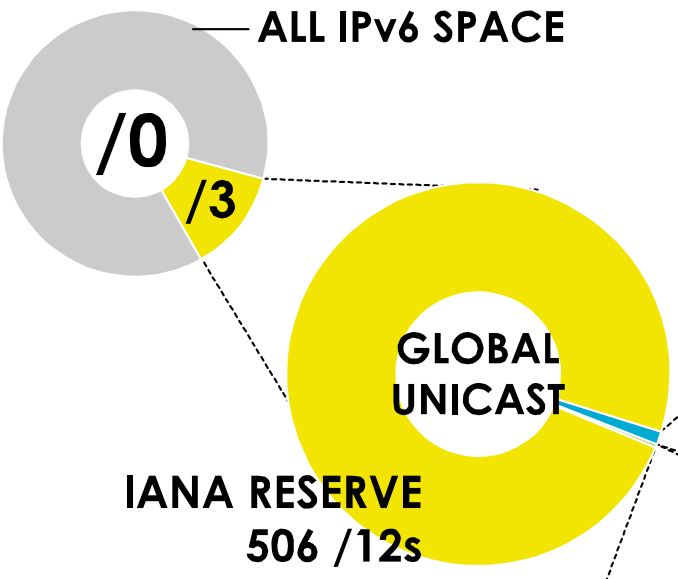
Internet resources distribution today

IPv4 Global Unicast Address



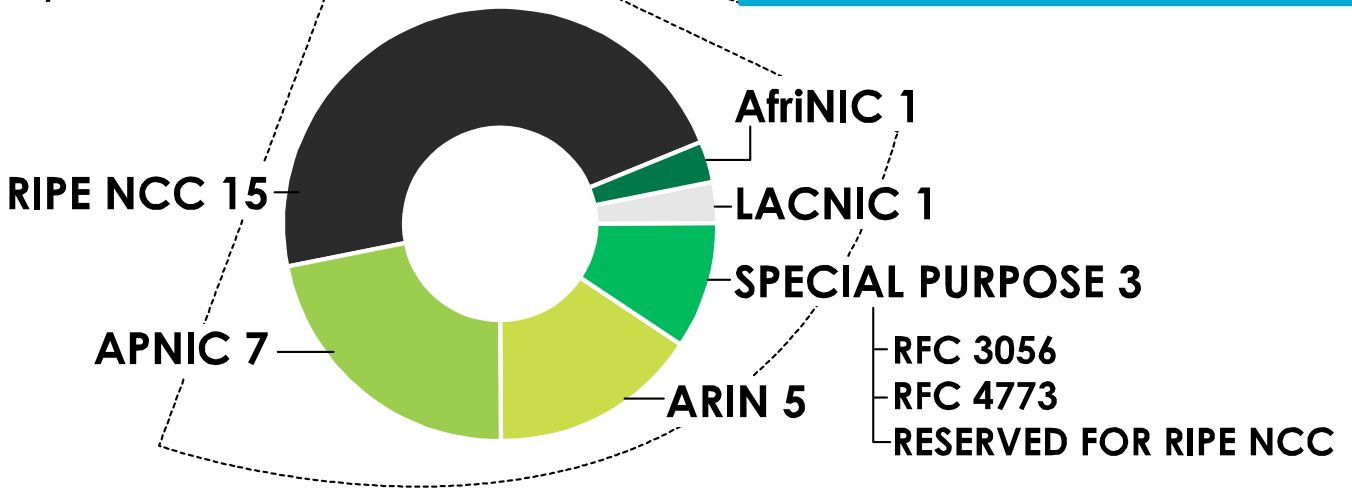
http://www.iana.org/assignments/ipv4-address-space/ as of 13/01/2009

IPv6 Global Unicast Address



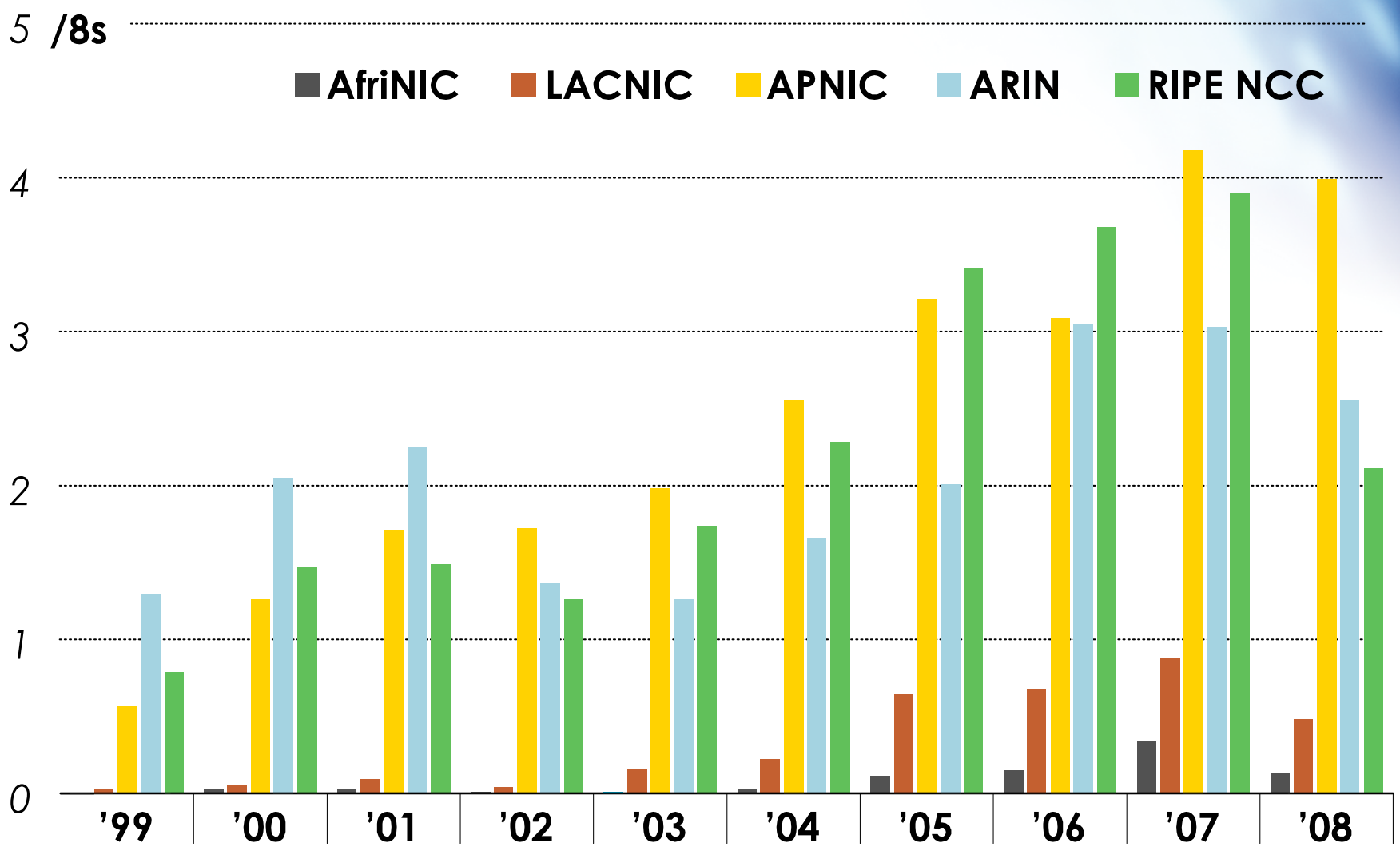
RIRs 5 /12s (October 2006)

RIR	IPv6 ADDRESS
AfriNIC	2C00:0000::/12
APNIC	2400:0000::/12
ARIN	2600:0000::/12
LACNIC	2800:0000::/12
RIPE NCC	2A00:0000::/12



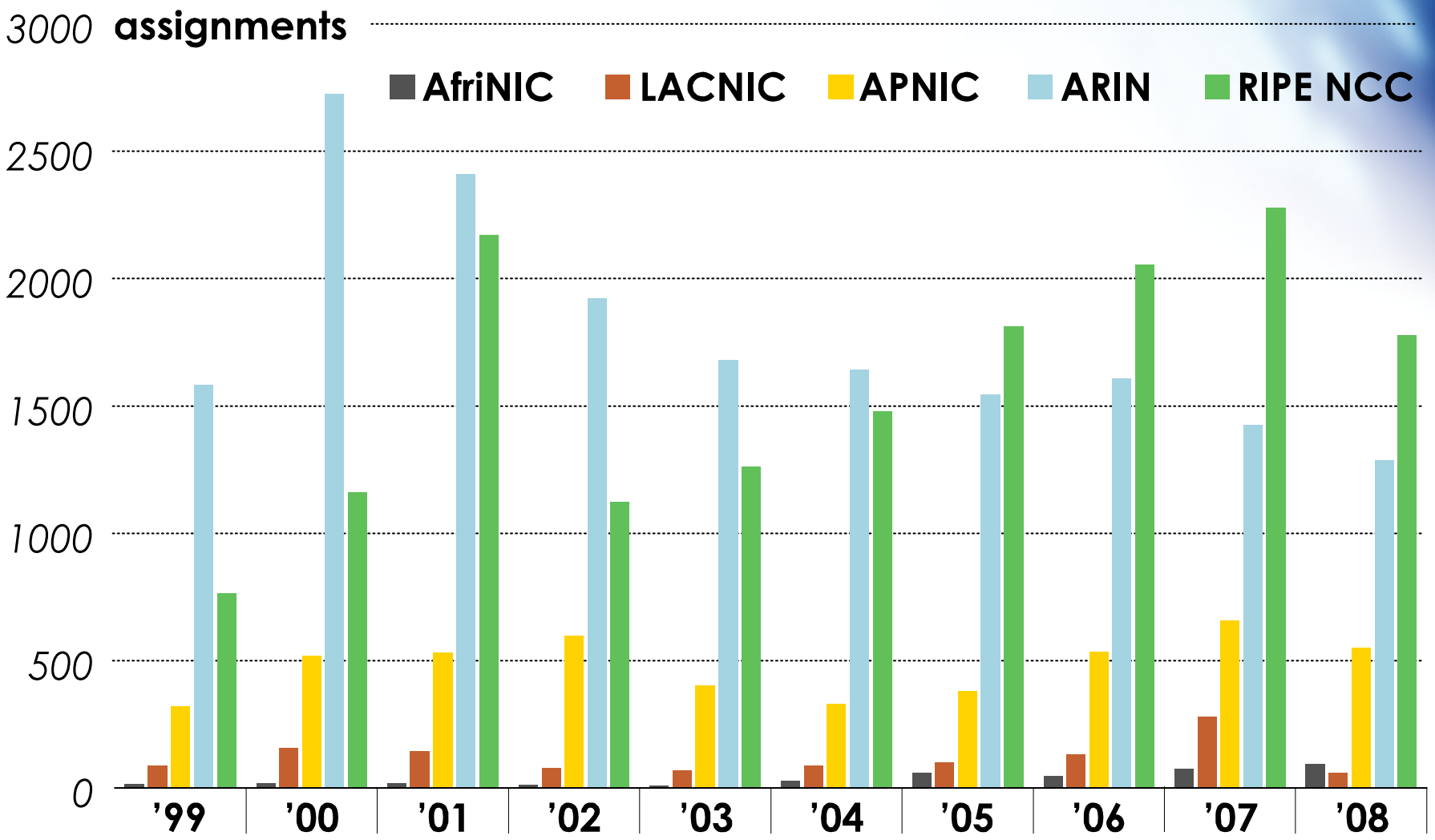
http://www.nro.net/documents/presentations/jointstats.sept08.pdf as of 30 Sept 2008

IPv4 addresses distributed by RIRs



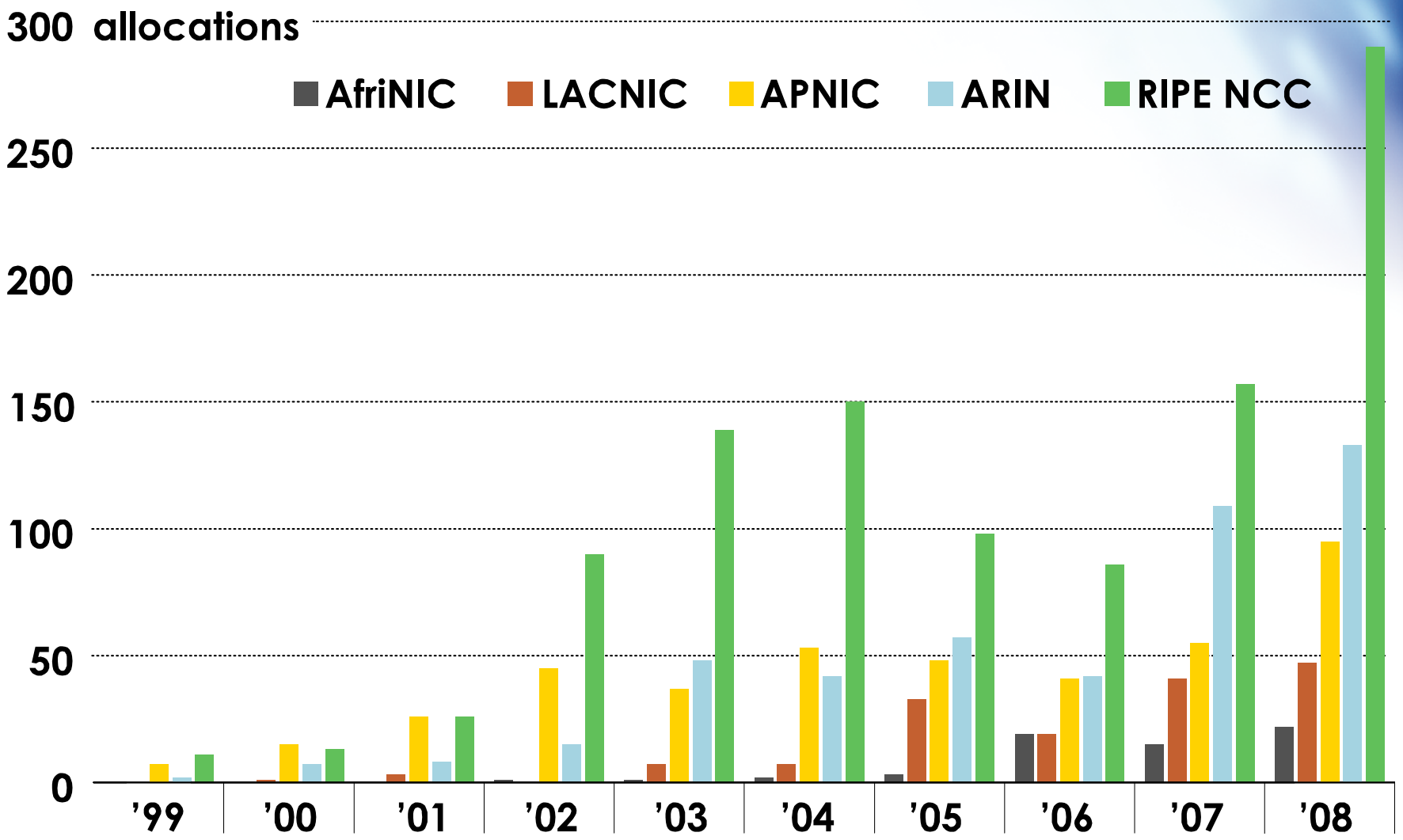
http://www.nro.net/documents/presentations/jointstats.sept08.pdf as of 30 Sept 2008

ASN distributed by RIRs



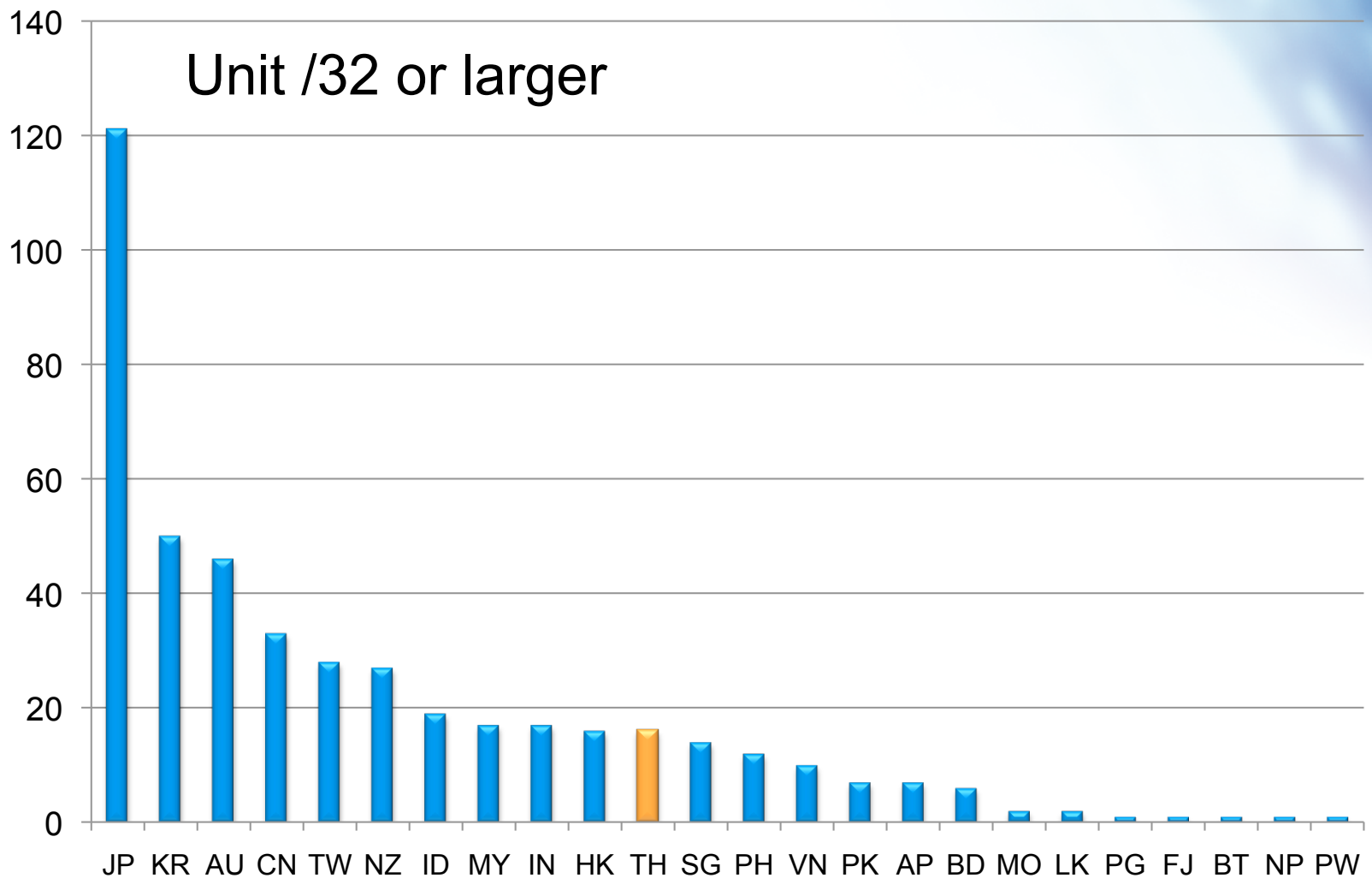
http://www.nro.net/documents/presentations/jointstats.sept08.pdf as of 30 Sept 2008

IPv6 addresses distributed RIRs

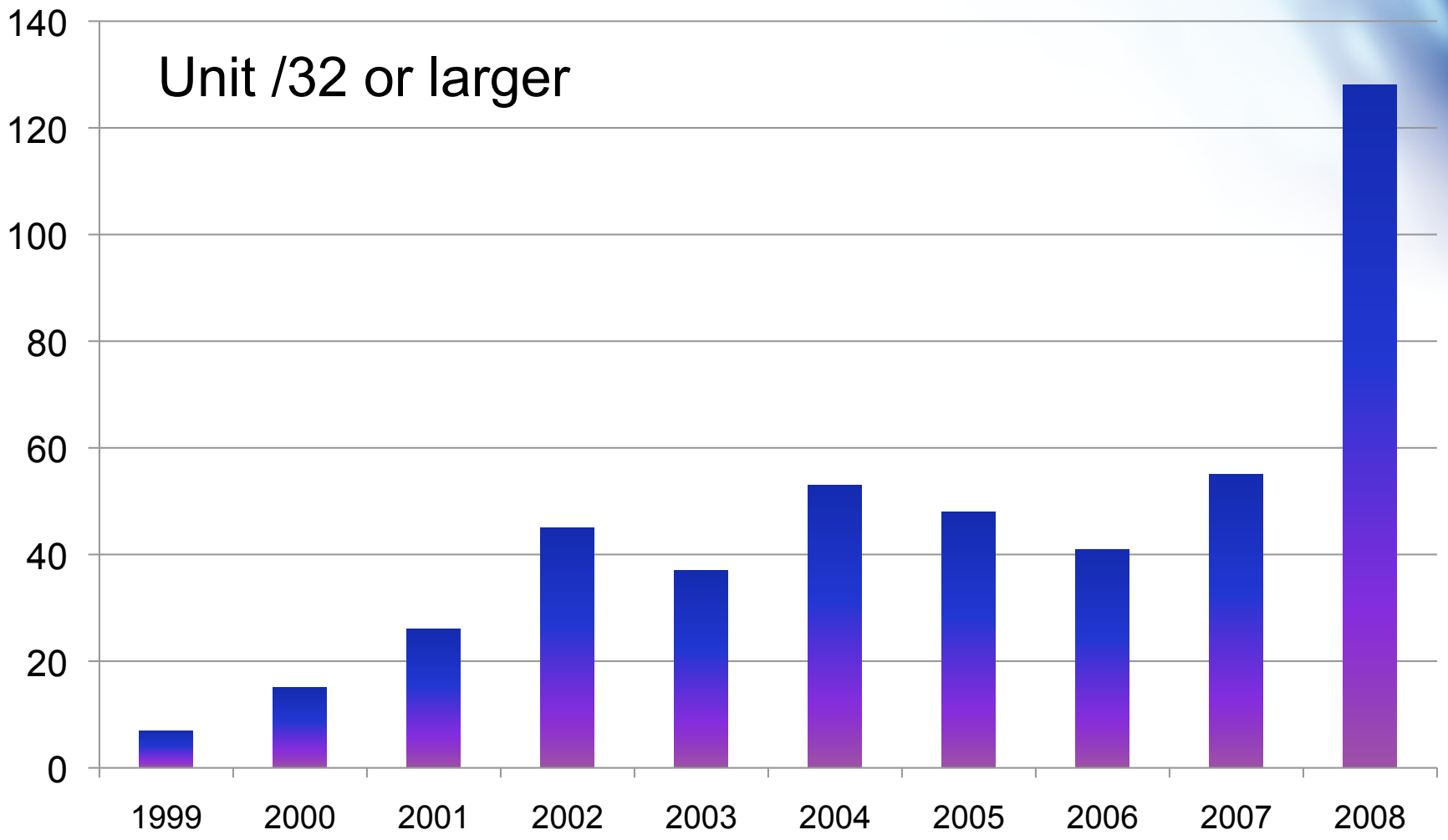


IP address distribution today

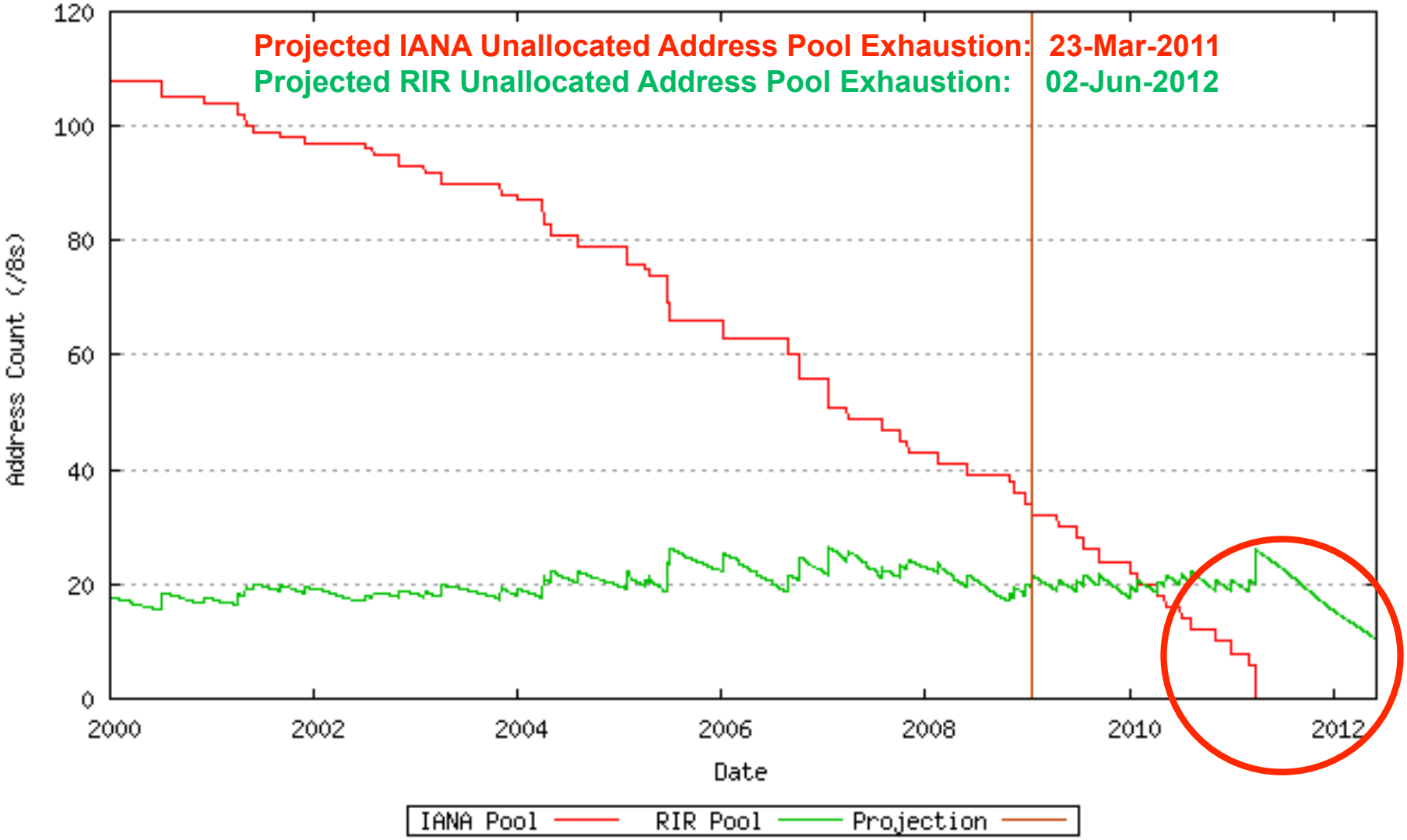
IPv6 address distribution – AP region



IPv6 address distribution – APNIC

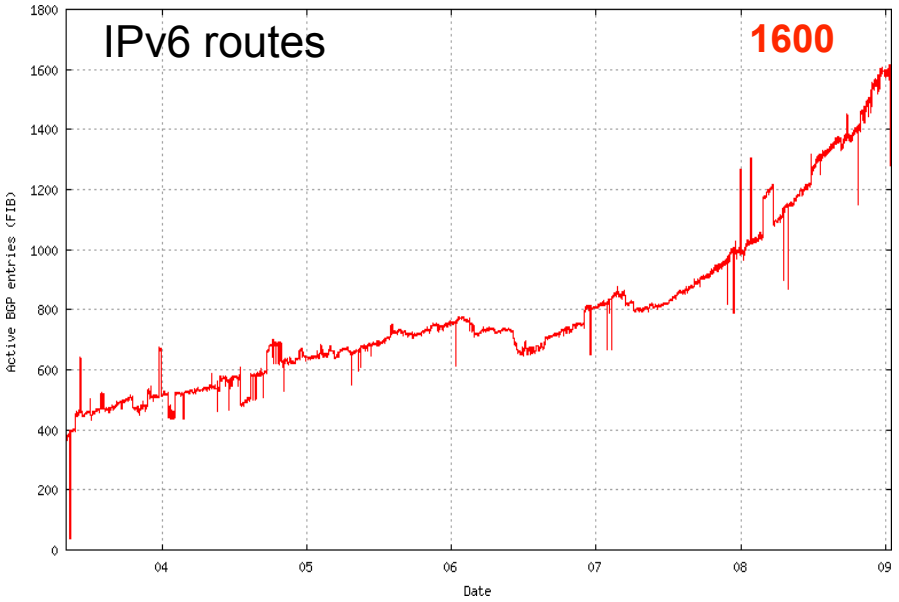


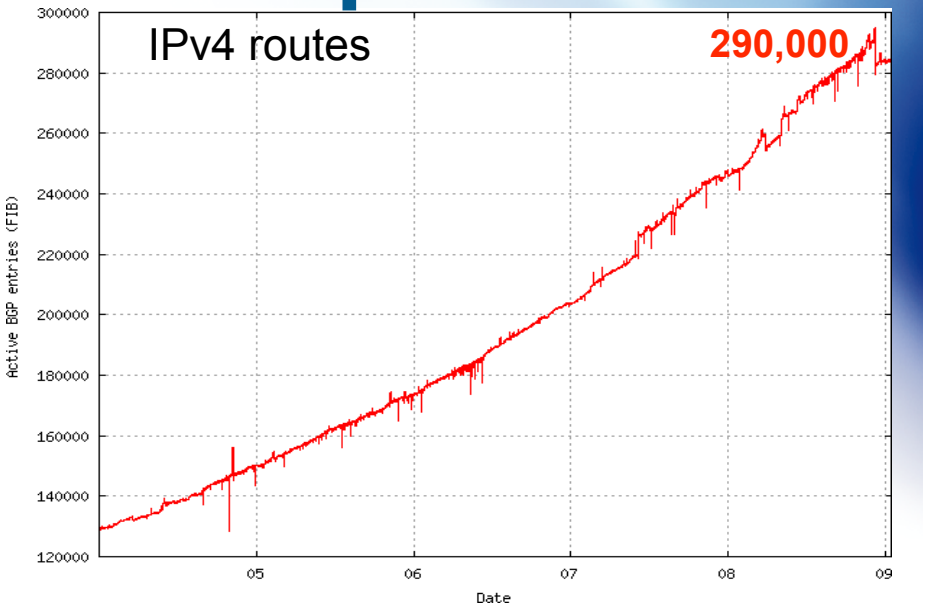
IPv4 consumption – Projection

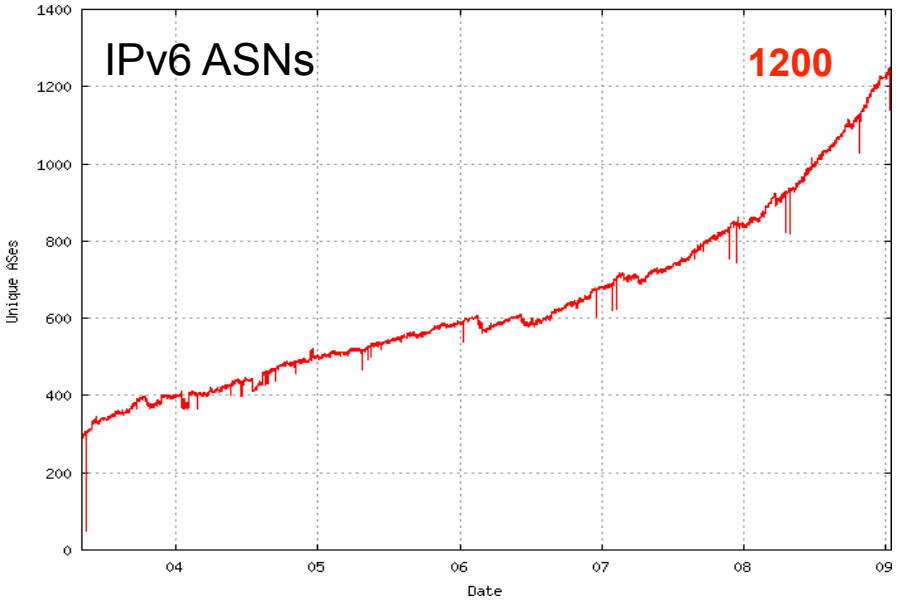


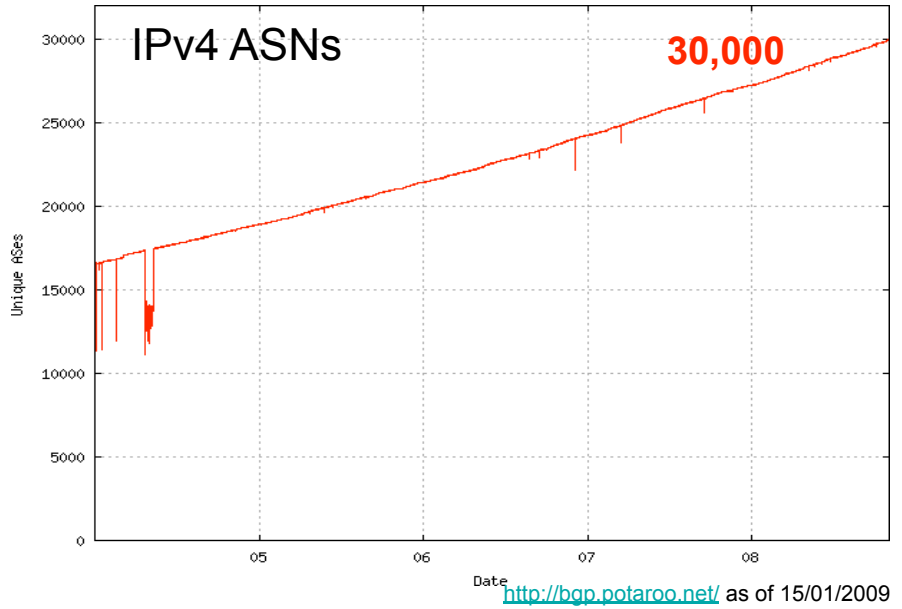
IPv6 deployment status

IPv4 vs IPv6 – 2004 to present



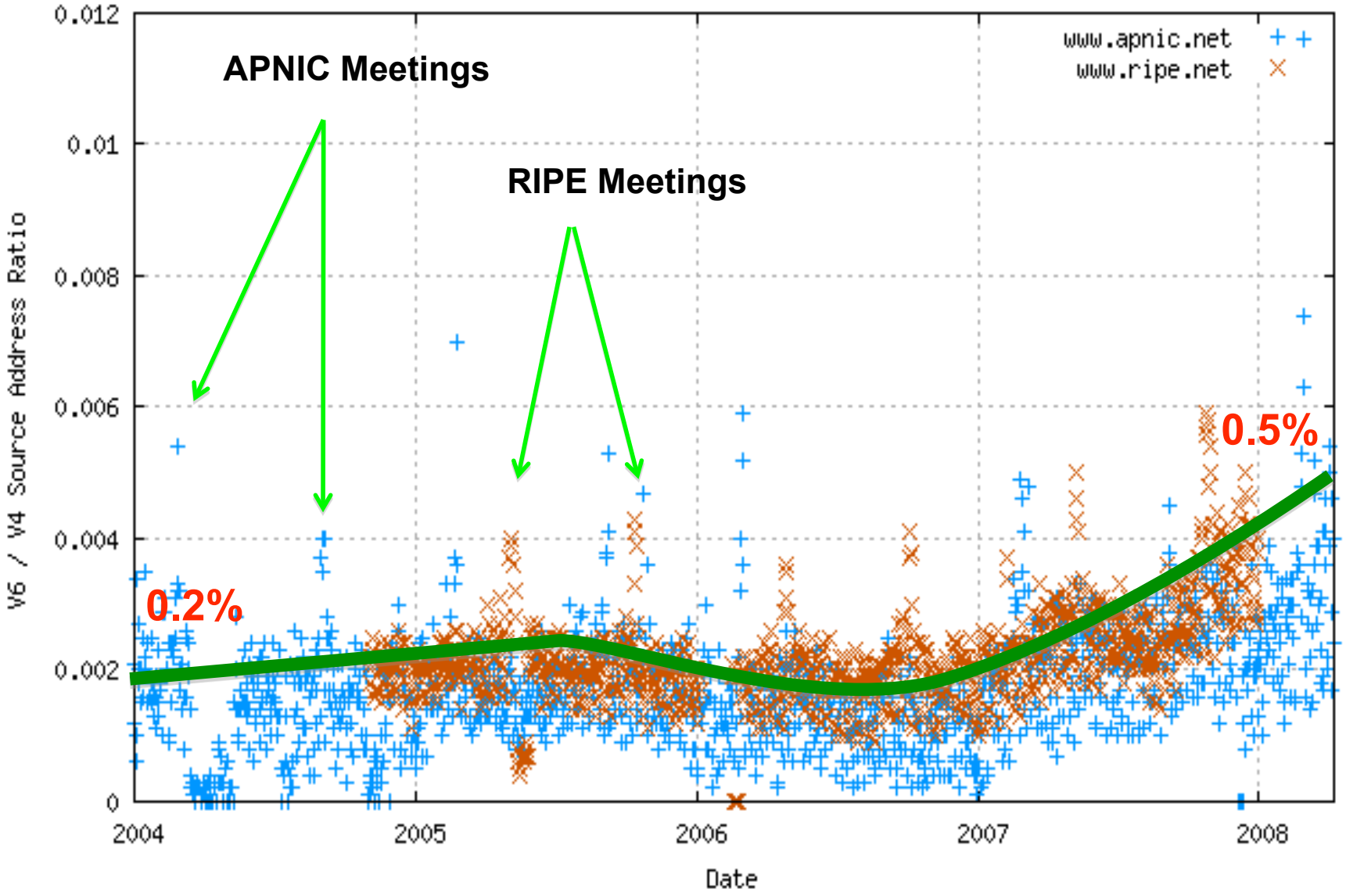






http://bgp.potaroo.net/ as of 15/01/2009

IPv6 traffic analysis – web servers



Where do we go from here?

The challenge

- IPv6 is not a simple replacement for IPv4
  - Industry will need to access both IPv4 and IPv6 throughout the entire transition period
  - Industry demand for IPv4 addresses will continue beyond the projected date of IPv4 address pool exhaustion
- Failure to adopt IPv6 will affect Internet innovation and development
- How do we achieve a smooth transition?
  - The process may take more than 10 years
  - “Dual stack networks” in use for many years
  - IPv4 addresses will still be needed

National responses (AP region)

- Japan
  - The IPv4 Address Exhaustion Task-Force, including industry and government
- Korea
  - IPv6 Strategy Committee (2003)
  - NIDA “IPv6 Promotion Plan II” (2007)
  - Deployment of IPv6 in the public sector
- Singapore
  - IDA “Internet Protocol Version 6 Transition Plans for Singapore” (2006)
  - “technologically agnostic approach … and communication between industry and government”

RIR response

- IPv4 address management
  - Numerous policy measures under discussion for management of remaining space
    - Hard landing vs soft landing
    - Rationing, reserves, limiting demand
  - Discussions about reclamation of IPv4 space
    - Transfer/trading (market) for address management
- IPv6 network deployment
  - Address policies are established
  - Increasing promotion and awareness
  - Putting preparations in place
  - The time is now right!

Why IPv6 is not yet ready?

- Need to recognise simple business reality
  - A company will always spend its available resources on profit-making activities in a highly competitive environment
  - Fundamental nature of IPv6
    - No customer currently demands IPv6
    - Currently no pressing business case for IPv6
- However the community recognises that IPv6 is the only path that enables the Internet to continue to expand
  - Large address space

The hope…

- The Internet has shown its ability to evolve
  - Those who are building infrastructure need to be aware of IPv4 consumption and IPv6 transition
  - Planning should start now, in detail, for the day when there is not enough IPv4 address space
- Industry, regulators, and public policy makers
  - Develop a strategy to support a transitional period between IPv4 and IPv6
  - Encourage the continuing contribution of various stakeholders in mutually supportive roles
  - Ensure preservation of the innovative, vital characteristics of the Internet

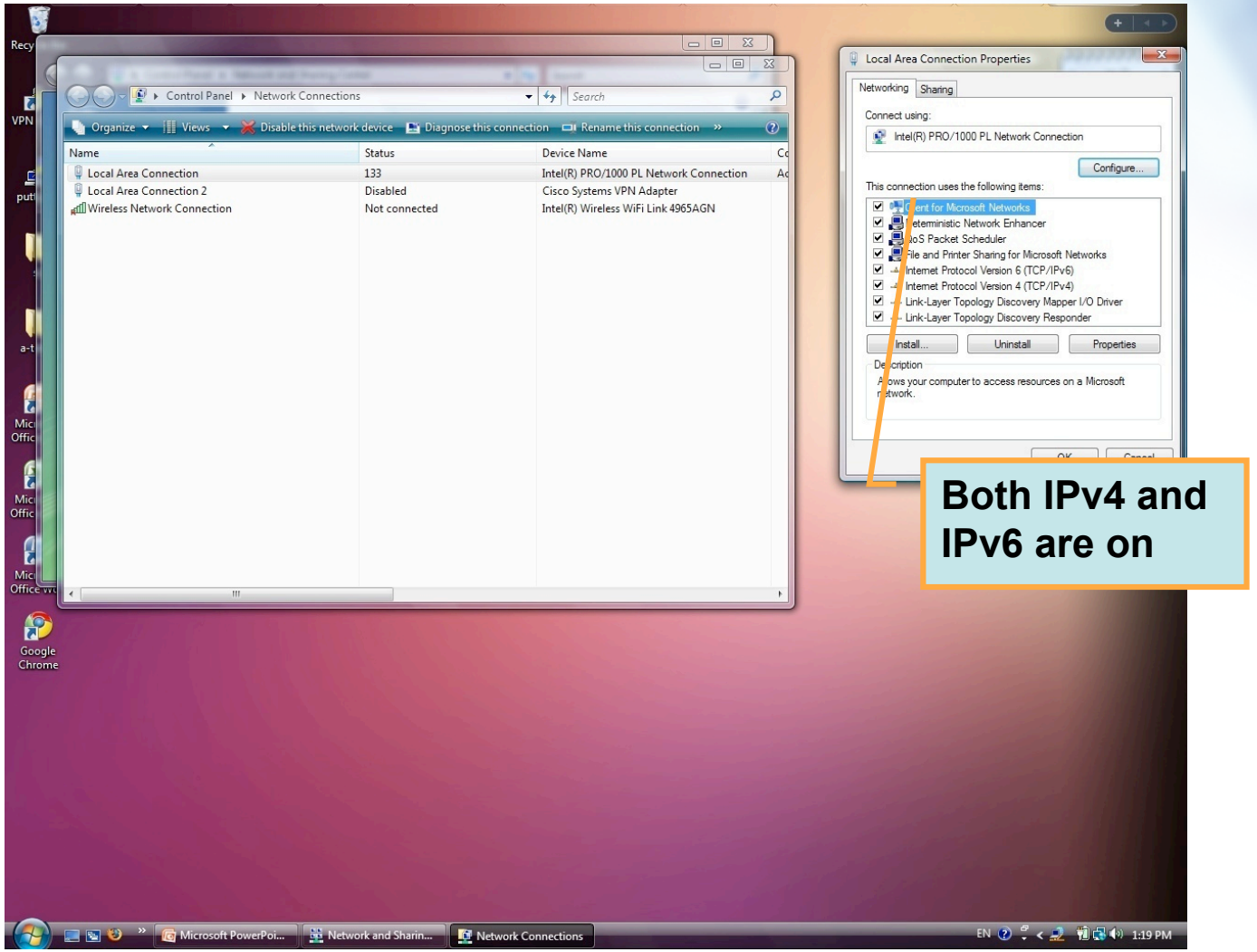
The hope…

- Help the industry break this IPv6 dilemma
  - If you're a governmental organisation, corporation, media or content provider
    - Please enable your services available over IPv6
    - So that you can sustain your online services to your customers via IPv6
  - If you haven't got IPv6 addresses, ask your ISP or,
  - become an APNIC/NIR member and obtain a IPv6 address space for multihoming and find an ISP or an IXP (Internet Exchange Point) who can route your IPv6 packets

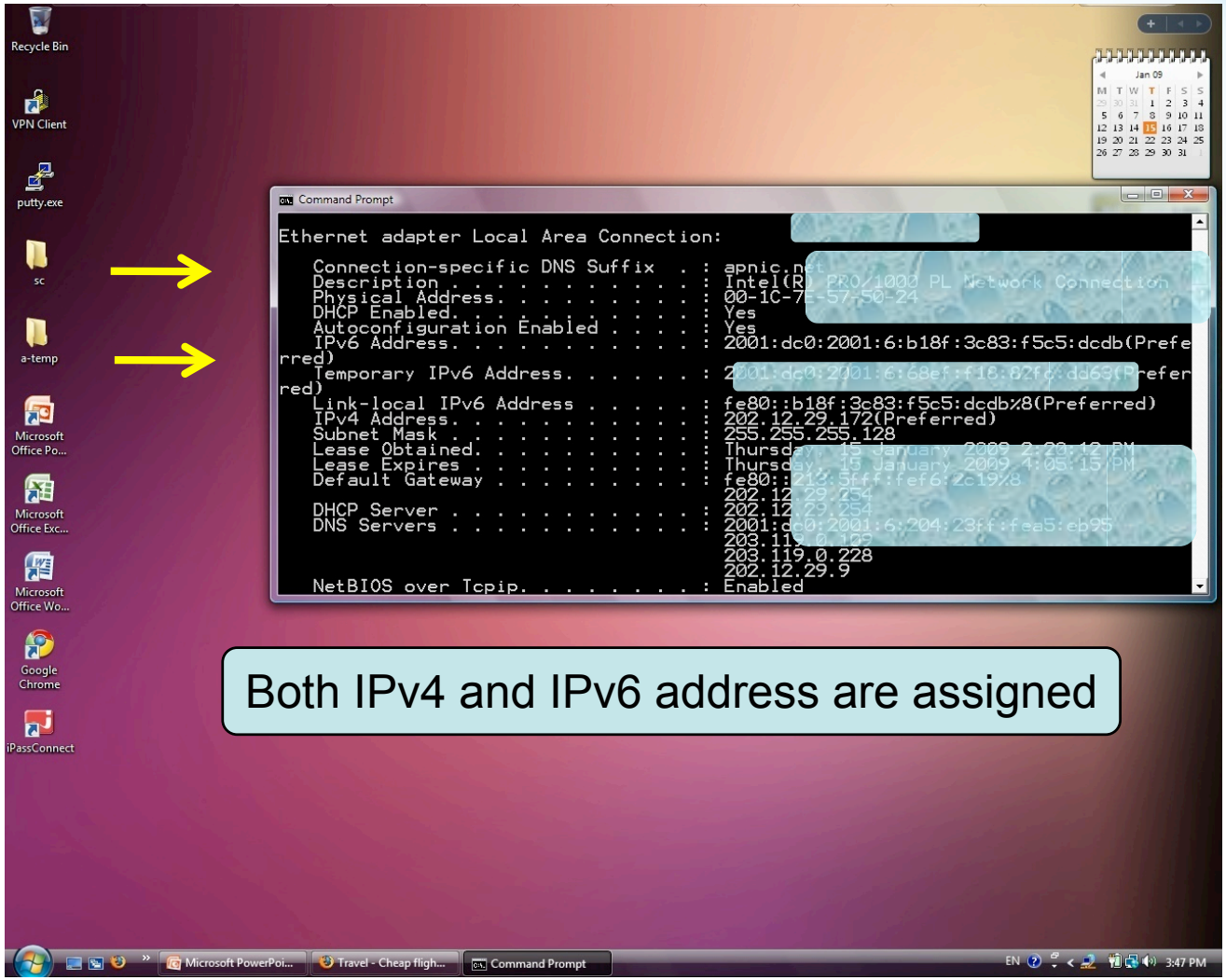
Let's step back and think about the future

- Researches predict IPv4 legacy assets (client PCs, servers, routers, switches, OS, various applications etc.) will remain for next 10 years
  - Dual-stack environment may last for some years
  - IPv4 address will be assigned strategically
    - Not everyone can receive global IPv4 addresses
    - Large number of end users may be given only IPv6 addresses at some point

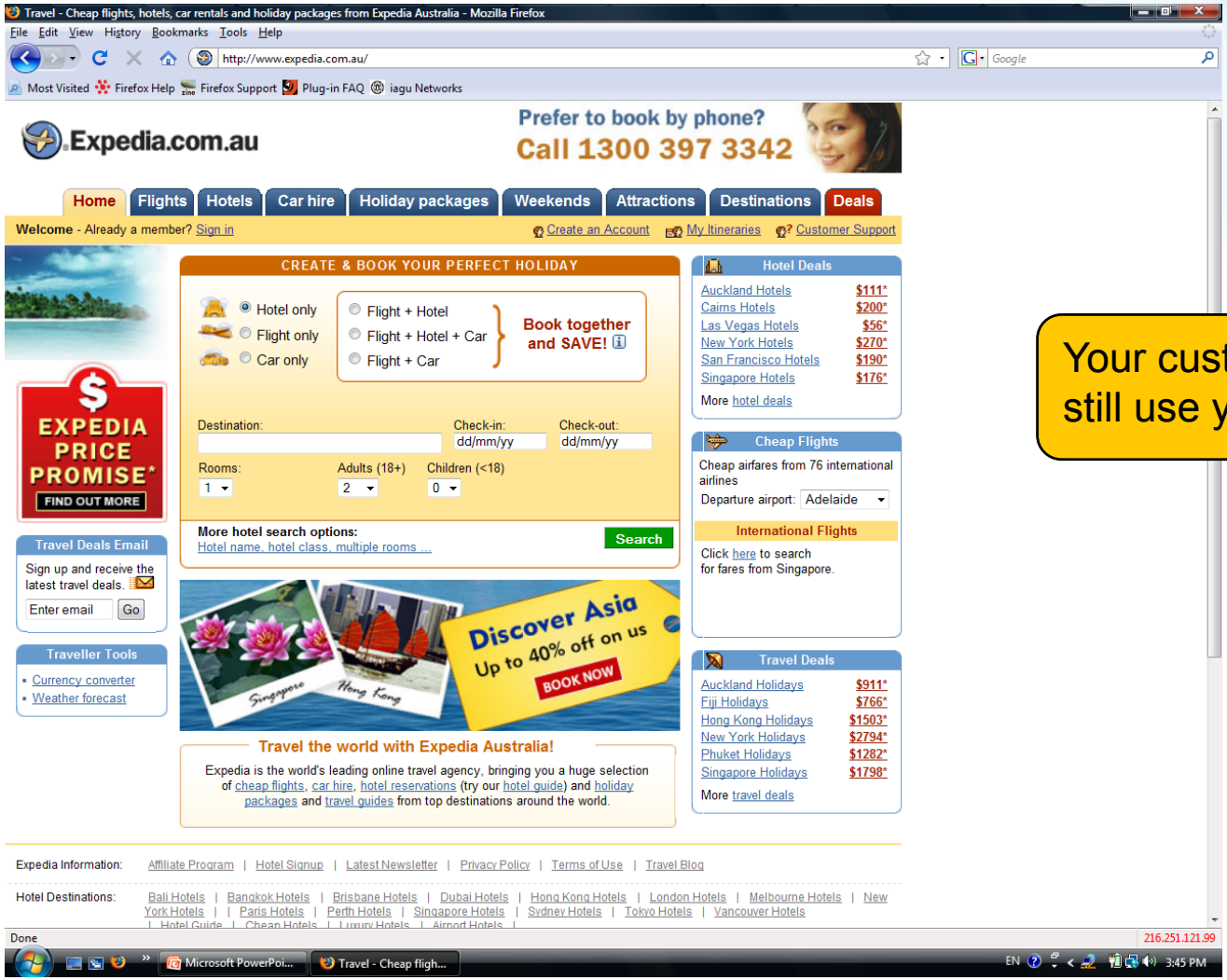
While client is running with IPv4/ IPv6



A client receives both IPv4/IPv6 addresses: dual-stack



Although service is only available via IPv4…

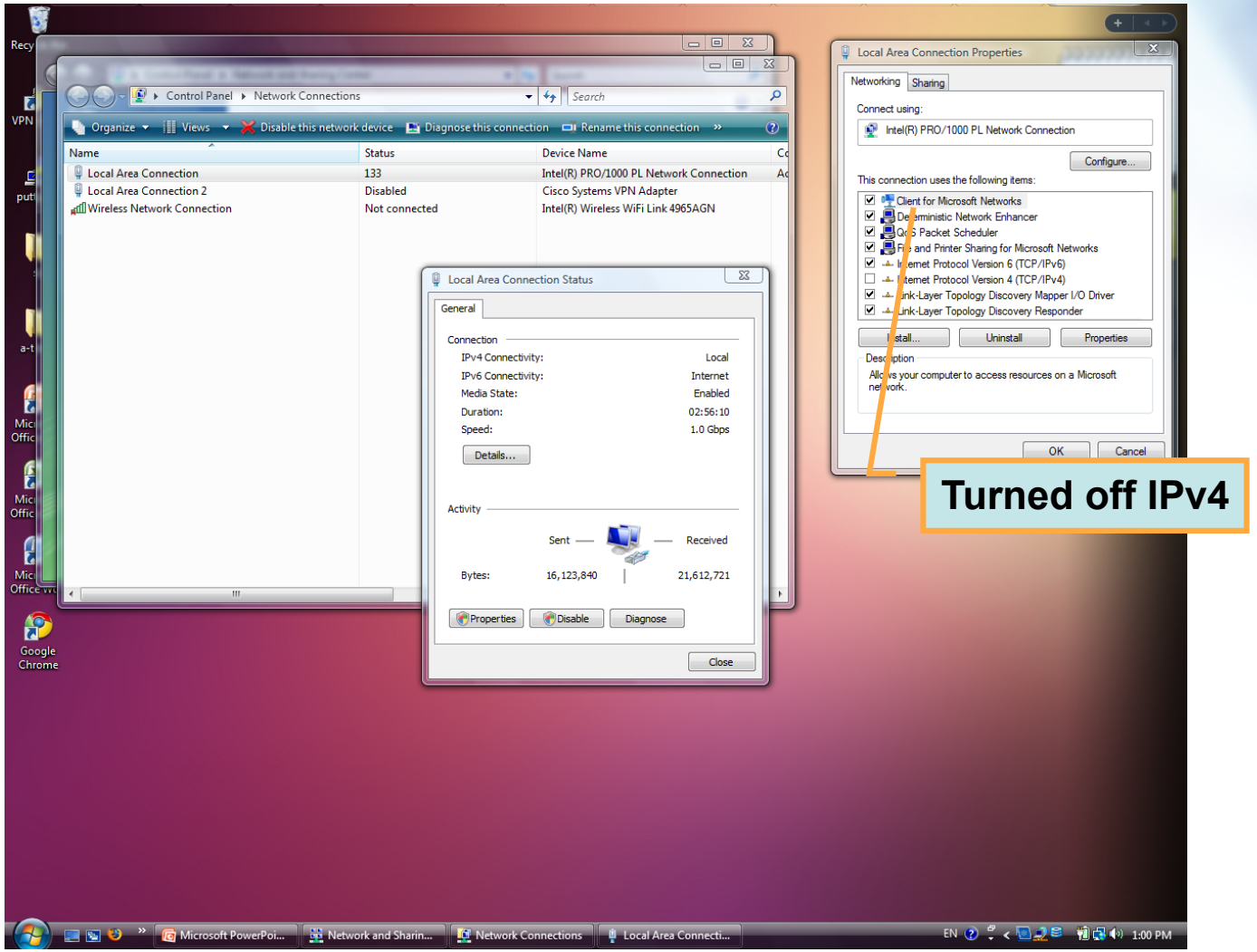


Your customers can still use your service

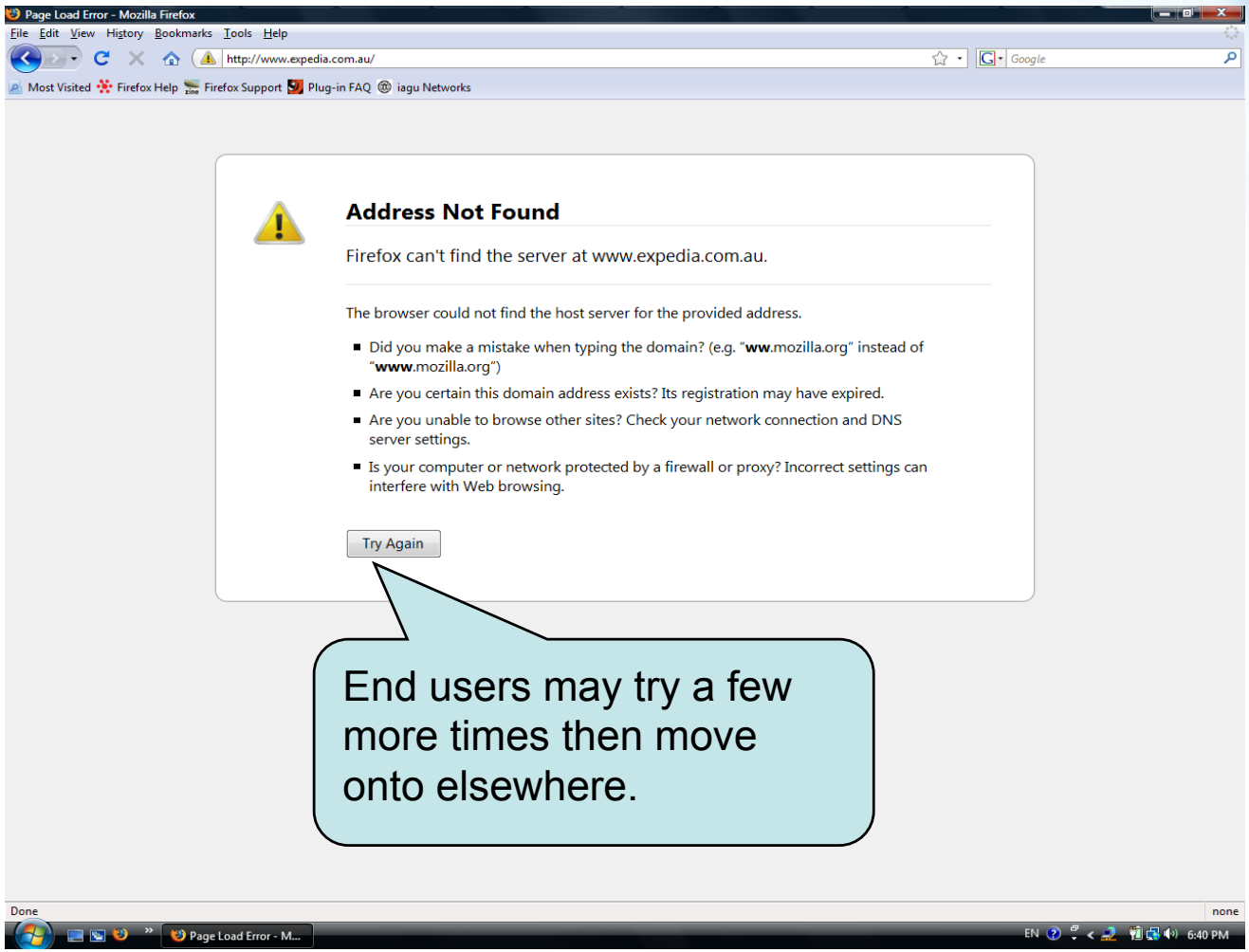
One day…

- In the future, many end users (i.e., your customers) will only receive an IPv6 address
  - Many “clients” access to the Internet via an IPv6 address
  - So if your web service is not ready via dual-stack networks, what will happen?

Simulating an IPv6 only client



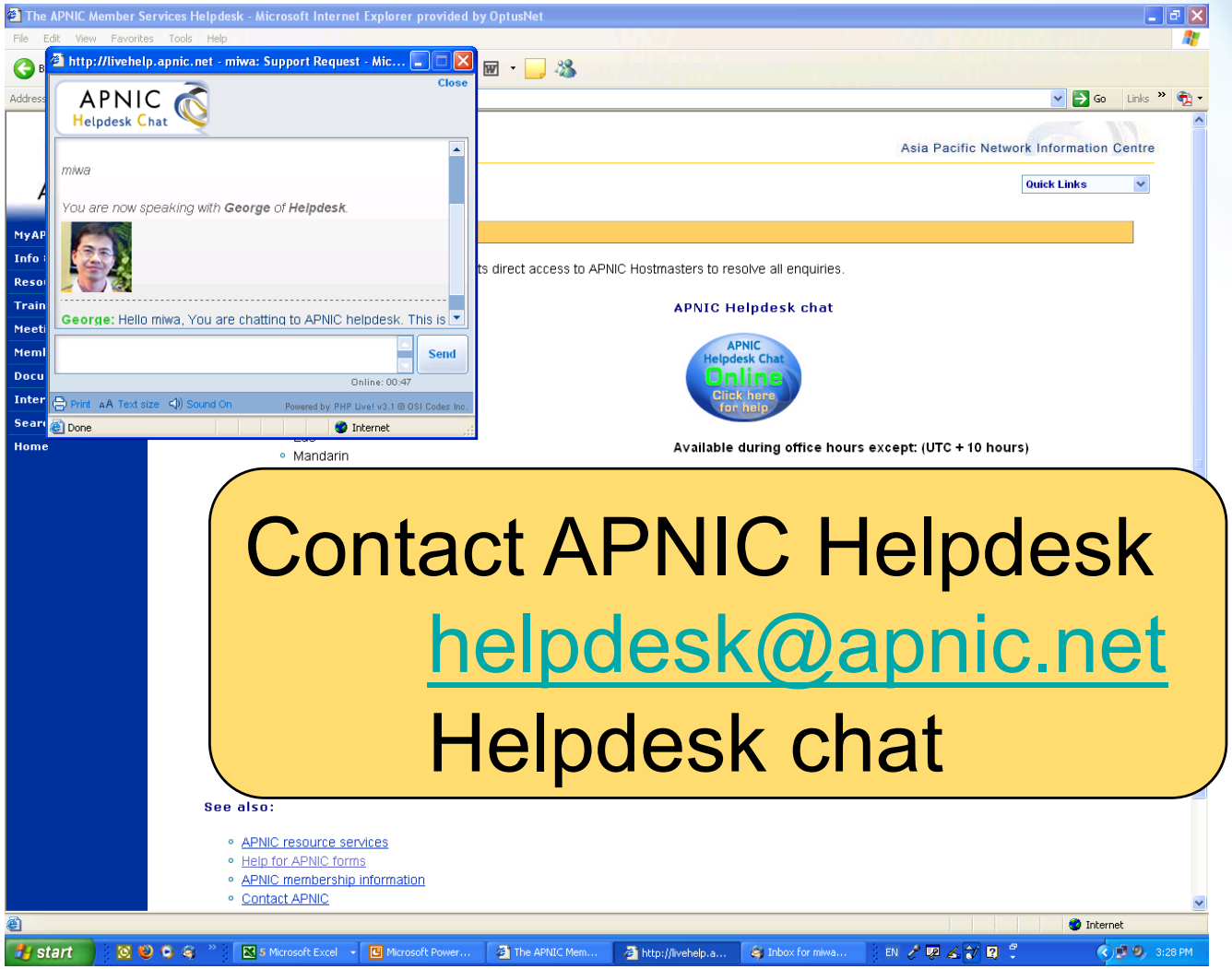
If your site is not ready with IPv6…



Transition planning for content providers: multihoming via IPv6

- Find an ISP that can provide you IPv6 connectivity
  - Contract with them to secure a connection via IPv6
- Find Internet exchange points that supports IPv6
- Peer with other IPv6 networks as much as you can

Obtaining multihoming address space from APNIC



Contact APNIC Helpdesk

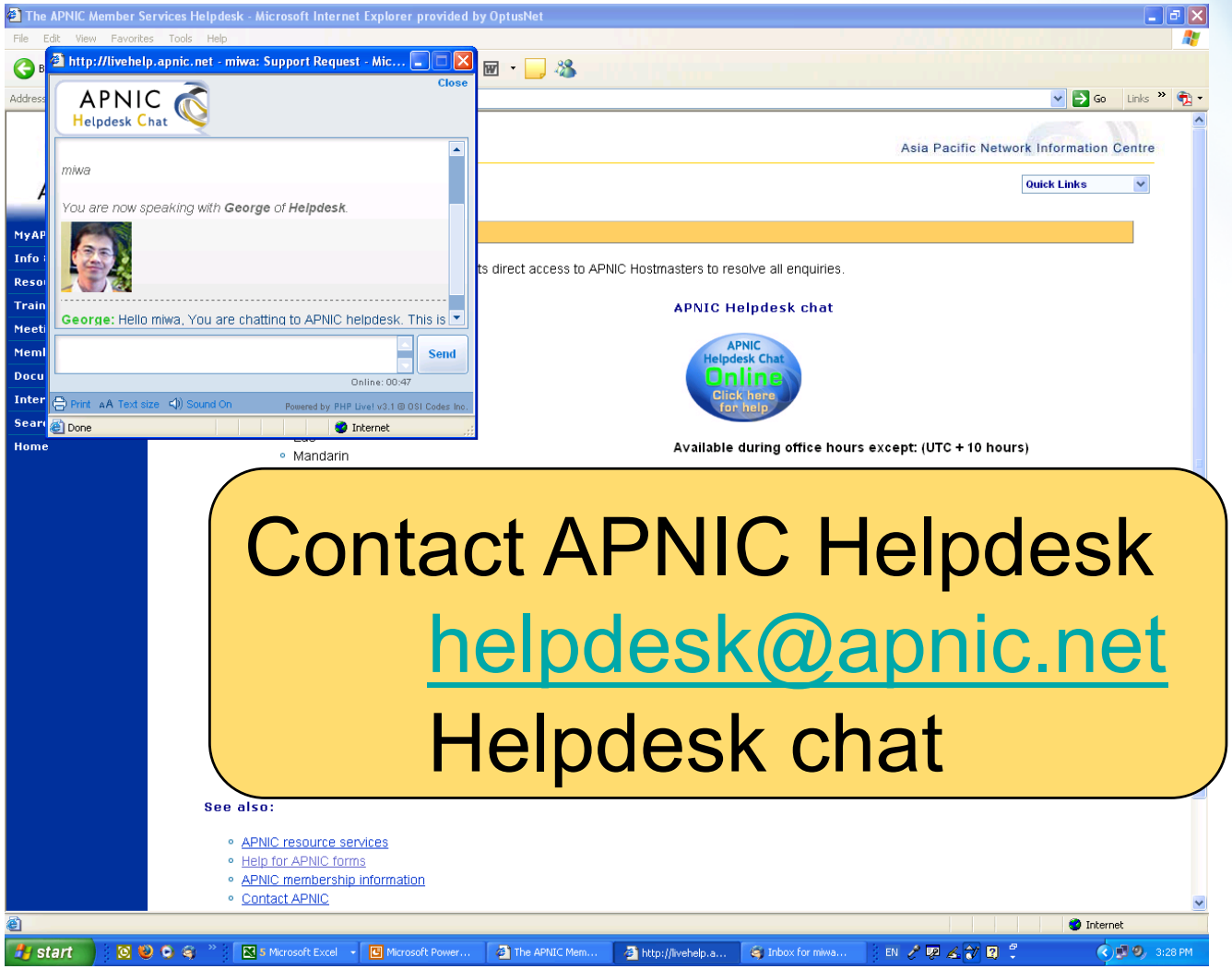
helpdesk@apnic.net

Helpdesk chat

Transition planning for network operators: deploy IPv6 by 2010

- APNIC's outreach activities to content providers
  - Urges content providers to deploy IPv6 services and connectivity
  - Promotes dual-stack use of IPv4 and IPv6 address by content providers
  - Promotes IPv6 multihoming address assignments
- Your customers (e.g., content providers, enterprises etc.) will eventually demand IPv6 connectivity
  - Be ready for such demand!
  - APNIC suggests that network operators and service providers be prepared to support customers and services using IPv6 by 2010

Obtaining IPv6 address allocation from APNIC



Asia Pacific Network Information Centre

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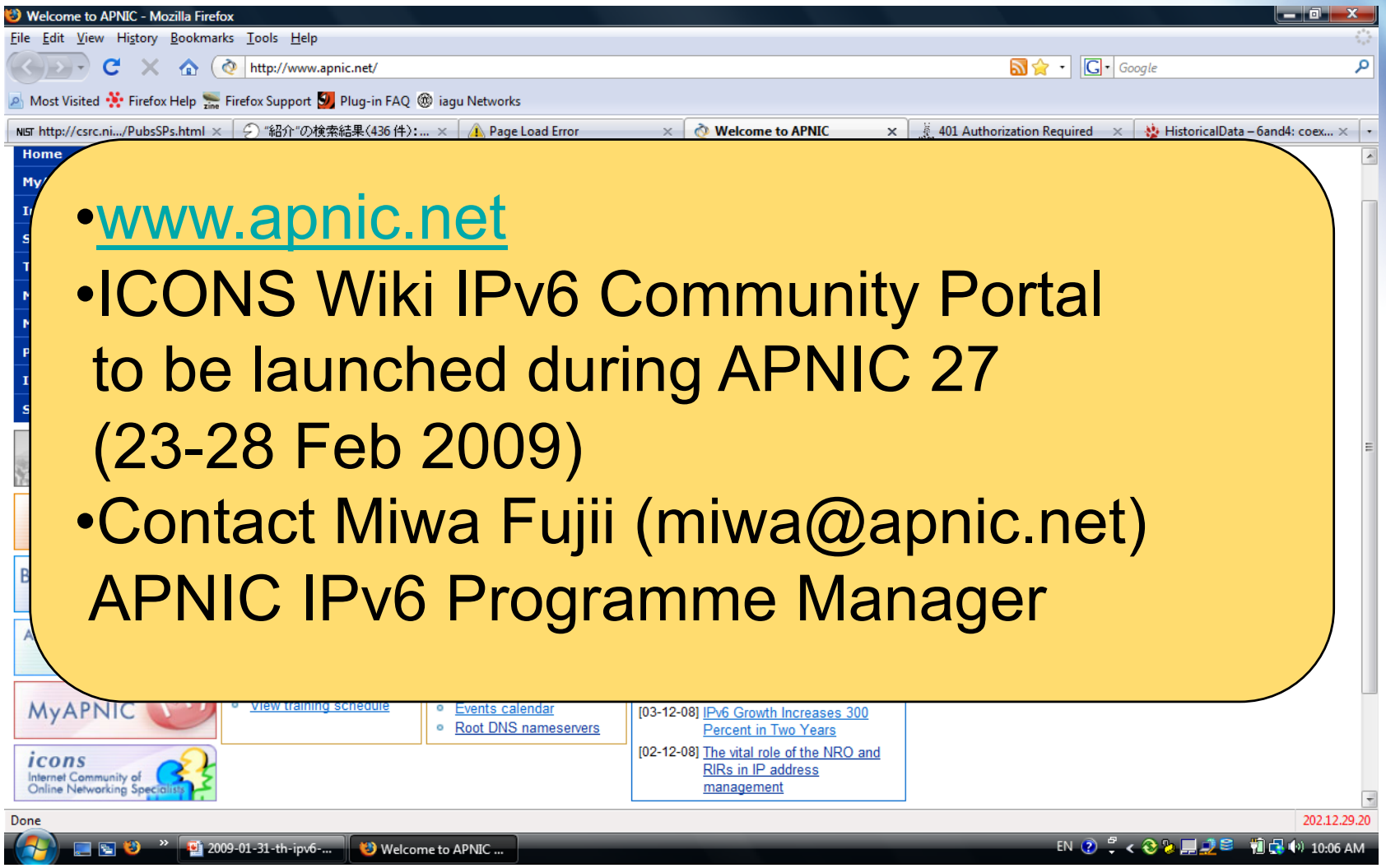
Transition planning for policy makers and regulators: support the industry

- Industry, regulators and public policy makers
  - Develop a coherent strategy to sustain the transitional framework between IPv4 and IPv6
  - Encourage the continuing contribution of various stakeholders in mutually supportive roles
- Stay tuned with topics of IPv4 address exhaustion and IPv6 transition

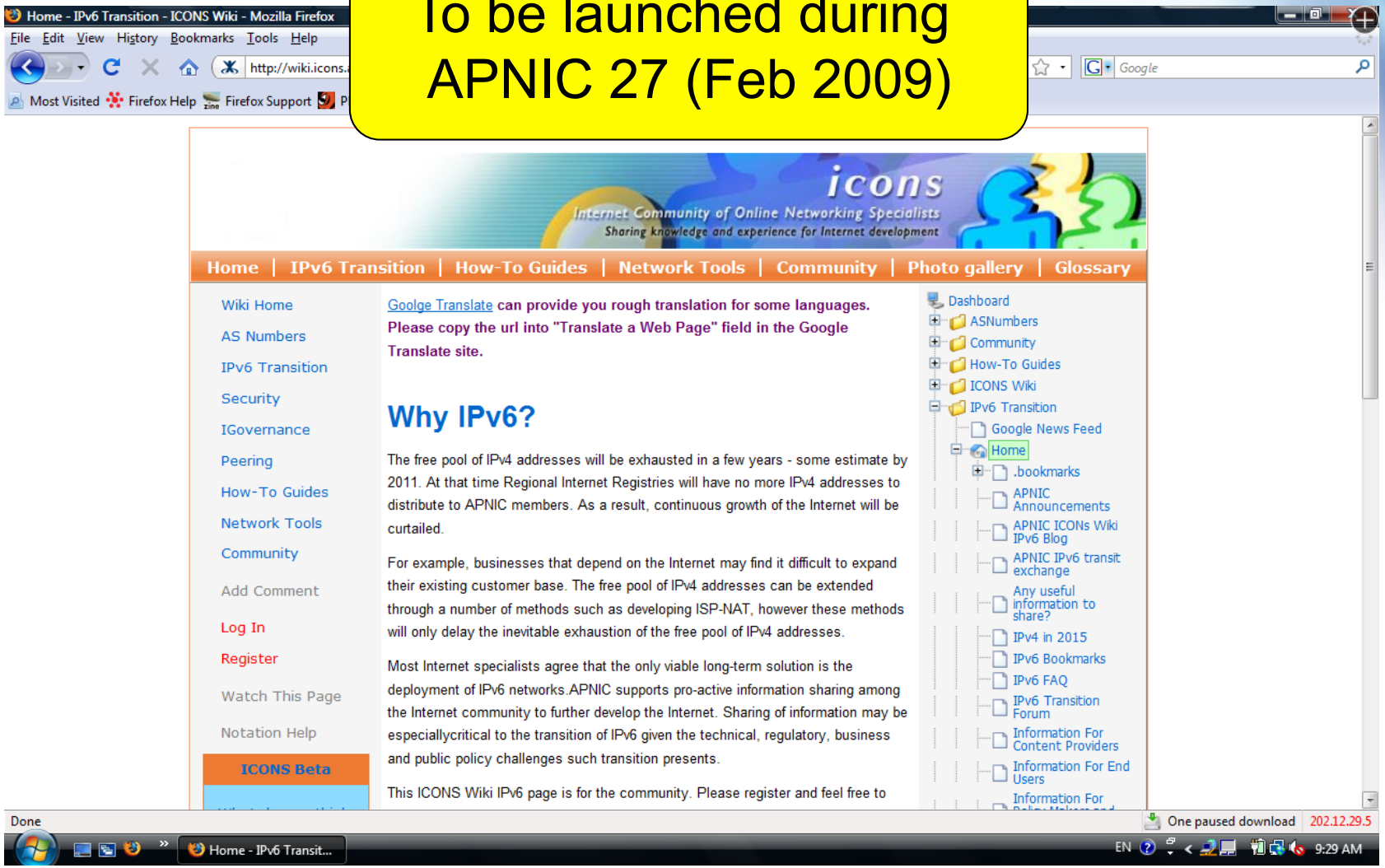
Obtaining information from



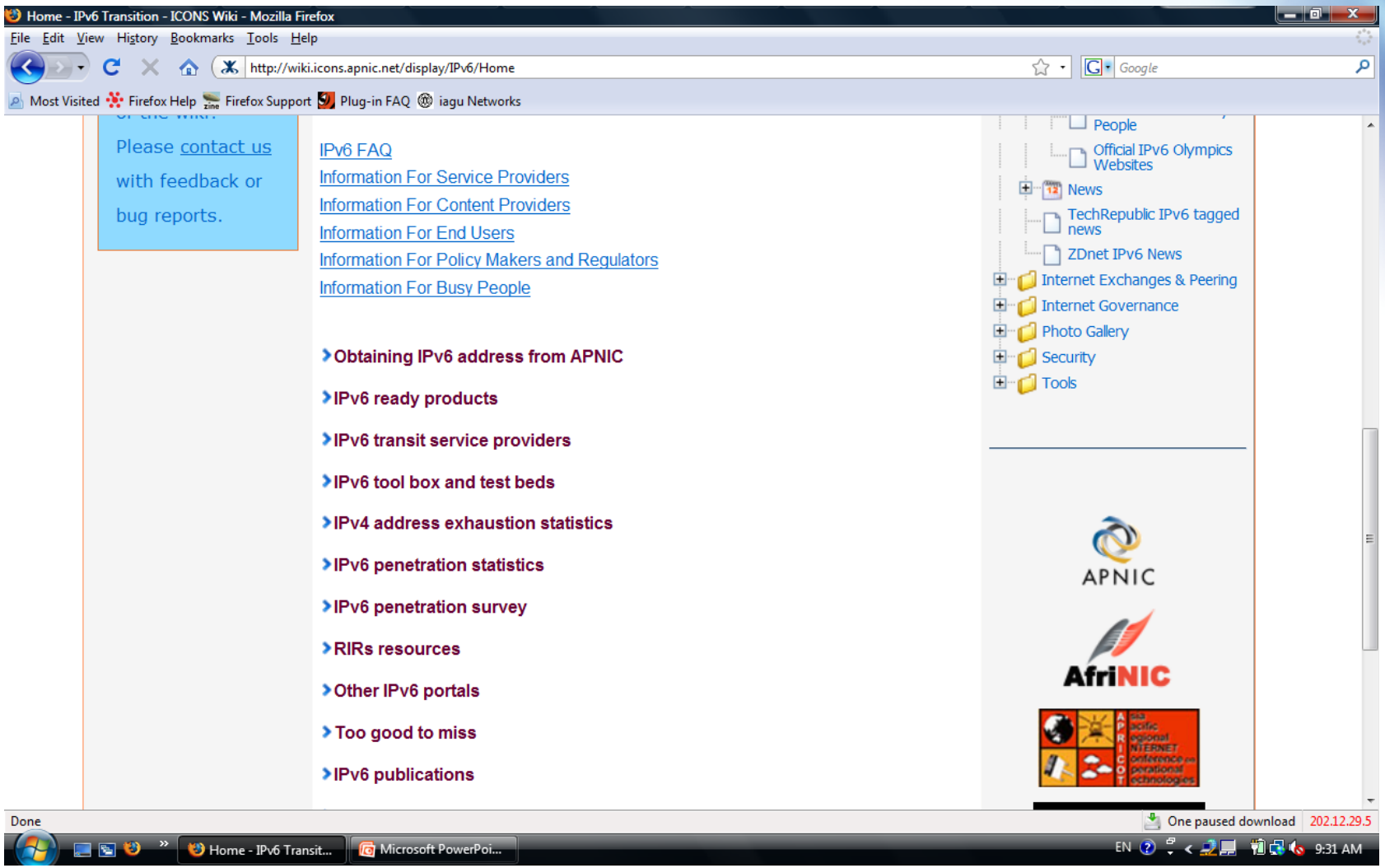
- www.apnic.net
- ICONS Wiki IPv6 Community Portal to be launched during APNIC 27 (23-28 Feb 2009)
- Contact Miwa Fujii (miwa@apnic.net) APNIC IPv6 Programme Manager

APNIC ICONS Wiki IPv6 page

To be launched during APNIC 27 (Feb 2009)

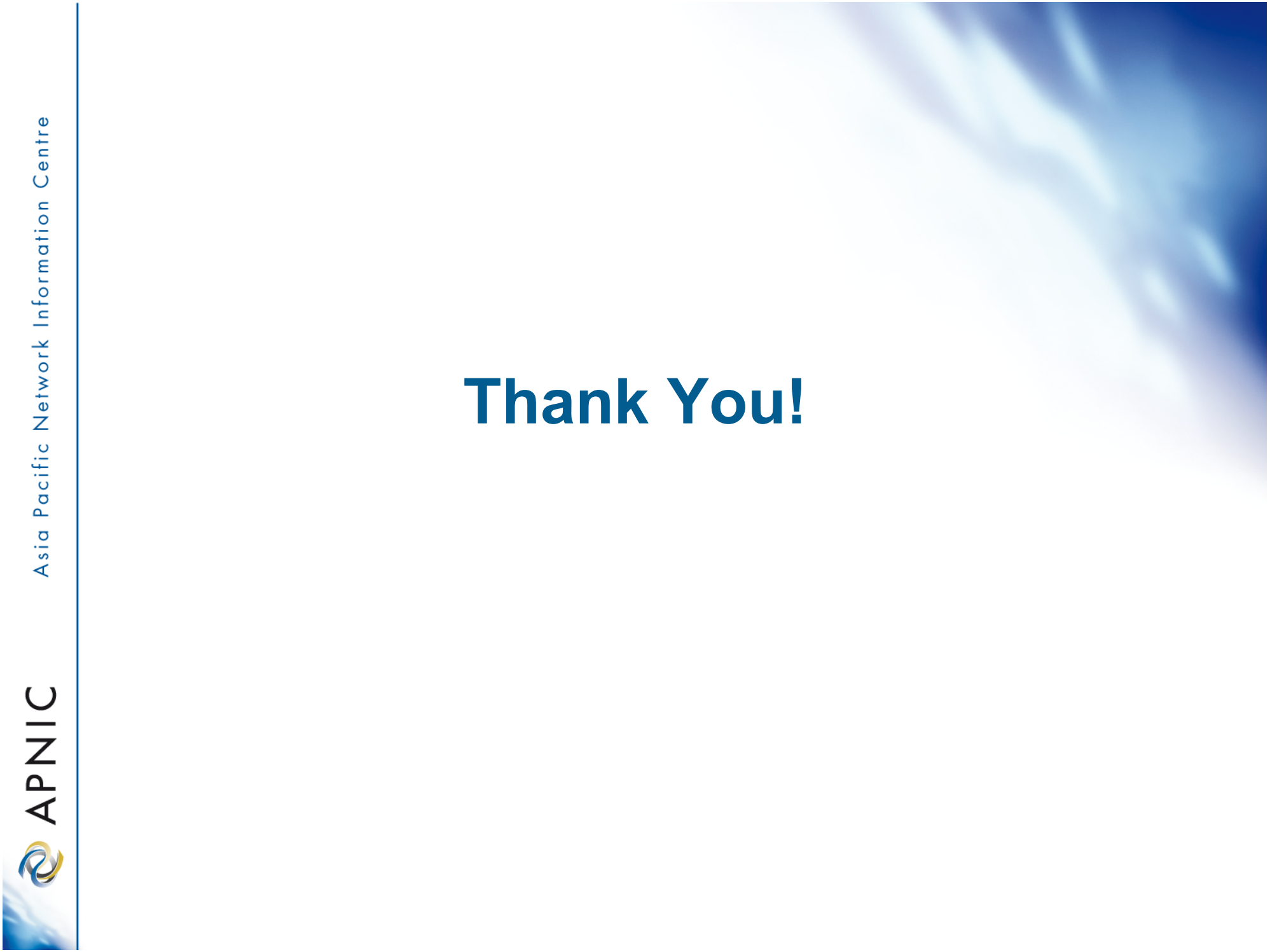


APNIC ICONS Wiki IPv6 page



APNIC IPv6 position statement

- APNIC supports the deployment of IPv6 as the optimal future outcome for the Internet
- APNIC suggests that network operators and service providers:
  - be prepared to support customers and services using IPv6 by 2010,
  - begin planning for this transition as soon as practically possible



Thank You!

Links to RIR statistics

- RIR Stats:
  www.nro.net/statistics

- Raw Data/Historical RIR Allocations:
  www.aso.icann.org/stats
  www.iana.org/assignments/ipv4-address-space
  www.iana.org/assignments/as-numbers
  www.iana.org/assignments/ipv6-unicast-address-assignments