Expanding the Internet: The IPv4 to IPv6 transition

Global IPv6 Summit in Korea 2009
Seoul, 10 July 2009

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IPv6 Program Manager, APNIC

Overview

- What is currently happening with the Internet?
  - IPv4 address free pool exhaustion
  - IPv6 transition
  - Readiness of resource management policies
- The Internet without IPv6
- How is the APNIC community responding?
  - IPv6 readiness survey
- Are you ready for these changes?
  - What do you need to do?

Where do IP addresses come from?

IETF

Standards

IANA

Allocation

APNIC

APNIC

*

Allocation

ISP

Assignment

End user

Regional Internet Registries (RIR) distribute IPv4, IPv6, and AS numbers to the Internet community

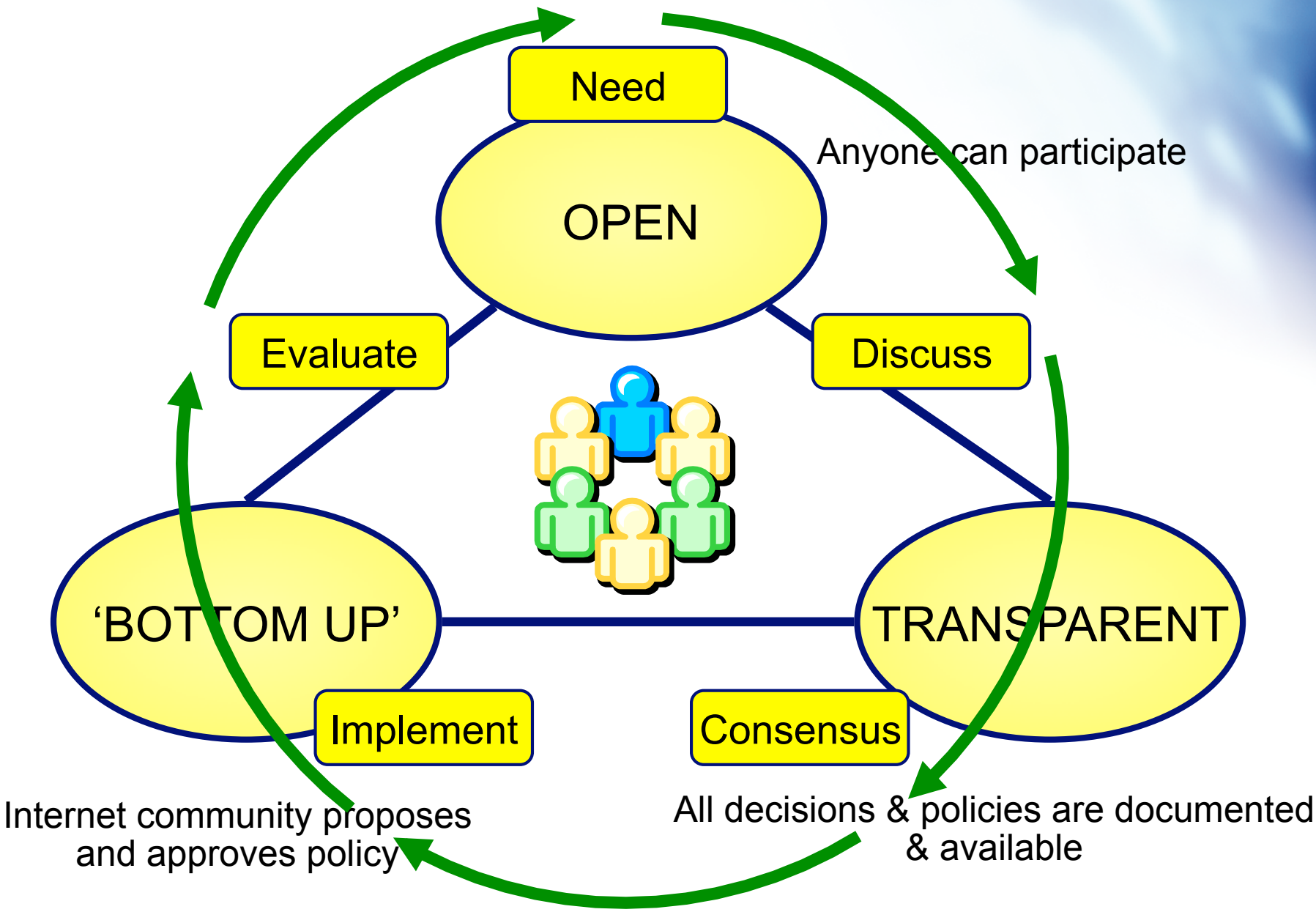
RIRs maintain accurate registration of Internet resource usage for the community

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

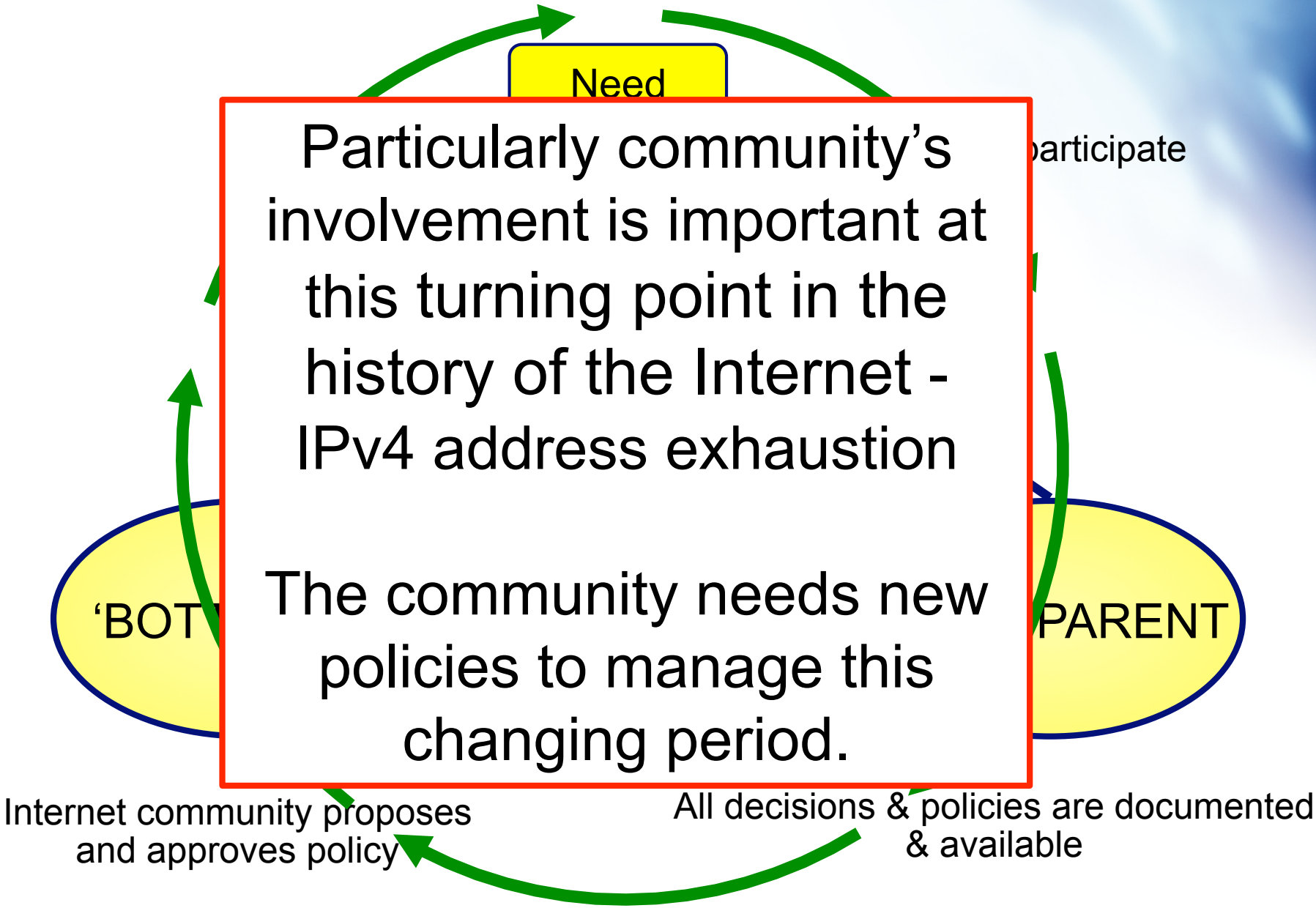
Regional Internet Registries

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

The policy development process



The policy development process



Particularly community's involvement is important at this turning point in the history of the Internet - IPv4 address exhaustion

The community needs new policies to manage this changing period.

The policy development process

Any concerns or questions?
Feel free to contact NIDA KRNIC or APNIC.

APNIC's Policy Development Manager

Sam Dickinson
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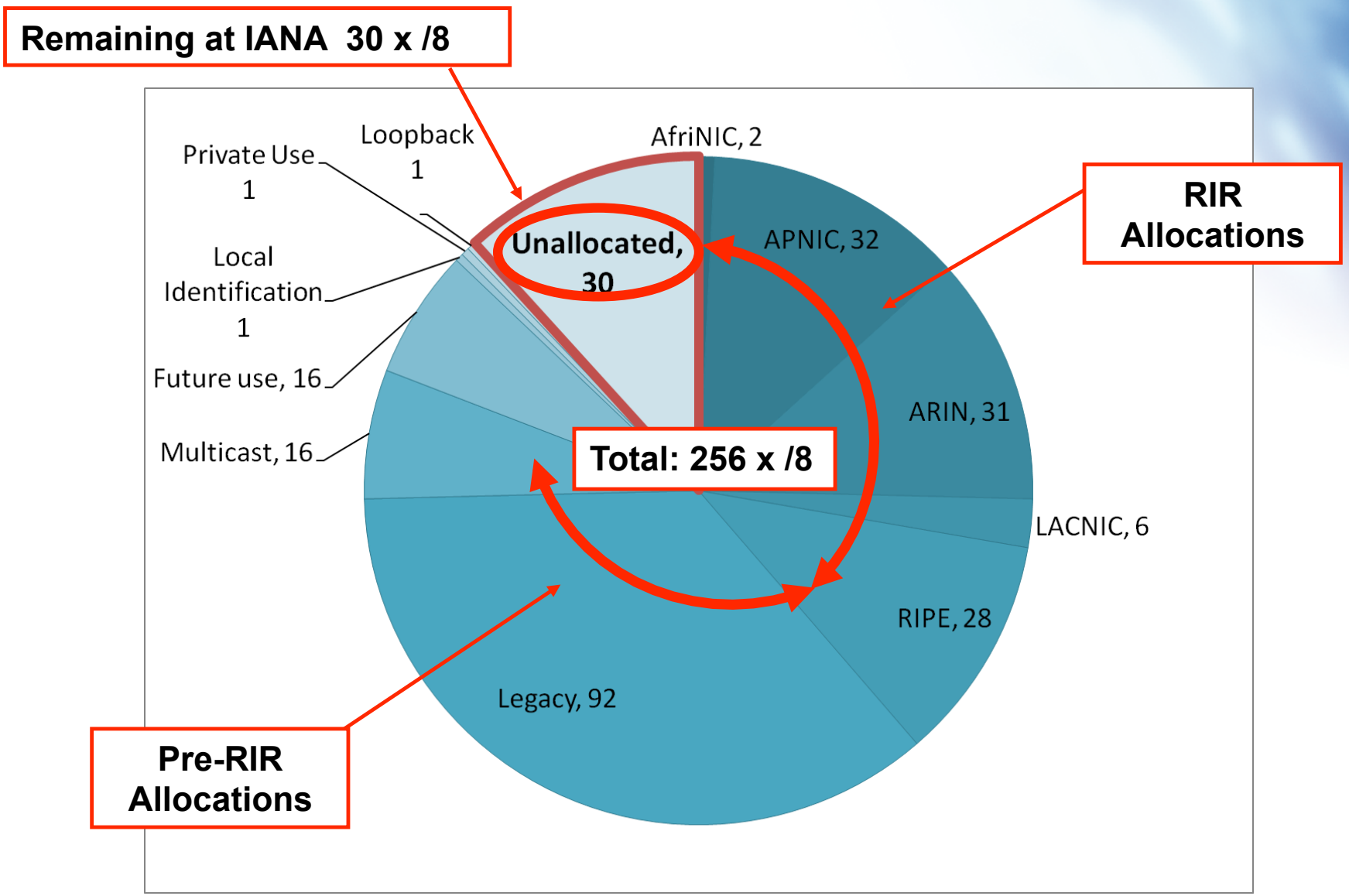
Current policy discussions

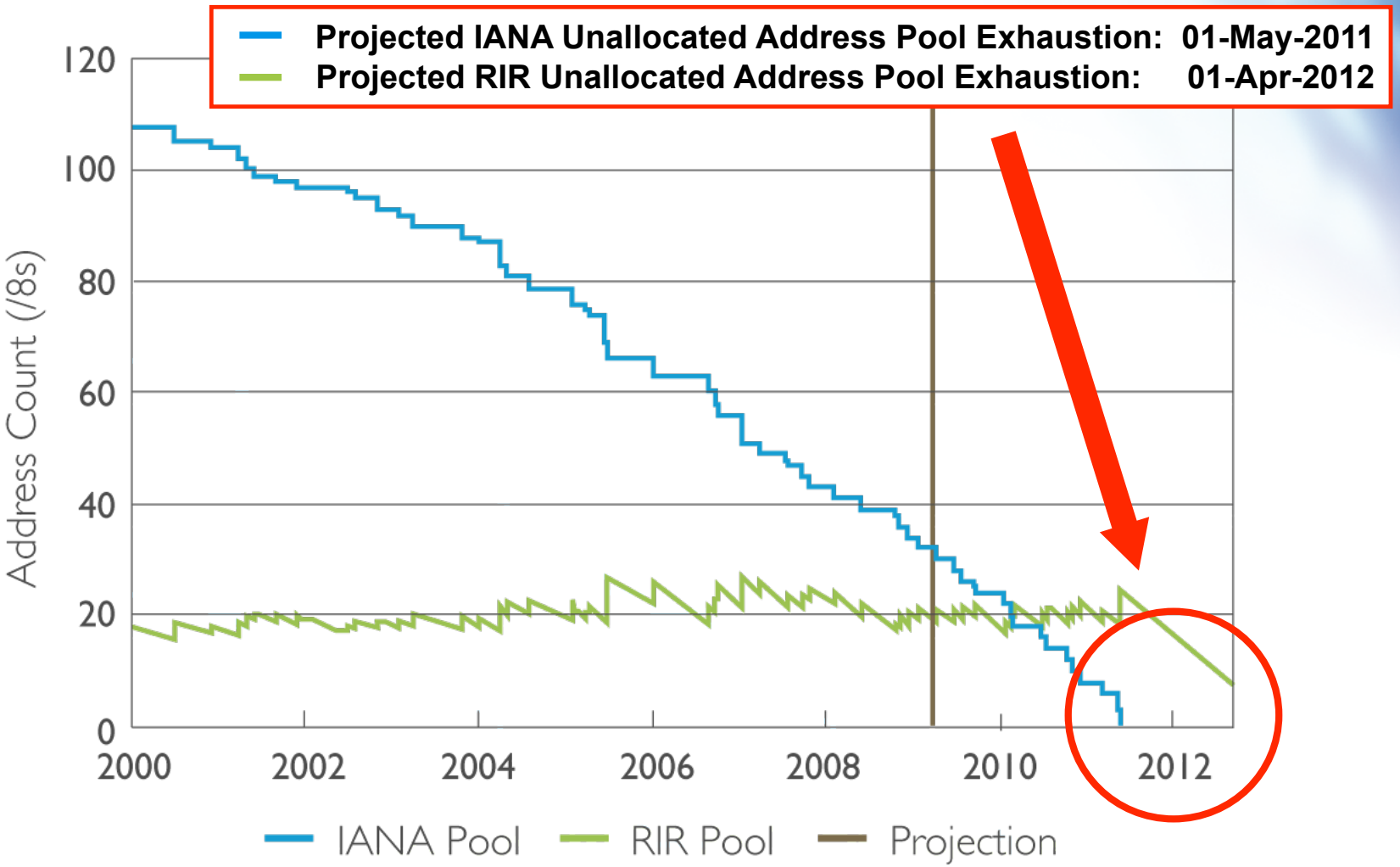
- We are experiencing an important turning point in the history of the Internet
- IPv4 allocation policies are changing
  - Prop-50 IPv4 address transfers
    - Deregulated transfers of IPv4 blocks
  - It has been under discussion since Sept 2007
  - To be discussed at APNIC 28, Aug 2009 once more
    - Community's full involvement is strongly encouraged
    - Join the "Policy-SIG" mailing list
      - http://www.apnic.net/community/participate/join-discussions/sigs
- IPv6 allocation policies are stable

Remaining IPv4 /8s at IANA



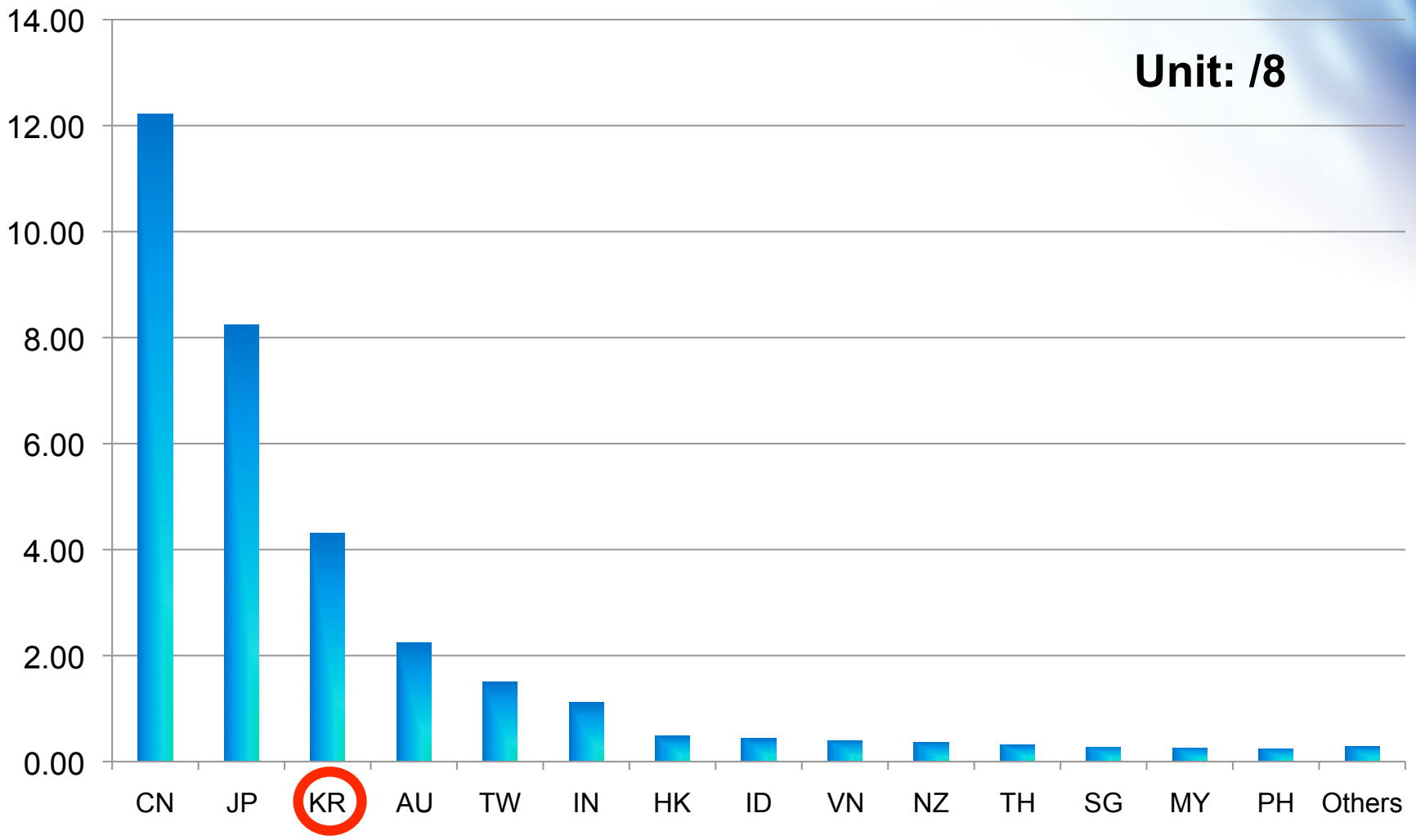
http://www.iana.org/assignments/ipv4-address-space/ as of 24/06/2009

IPv4 consumption – Projection



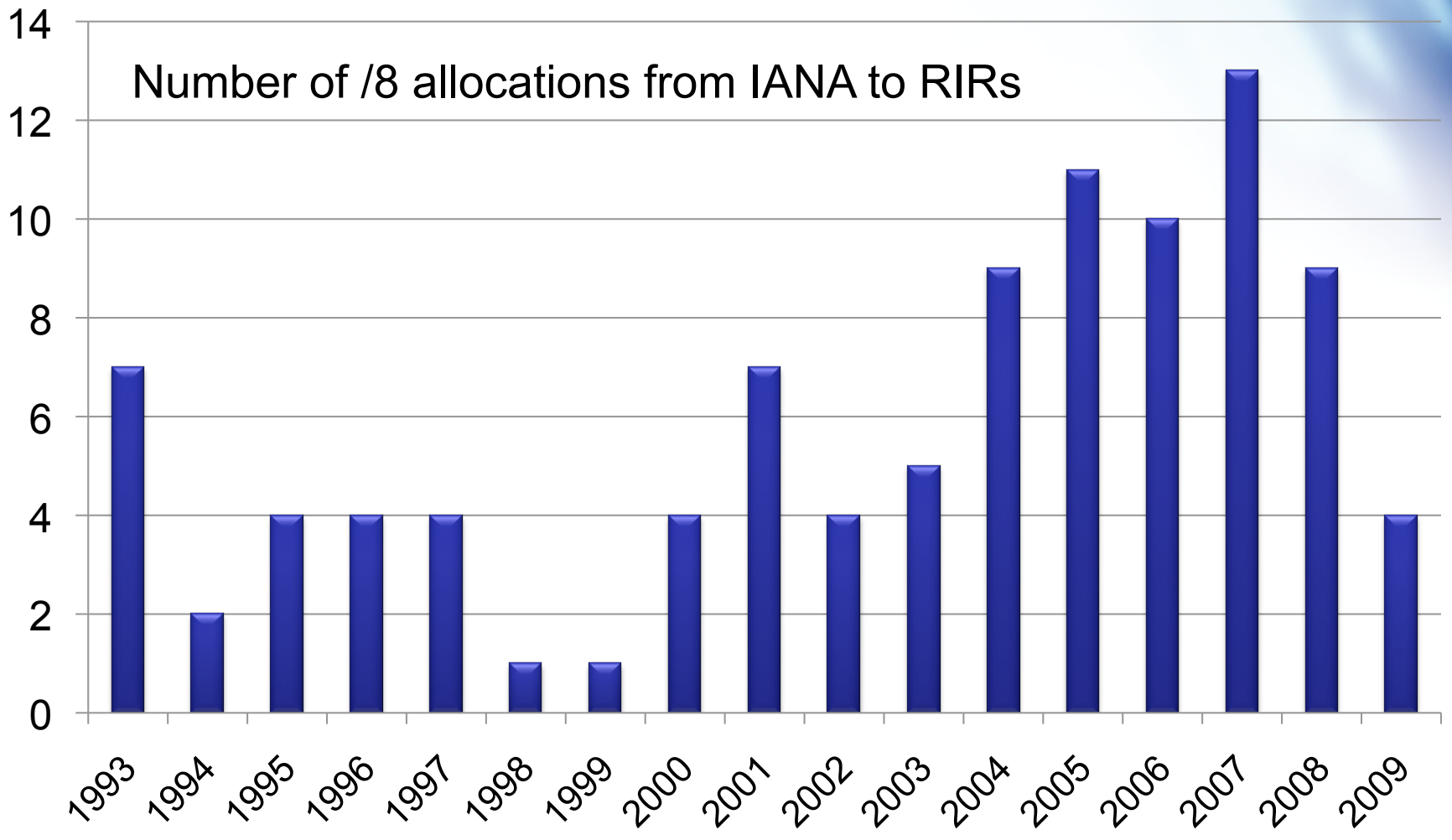
http://www.potaroo.net/tools/ipv4/index.html as of 25/06/2009

APNIC IPv4 allocations by economy



http://www.apnic.net/stats/o3/ as of 25/6/2009

IPv4 allocations from IANA to RIRs



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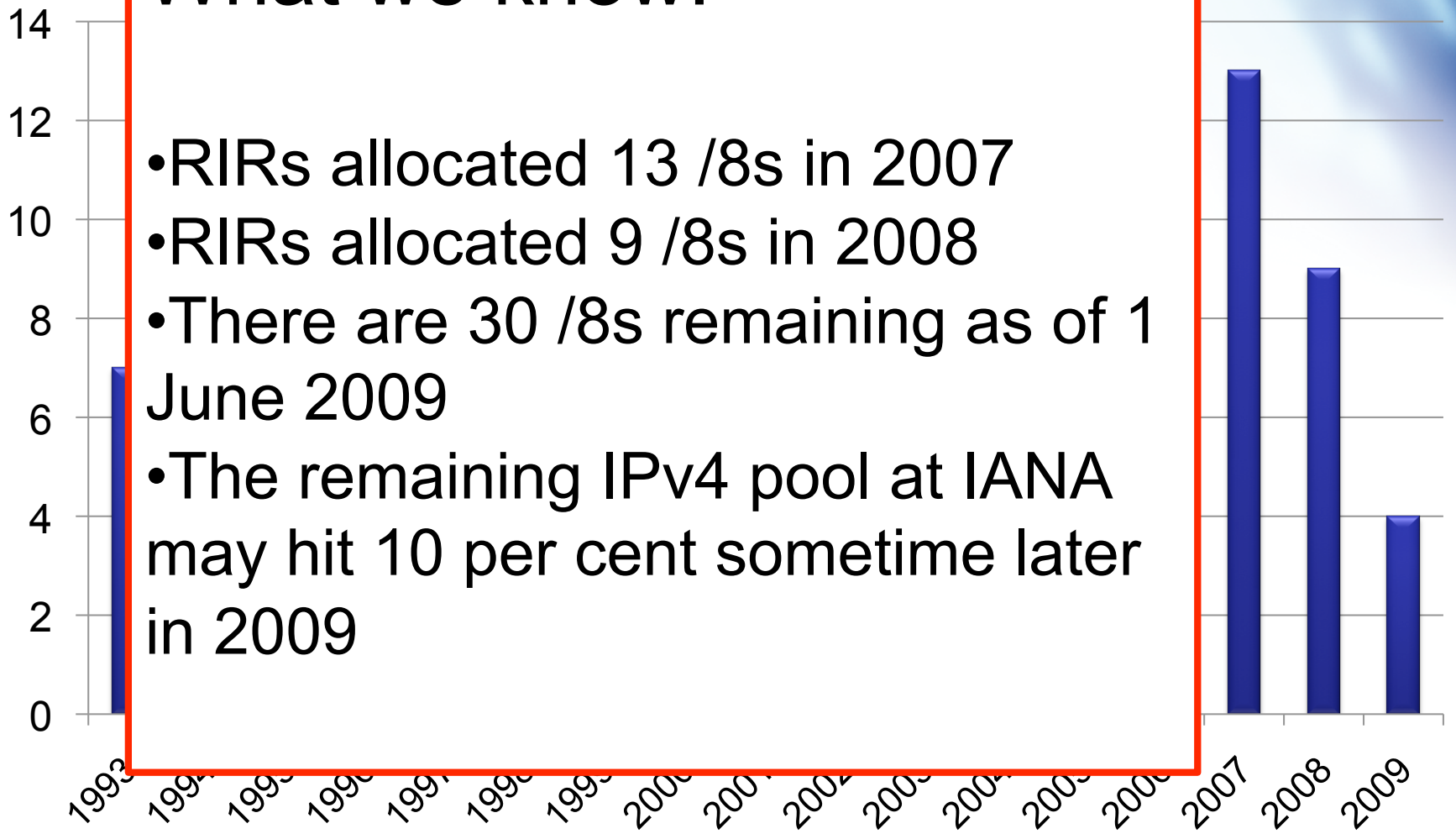
IPv4 allocations from IANA to RIRs



http://www.iana.org/assignments/ipv4-address-space/ as of 01/06/2009

What we know

- RIRs allocated 13 /8s in 2007
- RIRs allocated 9 /8s in 2008
- There are 30 /8s remaining as of 1 June 2009
- The remaining IPv4 pool at IANA may hit 10 per cent sometime later in 2009

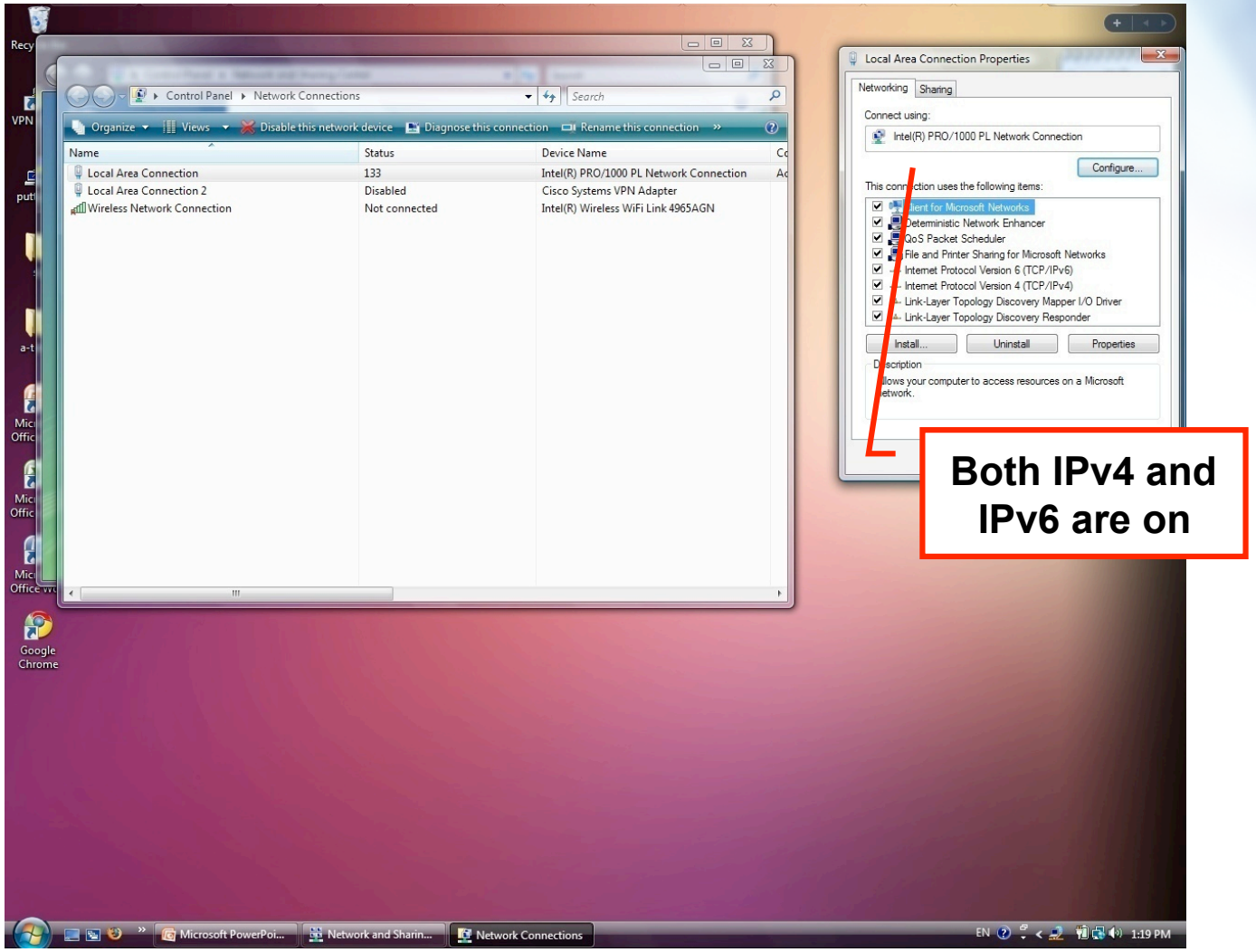
and more devices need to connect too!

Billions of them

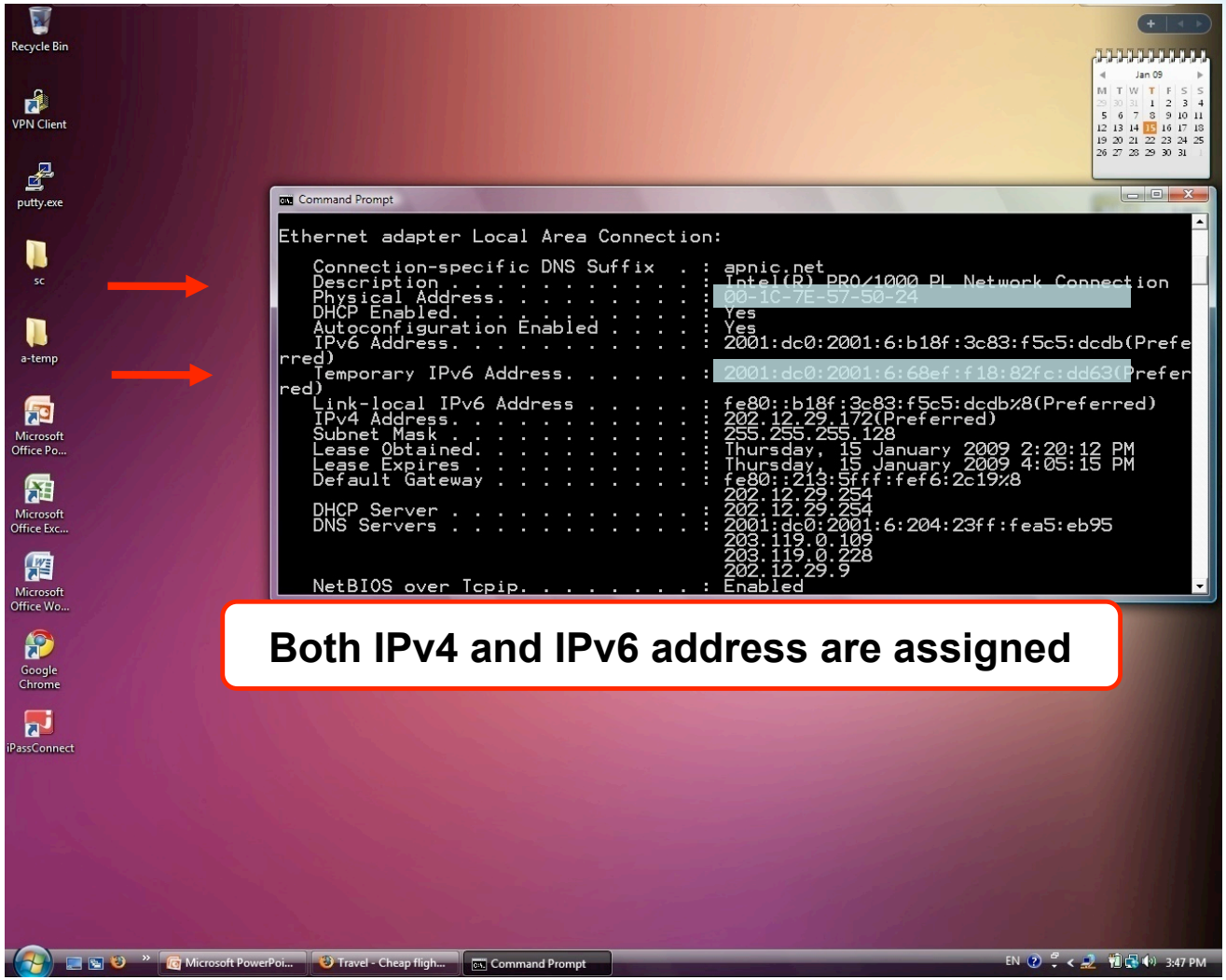
What will happen to my company if my ISP is not ready for IPv6?

- Researchers predict IPv4 legacy assets (client PCs, servers, routers, switches, OSes, various applications, etc) will remain for the next 10 years
  - Dual-stack environment will persist for many years to come
- IPv4 addresses will be assigned strategically
  - Not everyone can receive global IPv4 addresses
  - A large number of end users may be given only IPv6 addresses at some point

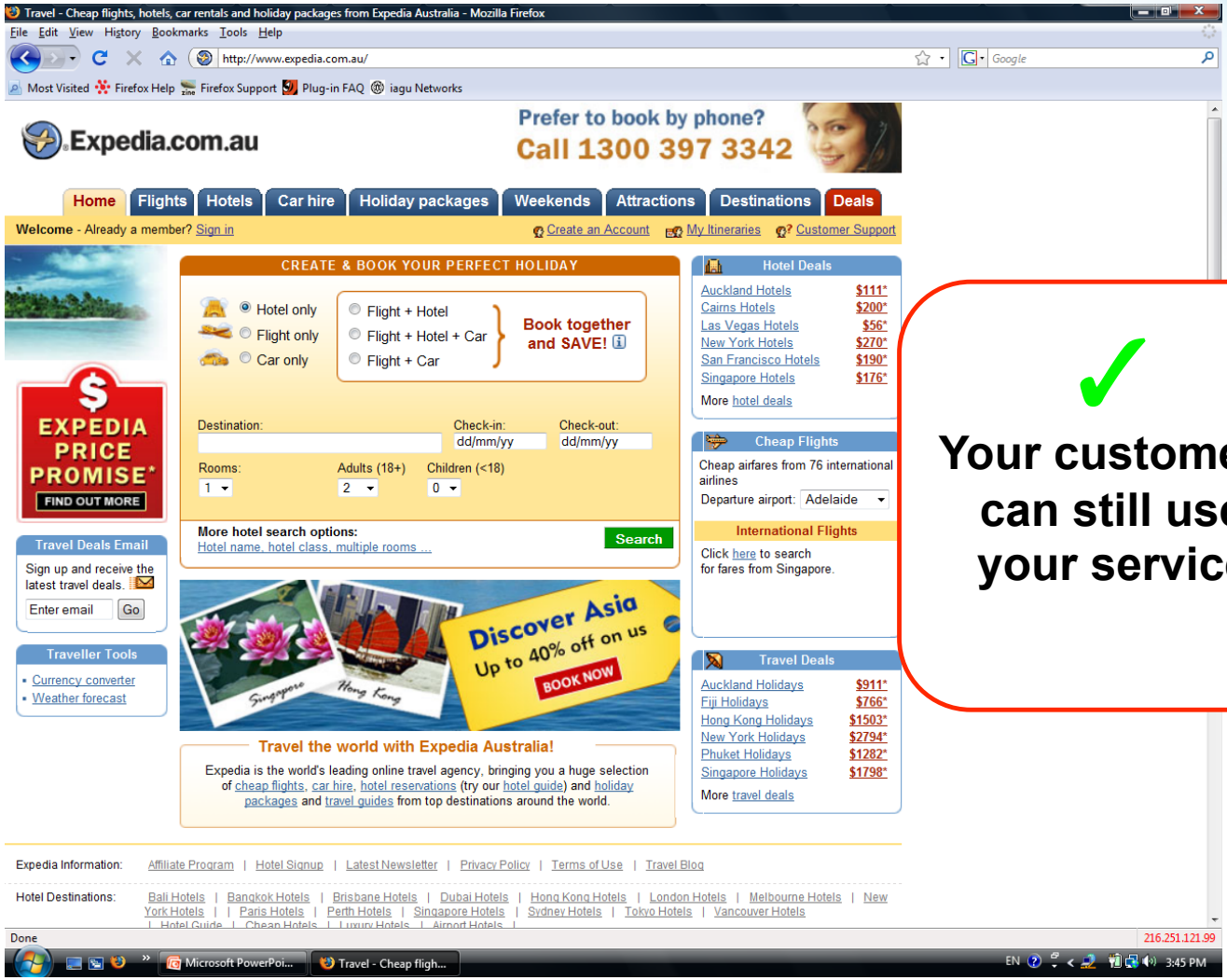
While a client is running with IPv4 and IPv6…



…it receives both IPv4 and IPv6 addresses: dual-stack



So even if a service is only available via IPv4…



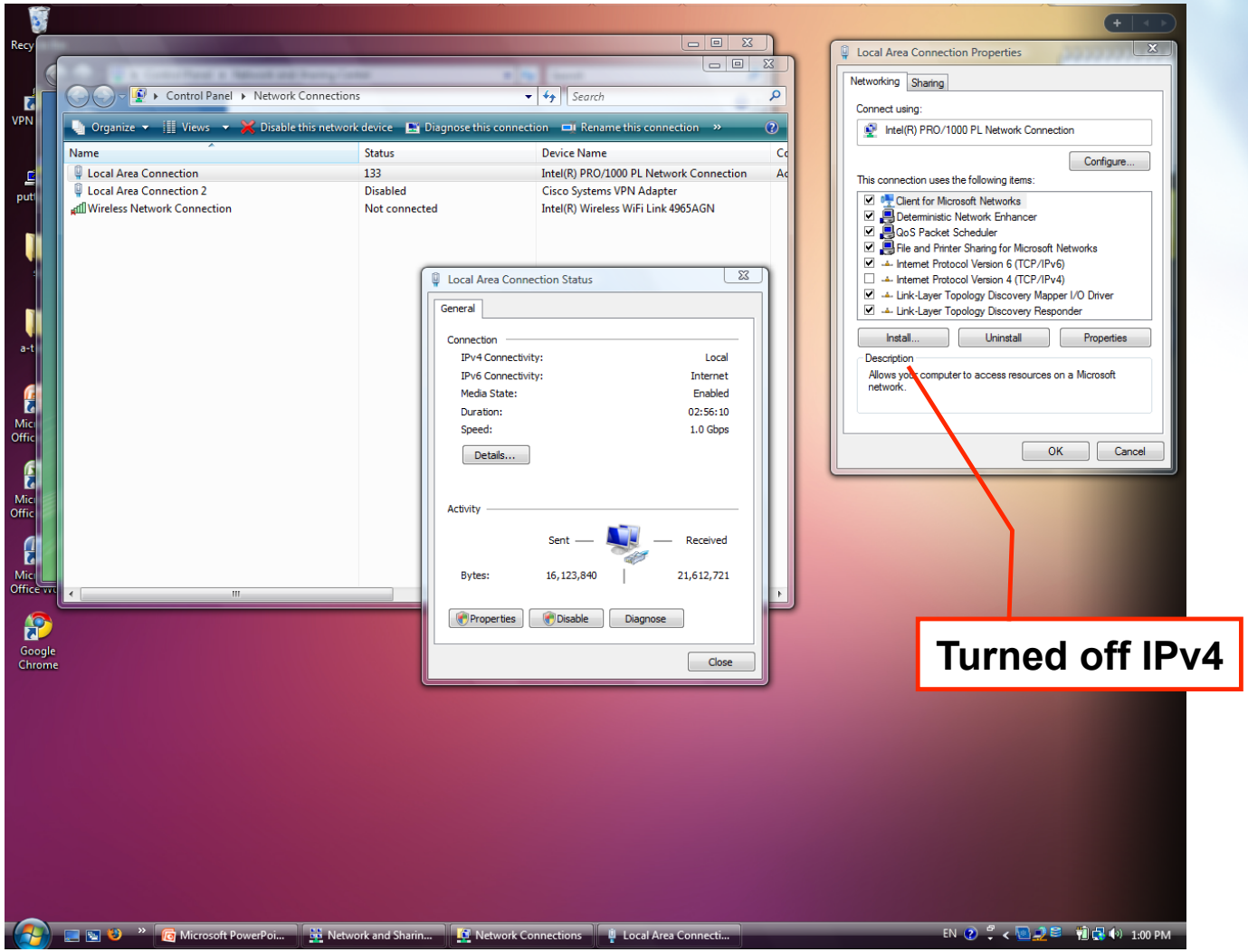
✓

Your customers can still use your service

But one day…

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

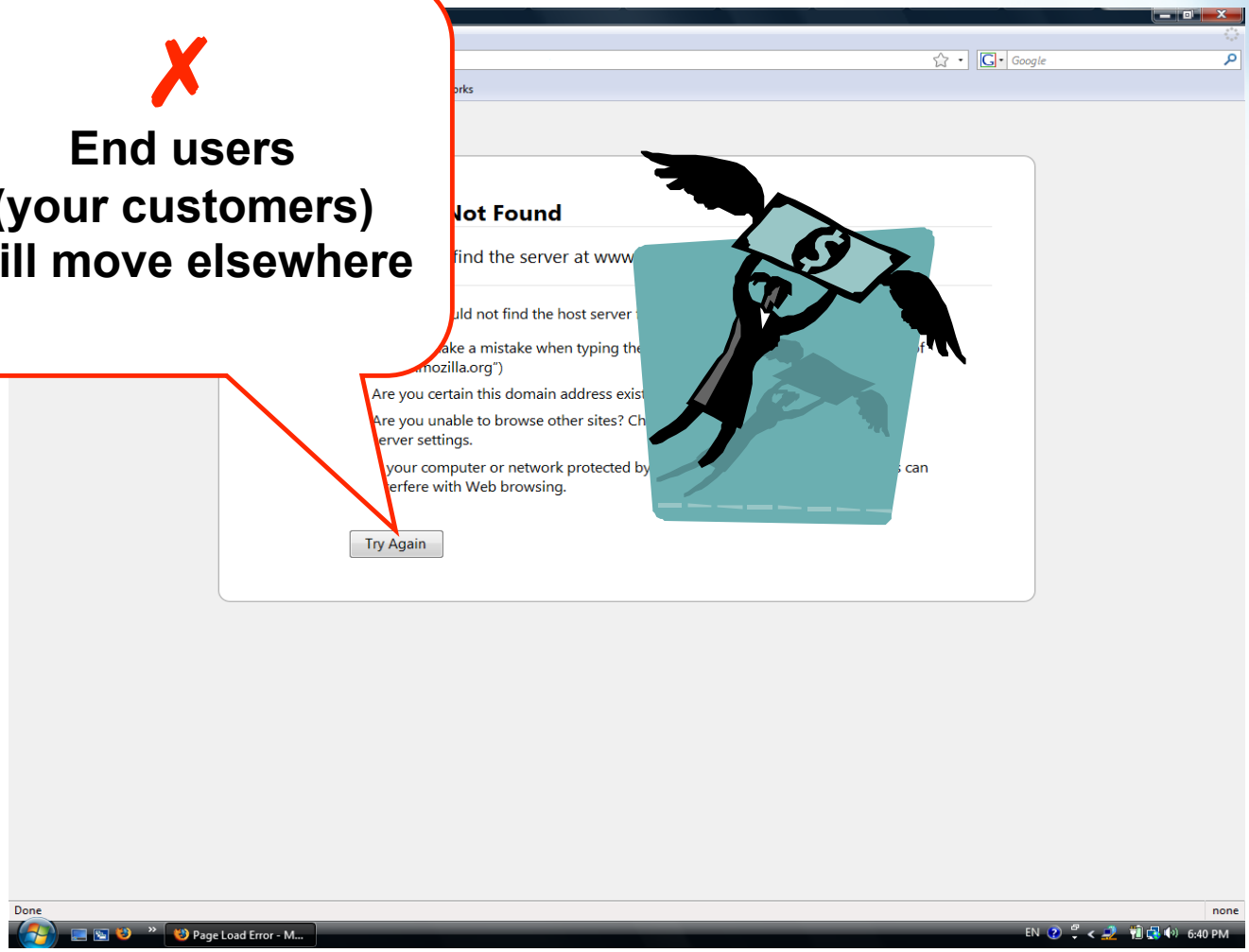
Simulating an IPv6-only client…



If your site is not ready for IPv6…

✗

End users (your customers) will move elsewhere



So why aren't we ready yet?

- It's a simple business reality:
  - Highly competitive environment
    - A company will always spend its available resources on profit-making activities
  - Fundamental nature of IPv6
    - No customers are currently demanding IPv6
    - So, there is currently no pressing business case for deploying IPv6
- However, IPv6 is the only path that enables the Internet to continue to expand
  - Large address space
  - Simpler and cheaper with more efficient networks

The challenge…

- IPv6 is not simply a substitute for IPv4
  - The process may take more than 10 years
  - "Dual-stack networks" will be in use for many years
  - IPv4 addresses will still be needed
- Need to consider long-term costs to maintain IPv4-only networks
  - Customer NAT and Large Scale Nat
  - Complex architecture and renumbering
  - Complexity of applications
  - Rising cost of IPv4 addresses

National responses (AP region)

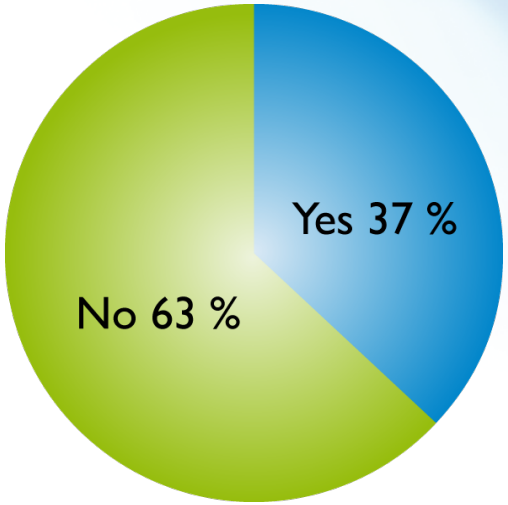
- China
  - Telecommunication and Information Technology Ten of 5 years development Plan (2007)
  - China Next Generation Internet (CNGI) project
    - The future development of the Internet through the early adoption of IPv6
- Japan
  - The IPv4 Address Exhaustion Task Force, including industry and government
- Korea
  - IPv6 Strategy Committee (2003)
  - NIDA “IPv6 Promotion Plan II” (2007)
  - Deployment of IPv6 in the public sector

RIR response

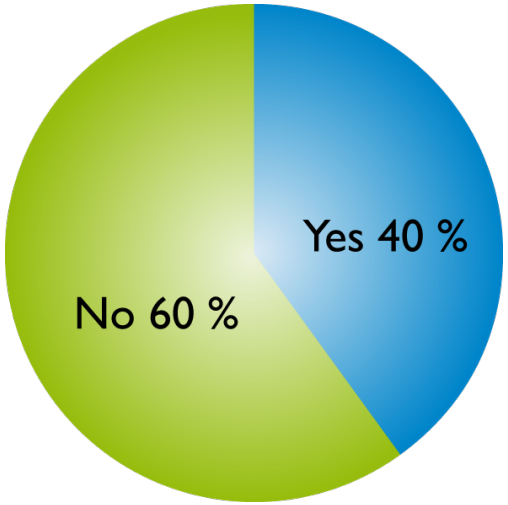
- IPv4 address management policies
  - Numerous policy measures about the reclamation of IPv4 space under discussion
    - Transfer/trading (market) for address management
    - Rationing, reserves, limiting demand
  - Numerous new policies were implemented
    - Use of final /8
    - Ensuring efficient use of historical IPv4 resources
- IPv6 network deployment activities
  - Address policies are established and stable
  - Increasing promotion and awareness
  - Putting preparations in place
  - The time is right!

APNIC IPv6 Readiness Survey 2009

- Have you deployed or are you ready for immediate IPv6 deployment?

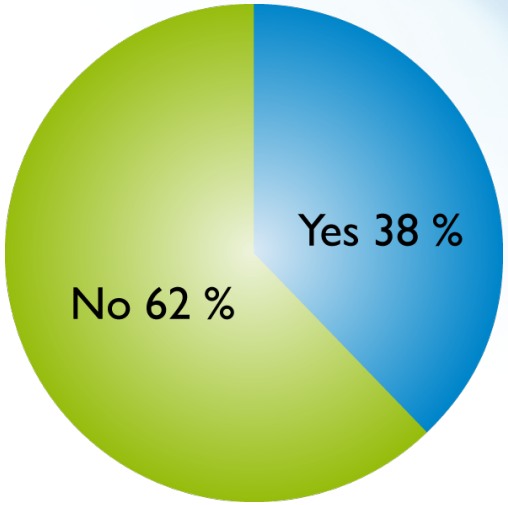


- Does your organization have a formal plan to deal with the deployment of IPv6?

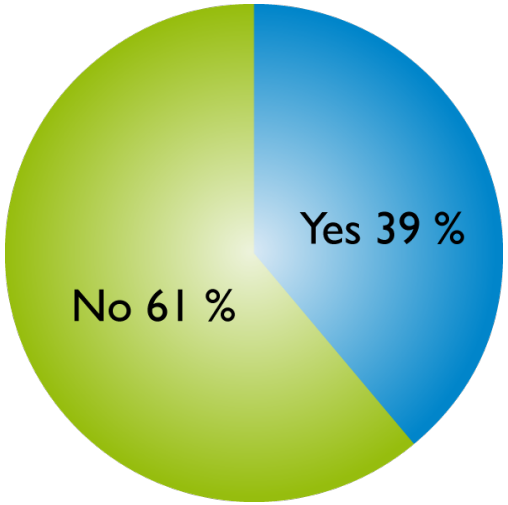


APNIC IPv6 Readiness Survey 2009

- Has your organization budgeted for future resource allocation for IPv6 deployment?



- Has your organization allocated resources (human or financial) for IPv6 deployment?



The future…

- The Internet has already shown its ability to evolve
  - Those who are building the Internet need to be aware of IPv4 consumption and IPv6 transition
    - ISPs, content providers, vendors, applications
  - Planning should start now, in detail, for the day when there is not enough IPv4 address space
    - Implementation plan, budget, and allocation of resources
  - A smooth transition is still possible

Transition planning for content providers: Multihoming via IPv6

- Obtain IPv6 address assignment
- Find an ISP that can provide you IPv6 connectivity
  - Contract to secure IPv6 connectivity
  - Use tunnels if necessary
- Find Internet exchange points that support IPv6
- Peer with other IPv6 networks as much as you can

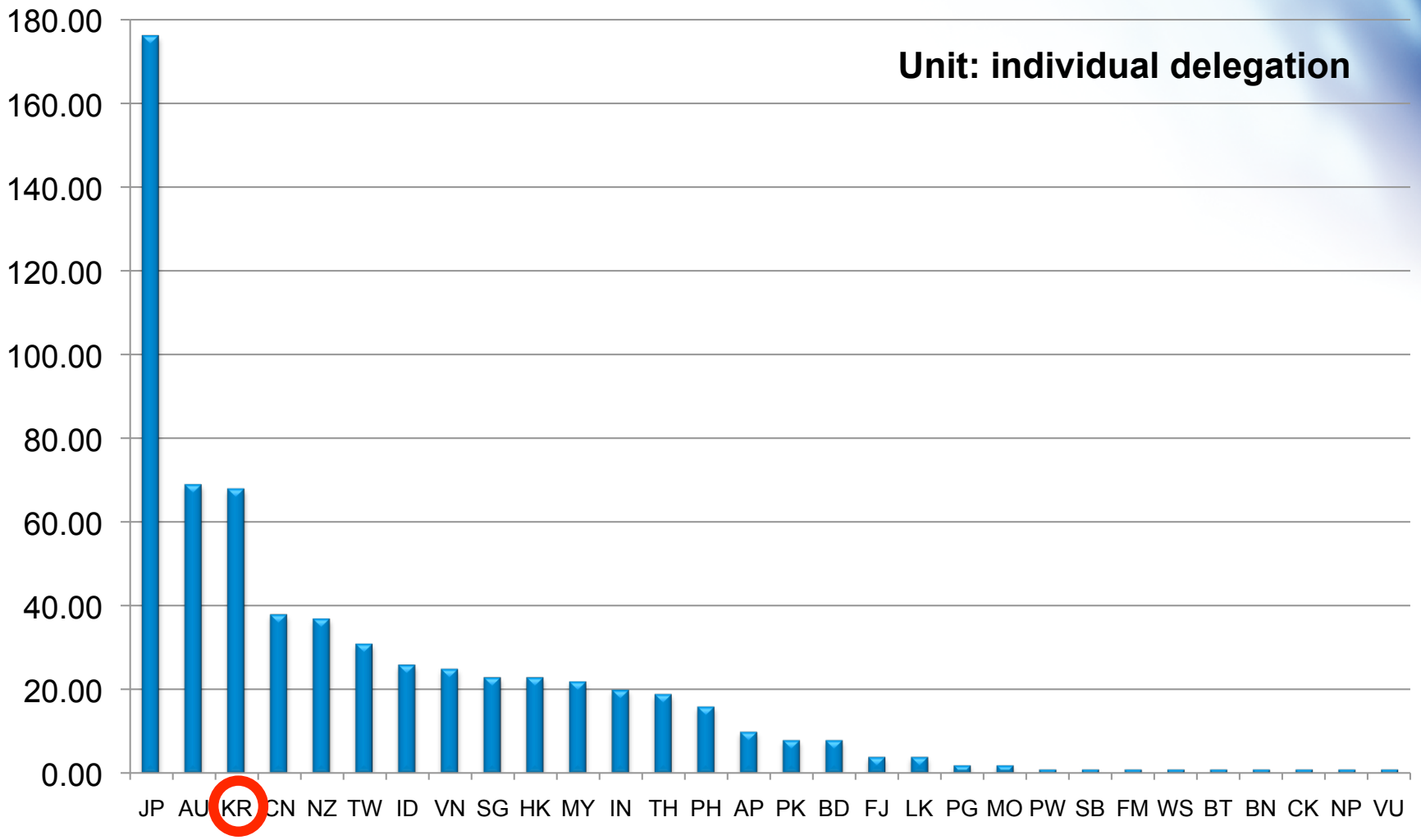
Transition planning for network operators: Deploy IPv6 by 2010

- Your customers - for example, content providers, enterprises etc - will eventually demand IPv6 connectivity
  - Be ready for them!
- Plan for deployment
  - APNIC suggests that network operators and service providers be prepared to support customers and services using IPv6 by 2010
  - Build IPv6 into regular product upgrade cycles
  - Contact your vendors now!

Transition planning for policy makers: Support the industry

- Industry, regulators, and public policy makers
  - Develop a coherent strategy to sustain the transitional framework between IPv4 and IPv6
  - Deploy IPv6 in government infrastructures, and require it of your suppliers
  - Encourage the continuing contribution of various stakeholders in mutually supportive roles
- Keep up-to-date with topics of IPv4 address exhaustion and IPv6 transition

APNIC IPv6 delegation by economy

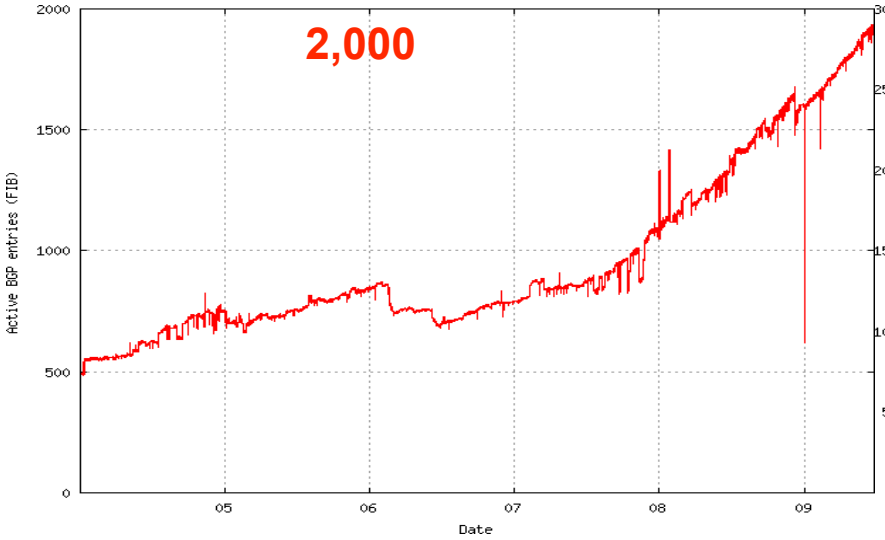


http://www.apnic.net/stats/o3/ as of 25/06/2009

How much IPv6 is deployed?

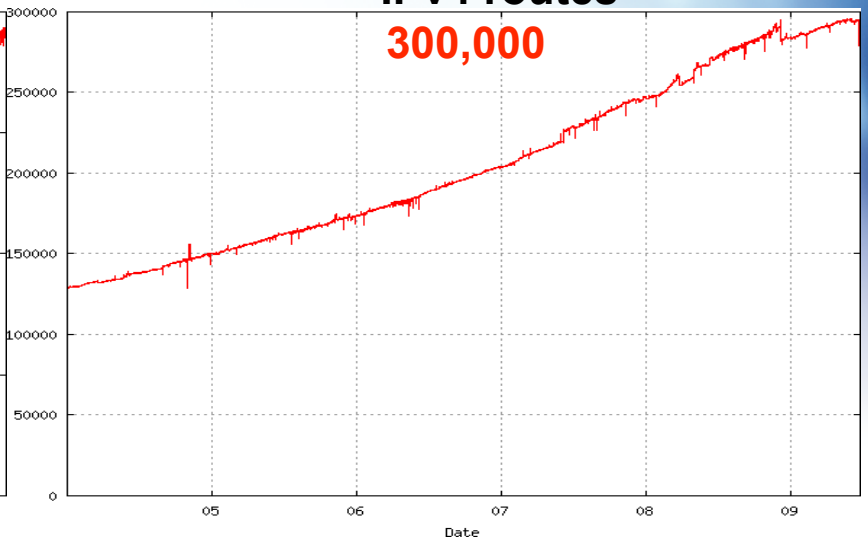
IPv6 routes

2,000



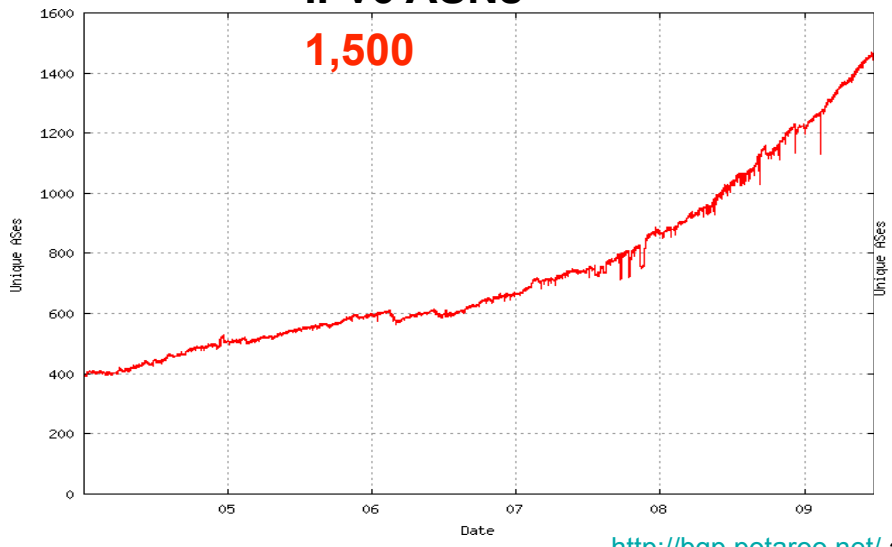
IPv4 routes

300,000



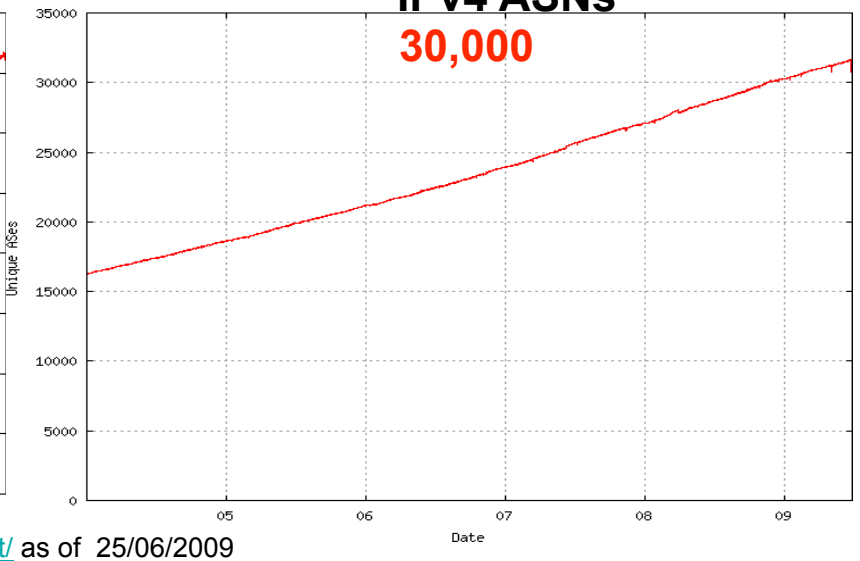
IPv6 ASNs

1,500



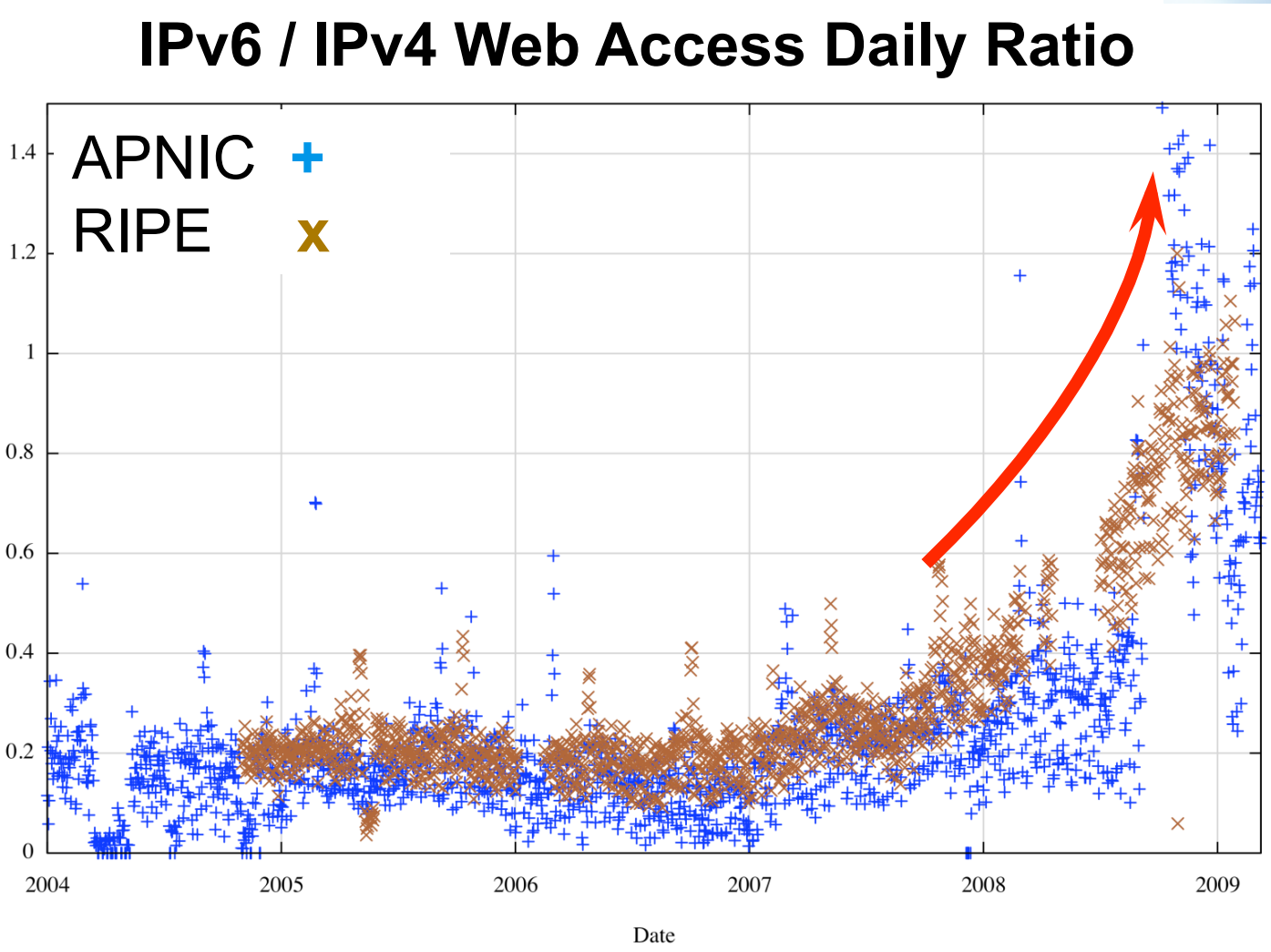
IPv4 ASNs

30,000



http://bgp.potaroo.net/ as of 25/06/2009

Upward trend



APNIC R&D data as of 01/06/2009

IPv6 deployment opportunities

- What benefits can you create by deploying IPv6 in your region?
- A new industry without much legacy
  - Effective use of the Internet for socio-economic development?
    - Point-to-point connectivity in remote learning environments?
    - Effective use of multicasting to conserve bandwidth?
  - Stable, continuous Internet for:
    - Disaster risk management and risk reduction?
    - Early warning and response to disaster risks?
  - Effective use of IPv6's new features?
    - Transportable communication system for effective disaster and emergency management?
  - Energy efficient networks?
    - Deploy new technologies with less power consumption?
    - Positive impact to the environment?

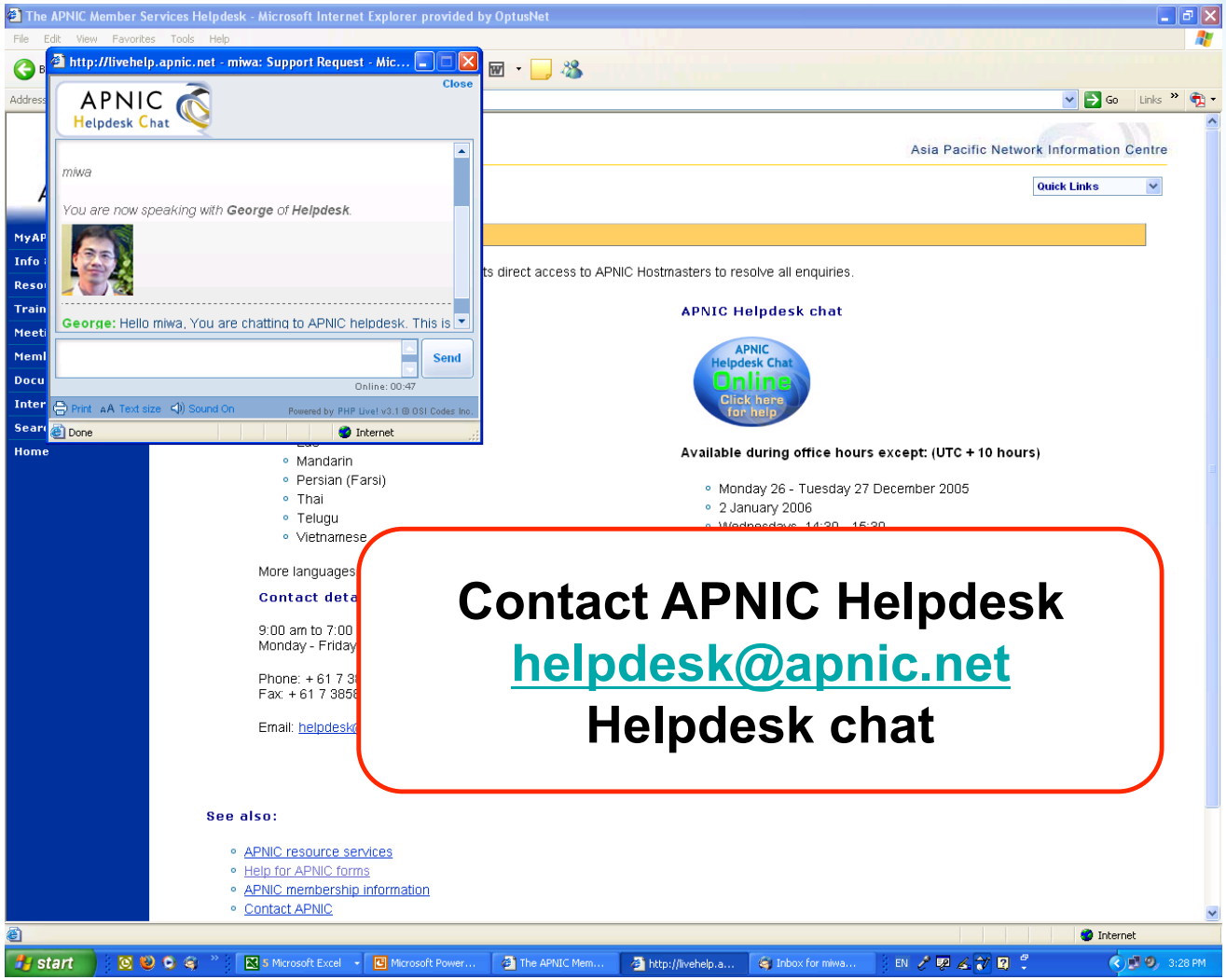
Recent IPv6 implementation case Q2, 2009

- Sify.com India enabled their services with IPv6
  - Internet access to enterprise customers
  - MPLS-based IP-VPN services
- Orange Business Services deployed IPv6 in its MPLS IP VPN backbone
  - Available in 35 countries in Q2 2009
  - Gradually extended to more than 100
- FX Networks in NZ
  - High performance national Internet backbone is natively running IPv6 in parallel with IPv4 and is available for customers to use
  - To sustain their business with Asian business partners

http://sev.prnewswire.com/computer-networks/20090528/3907349en_iCrossing28052009-1.html
http://www.orange.com/en_EN/press/press_releases/att00012170/print.jsp
http://www.geekzone.co.nz/content.asp?contentid=8251

Need IPv6 addresses?

Need IPv6 addresses?



APNIC IPv6 Readiness Survey 2009

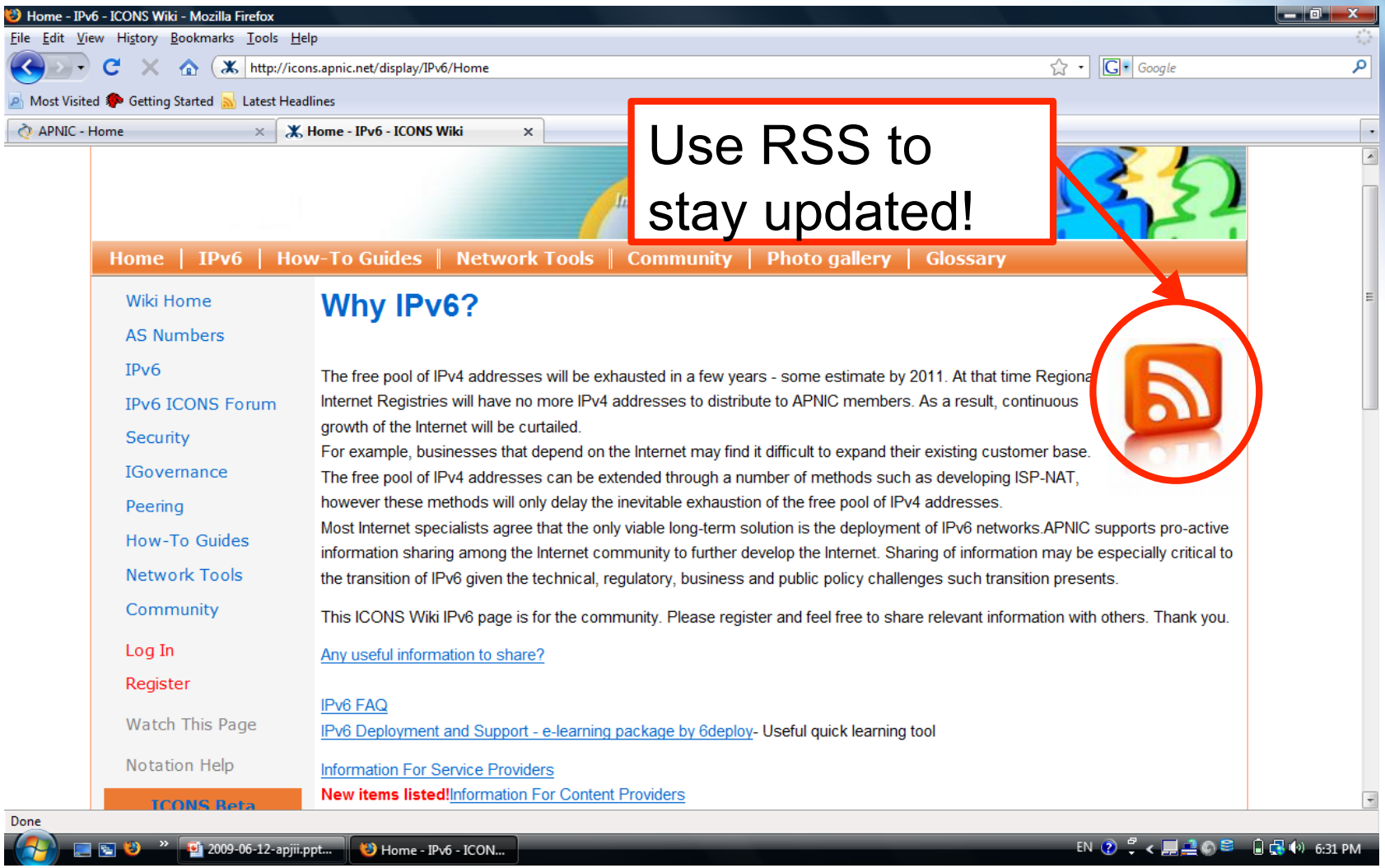
- APNIC should have a bigger role in promoting IPv6 deployment within the AP region
  - Mean: 8.44, Standard deviation: 1.72
- Governments should require IPv6 compliance within entities under their control
  - Mean: 7.32 Standard Deviation: 2.38

APNIC supports IPv6 deployment

- APNIC IPv6 Program – since 2008
  - Miwa Fujii <miwa@apnic.net>
  - Rolling out various IPv6-related activities
  - ICONS IPv6 Wiki and IPv6 ICONS Forum
    - http://icons.apnic.net/display/icons/Home
    - Your participation will help the Internet community
- APNIC meetings are open to everyone!
  - Next meeting is in Beijing http://www.apnic.net/meetings/28/
  - Many thanks for CNNIC's sponsorship

ICONS IPv6 Wiki

http://icons.apnic.net/IPv6



APNIC 28: Beijing, China

Thank You!

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