

# Expanding the Internet: The IPv4 to IPv6 transition

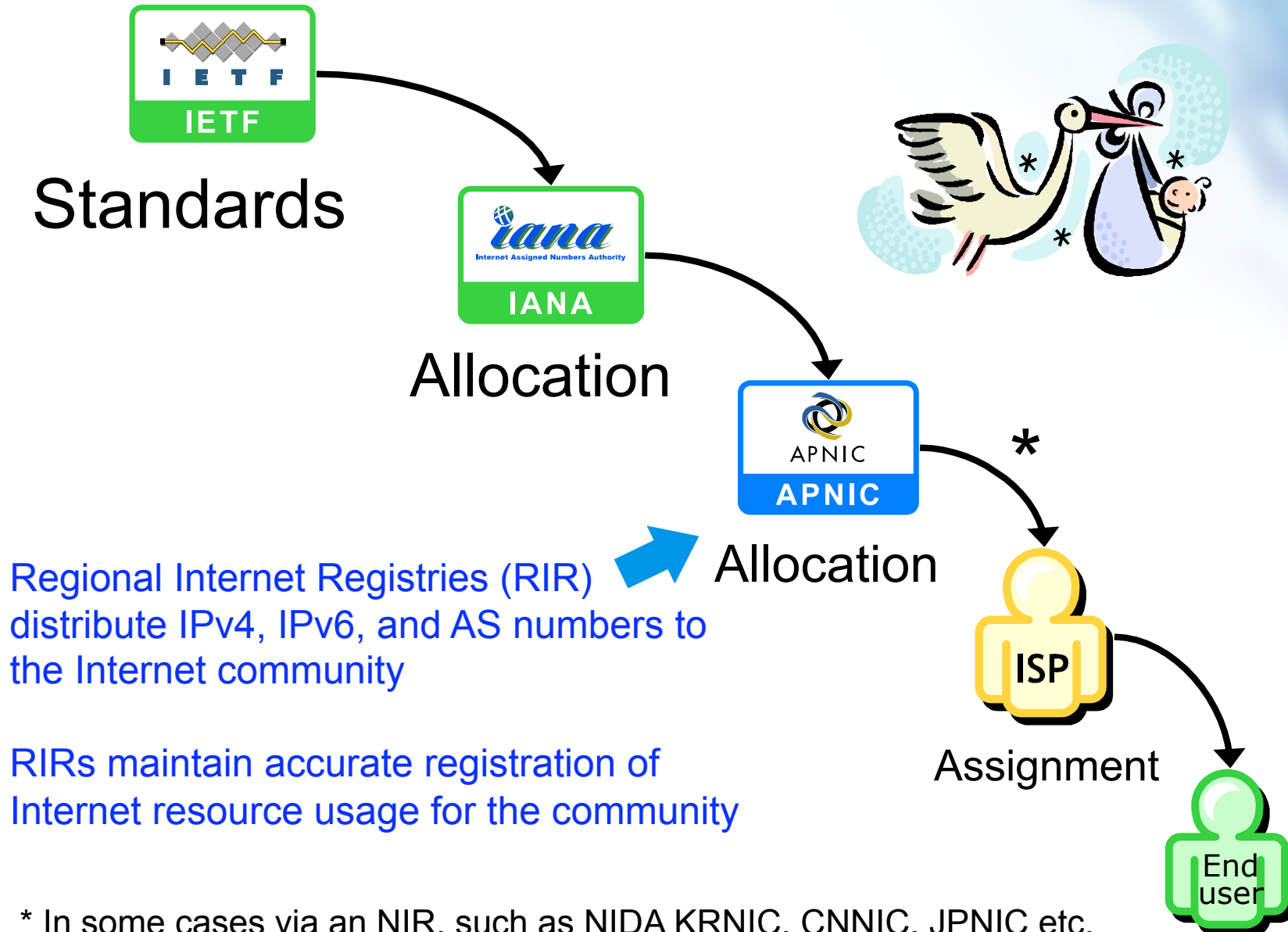
Global IPv6 Summit in Korea 2009  
Seoul, 10 July 2009

Miwa Fujii  
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?

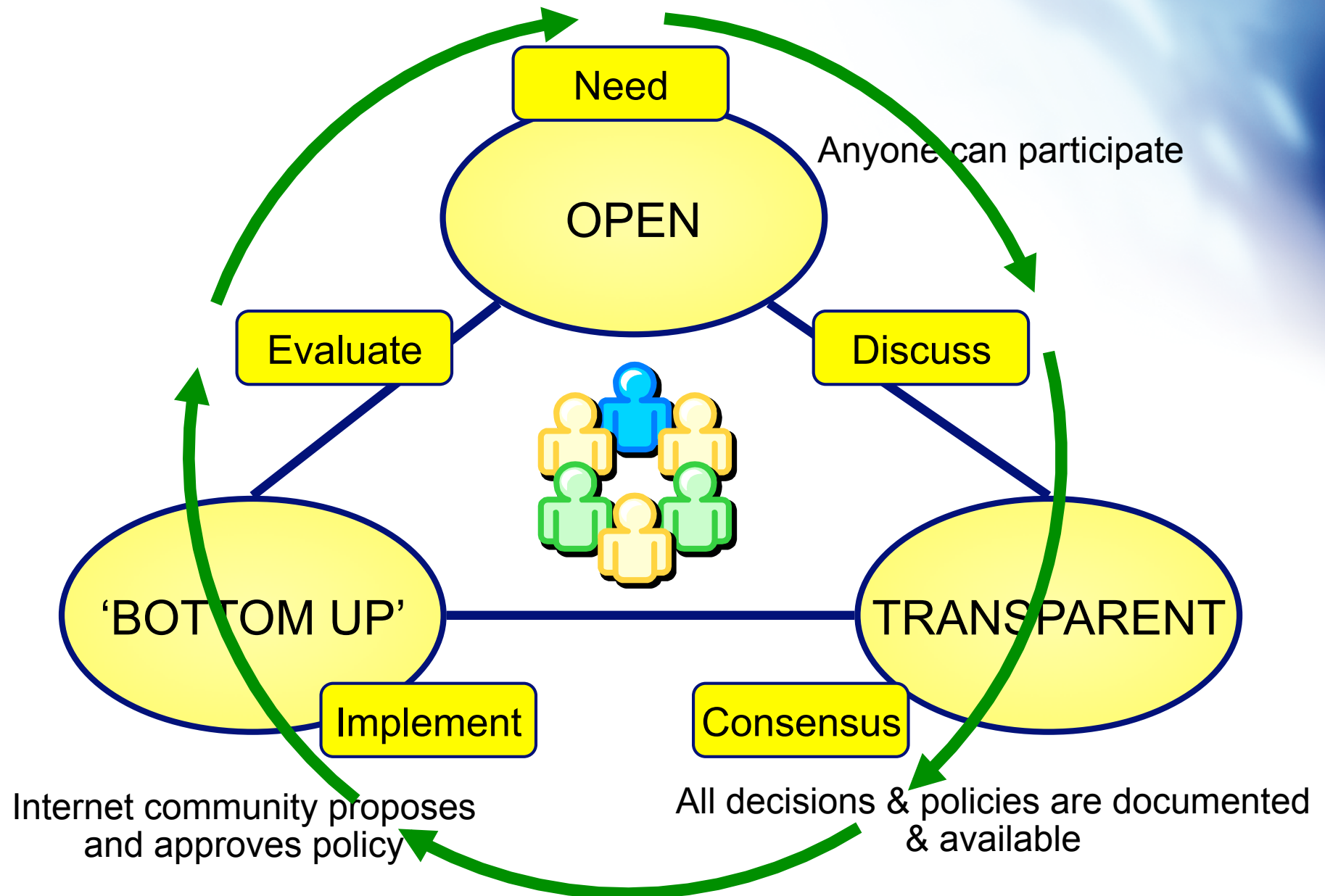


# Regional Internet Registries

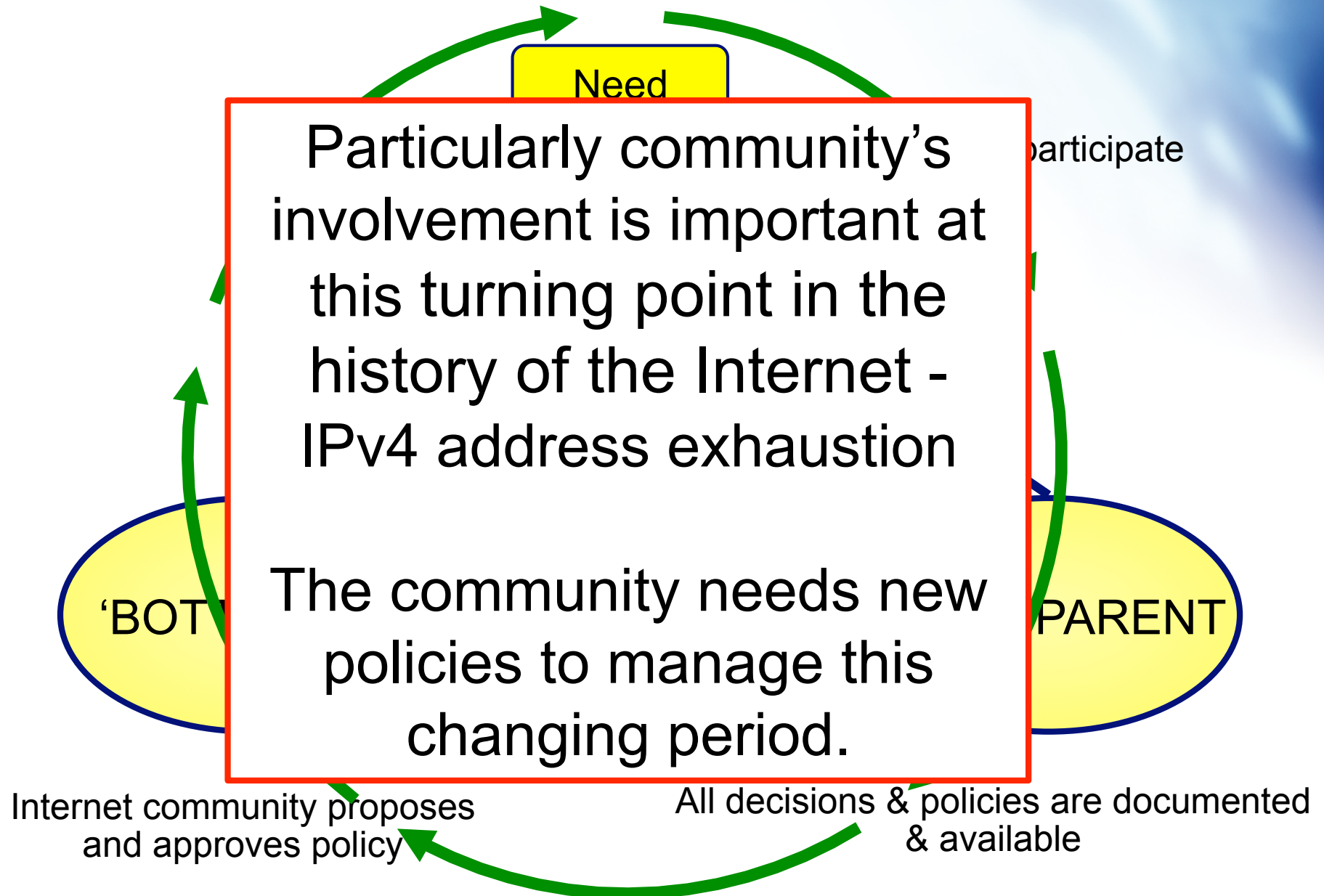


The Internet community established the RIRs to provide fair and consistent resource distribution and accurate resource registration throughout the world.

# The policy development process



# The policy development process





# The policy development process

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

## APNIC's Policy Development Manager

**Sam Dickinson**  
[sam@apnic.net](mailto:sam@apnic.net)





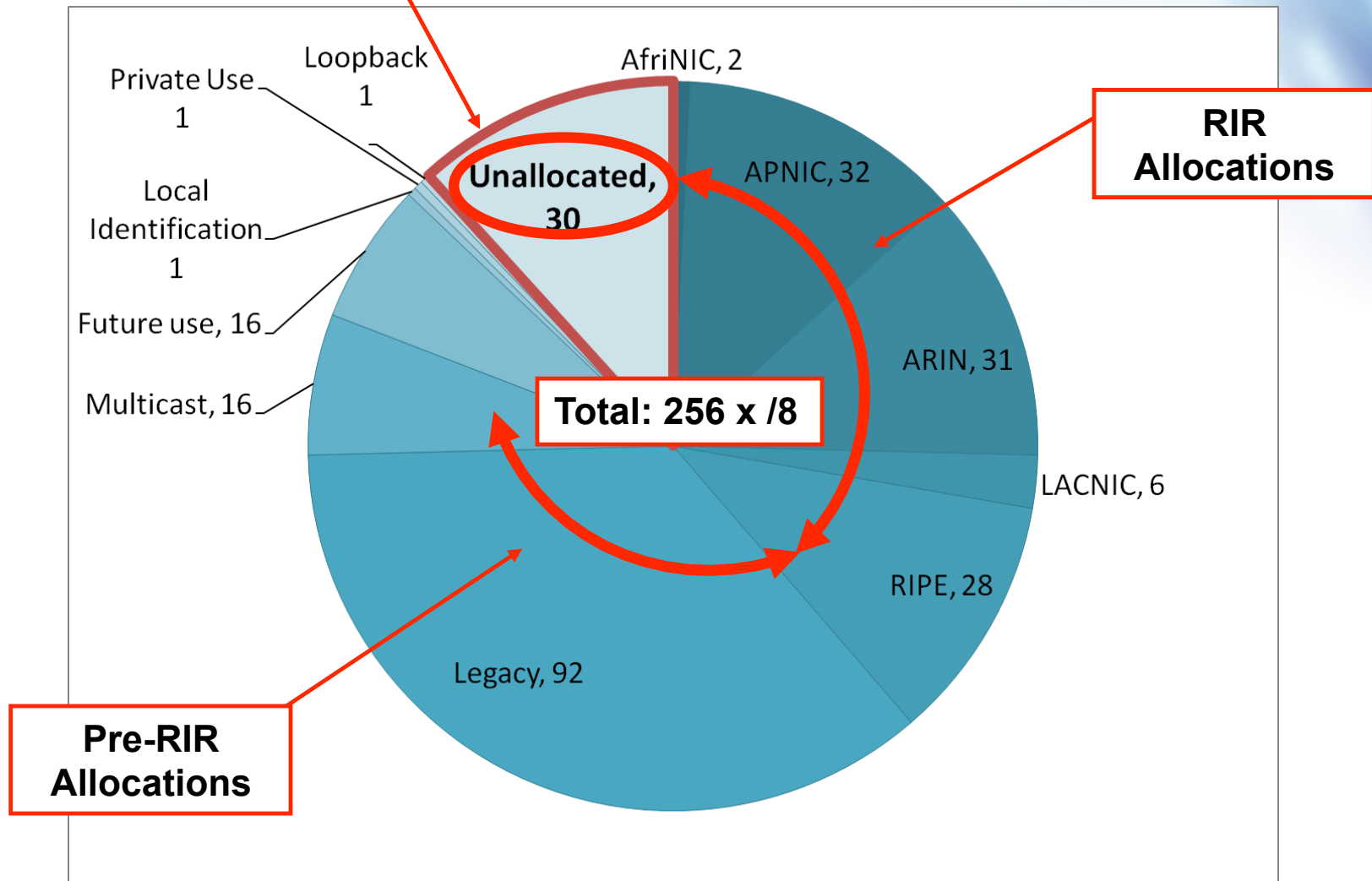
# Current policy discussions

- 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

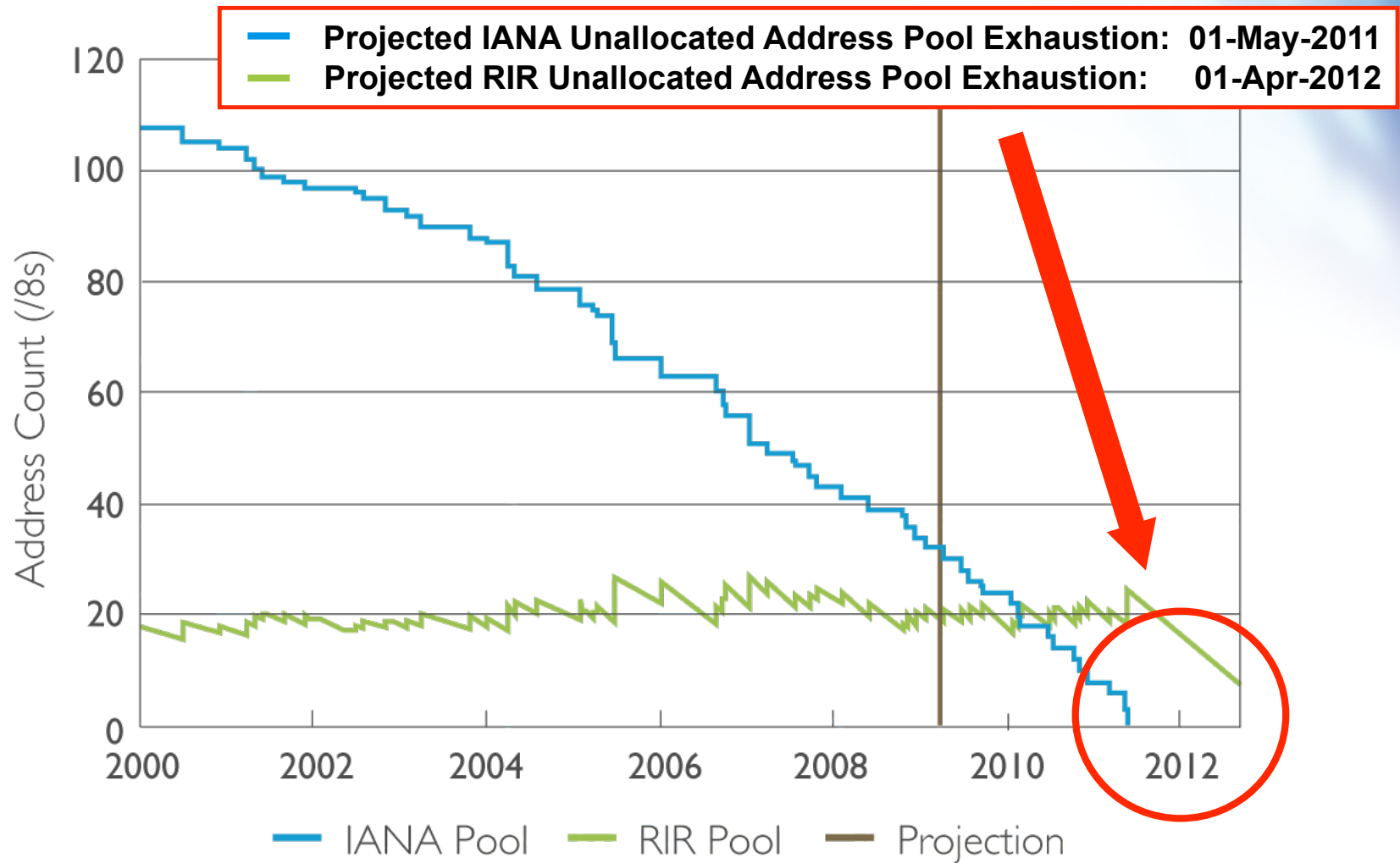


# Remaining IPv4 /8s at IANA

Remaining at IANA 30 x /8

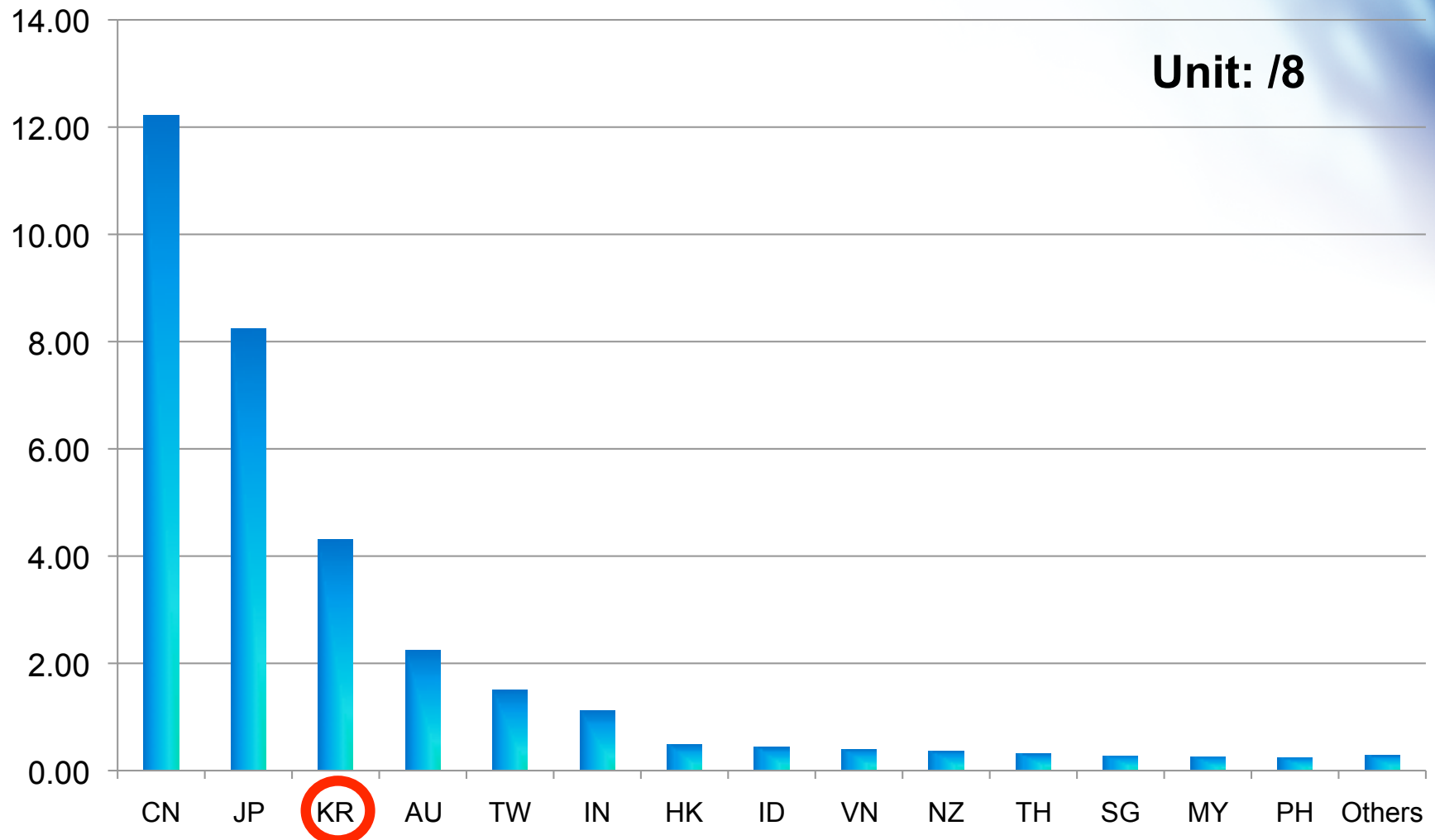


# IPv4 consumption – Projection





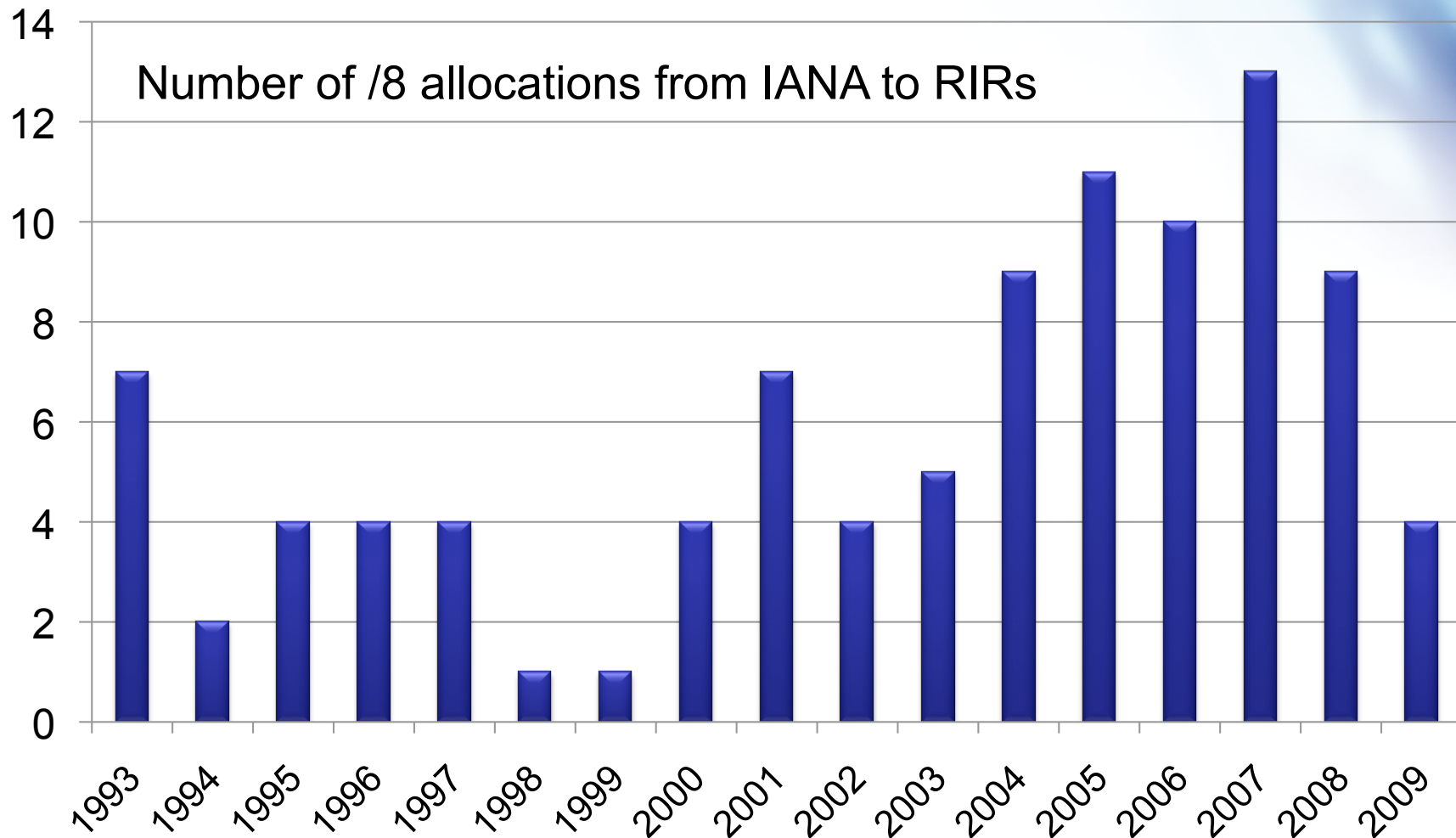
# APNIC IPv4 allocations by economy



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



# IPv4 allocations from IANA to RIRs

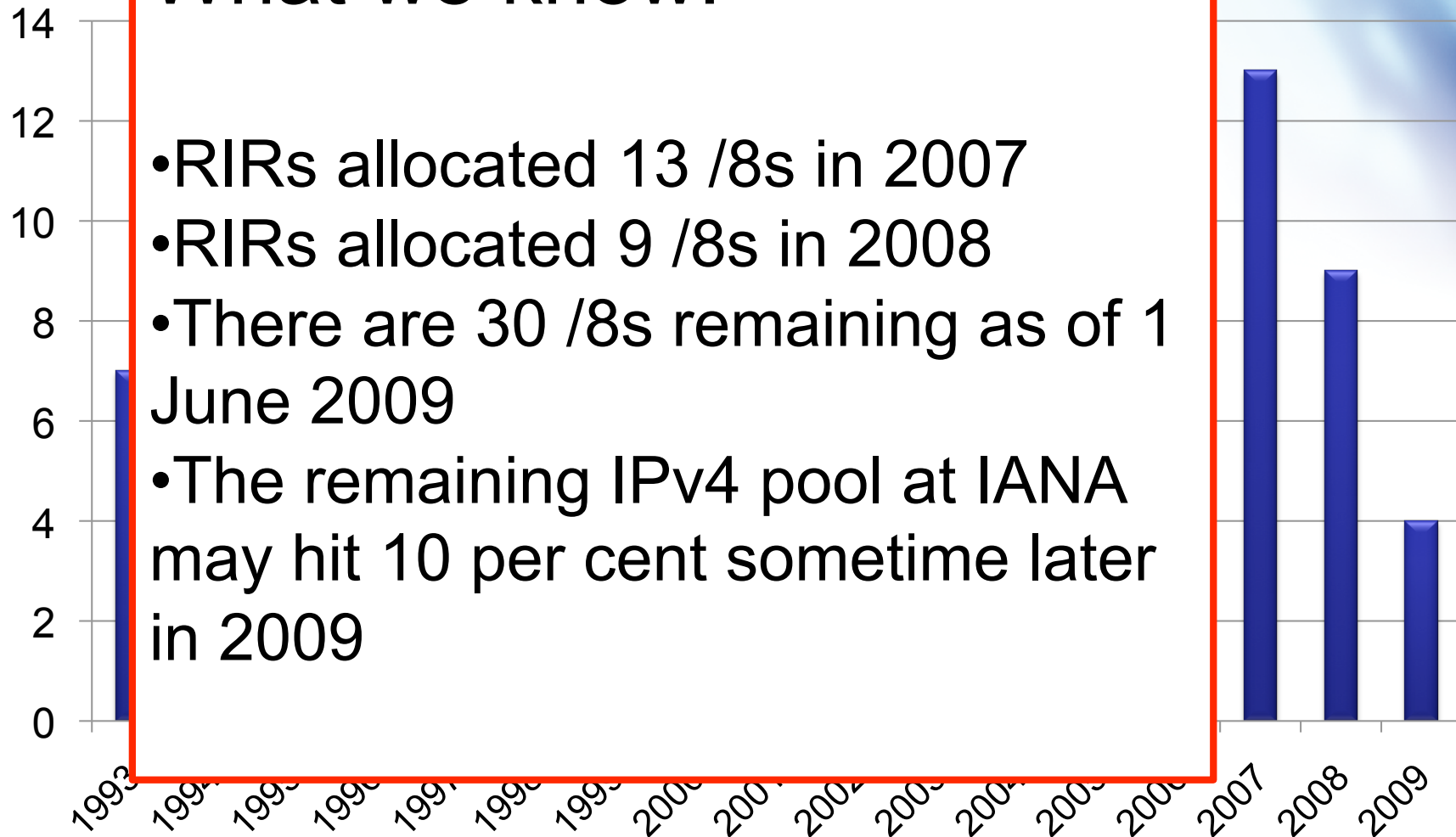




# IPv4 allocations from IANA to RIRs

## 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



## What we know

- RIRs allocated 13 /8s in 2007
- RIRs allocated 9 /8s in 2008
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# and more devices need to connect too!

Billions of them



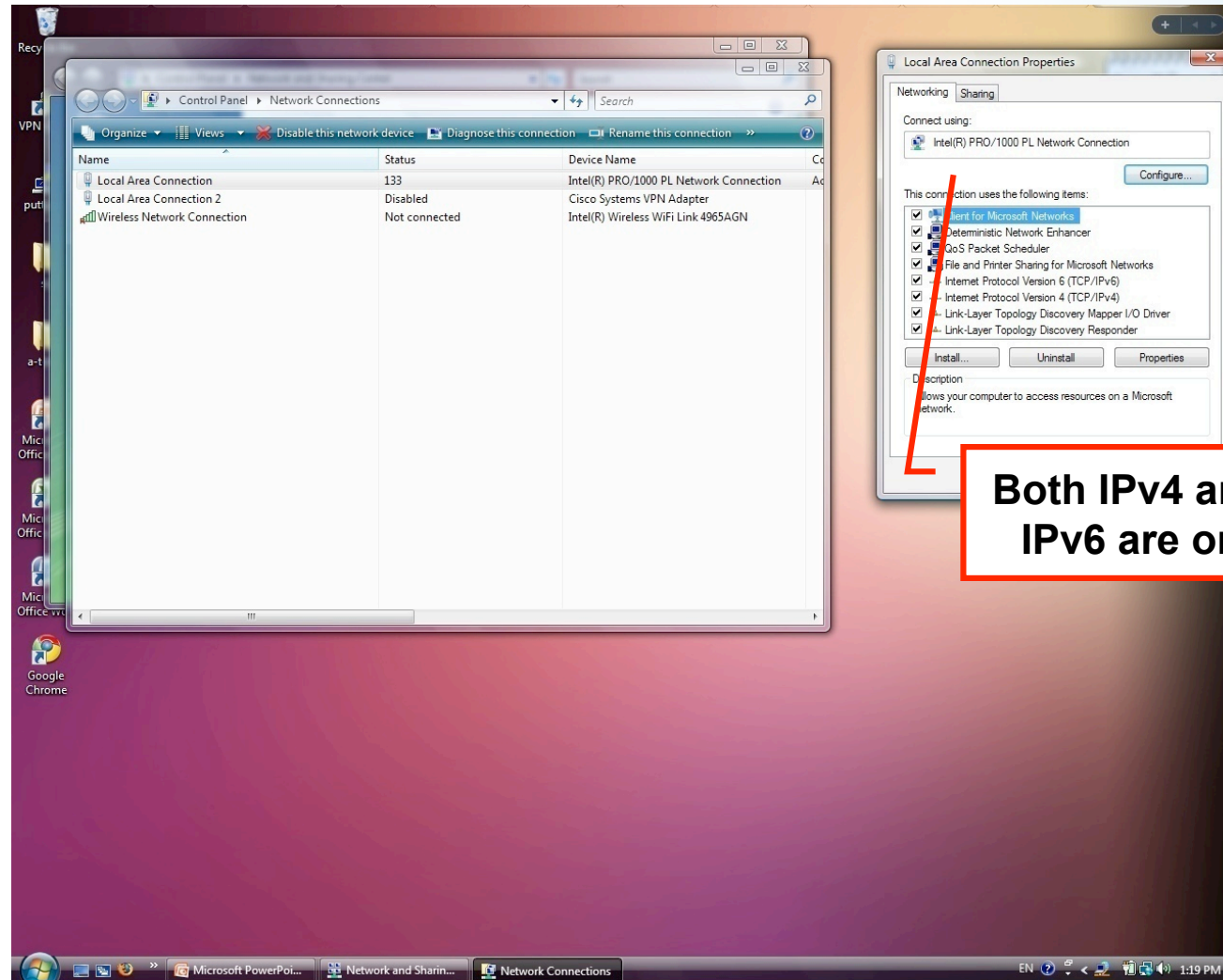
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拡大写真をご覧いただけます。



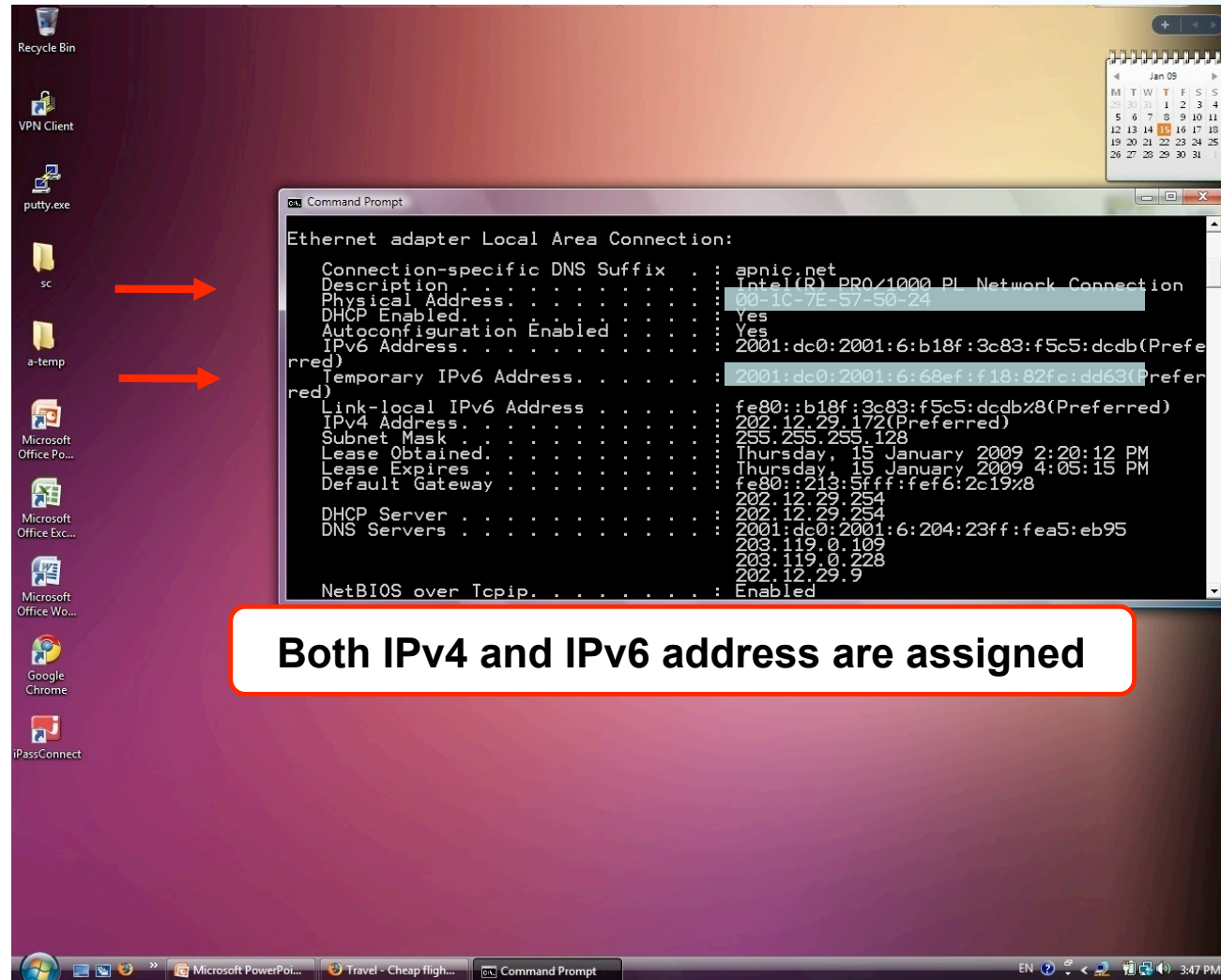
# What will happen to my company if my ISP is not ready for IPv6?

- 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...

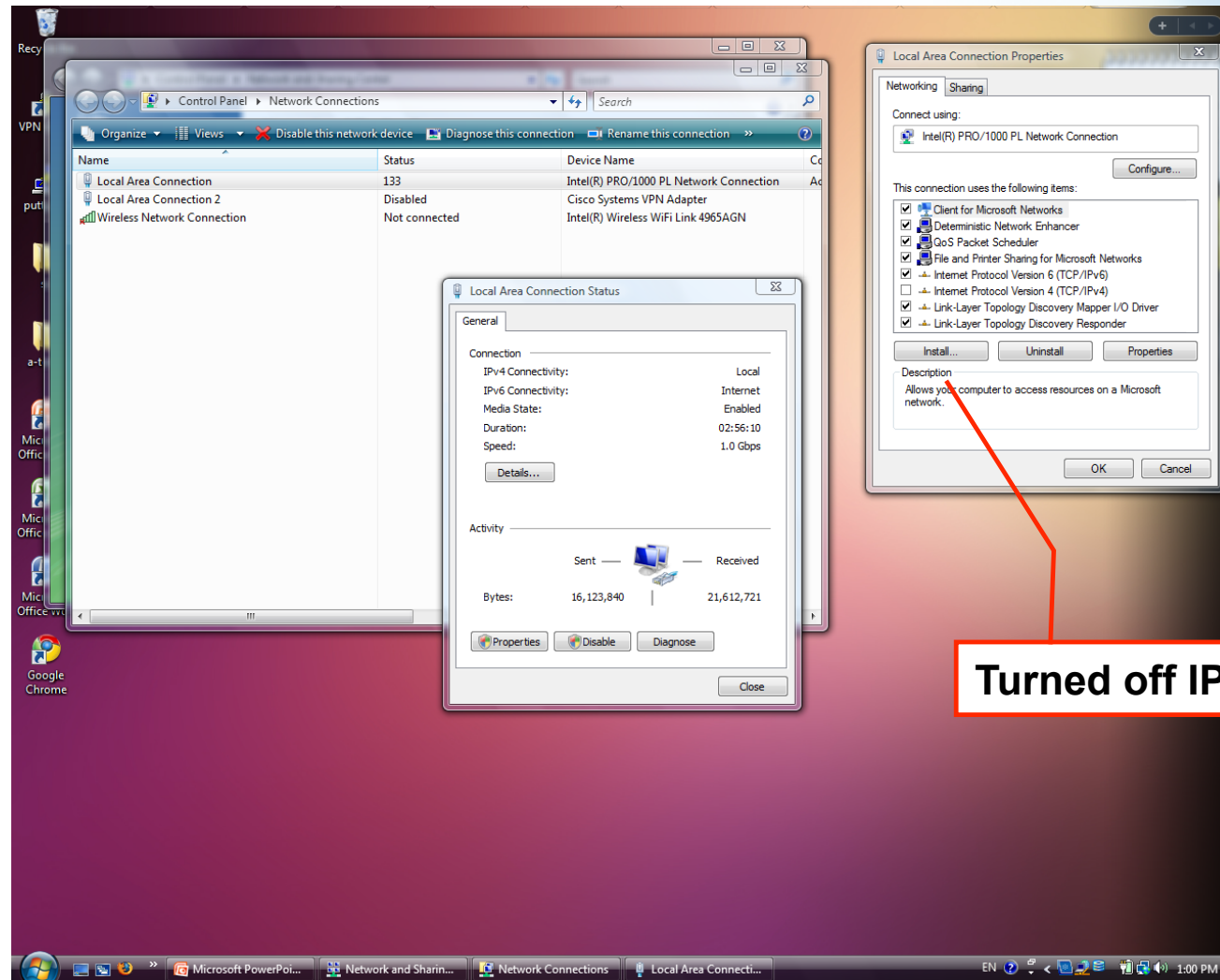
The screenshot shows the Expedia Australia website interface. The browser window title is "Travel - Cheap flights, hotels, car rentals and holiday packages from Expedia Australia - Mozilla Firefox". The address bar shows "http://www.expedia.com.au/". The page features a navigation bar with links like Home, Flights, Hotels, Car hire, Holiday packages, Weekends, Attractions, Destinations, and Deals. A prominent "EXPEDIA PRICE PROMISE" badge is visible. The main content area includes a "CREATE & BOOK YOUR PERFECT HOLIDAY" section with options for Hotel only, Flight + Hotel, Flight + Hotel + Car, and Flight + Car. There are also sections for "Hotel Deals" and "Cheap Flights". A red box on the right side of the page contains a green checkmark and the text "Your customers can still use your service".

## But one day...

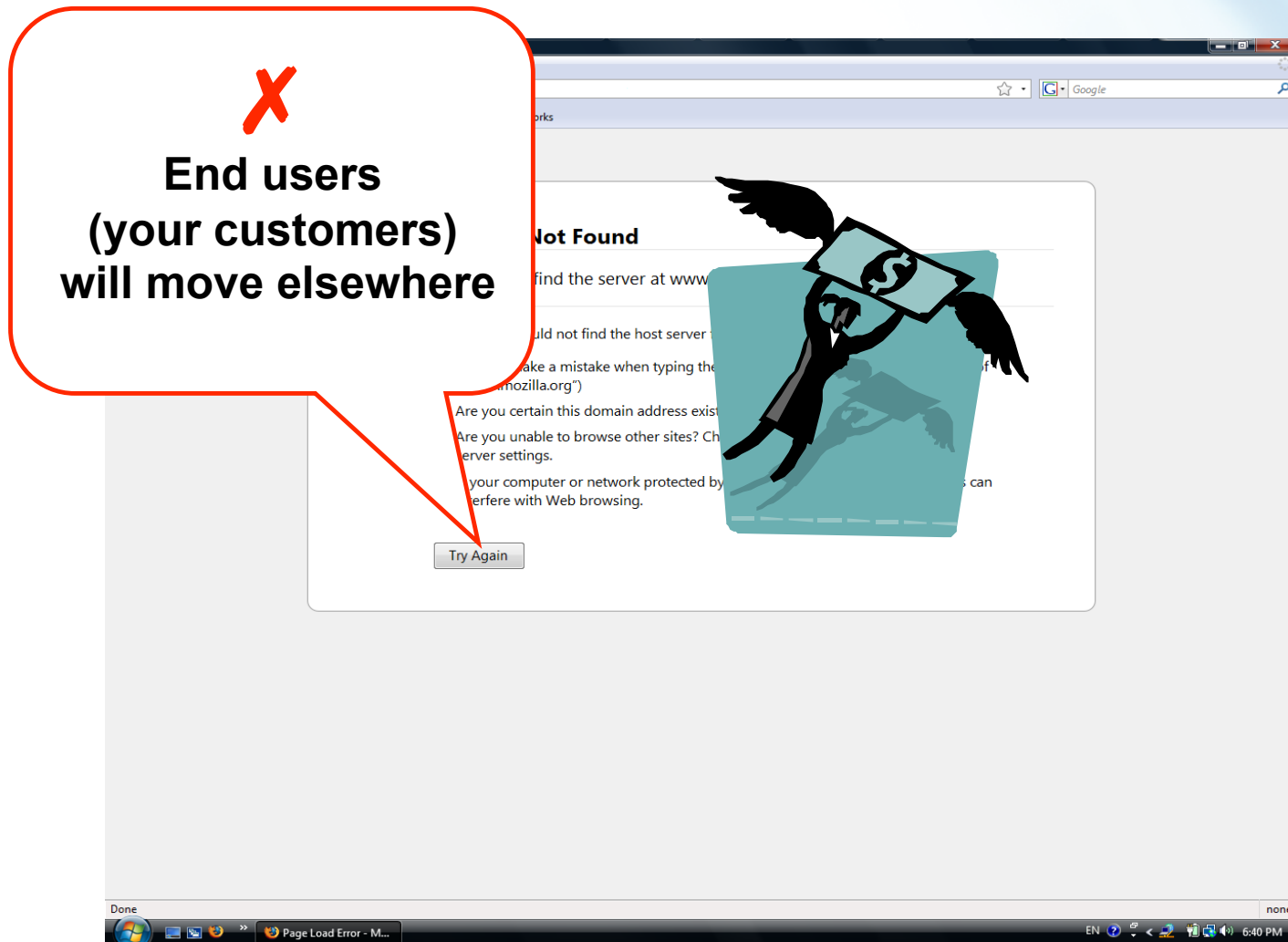
- In the future, many end users (that is, your customers) will only receive an IPv6 address
  - Many “clients” access the Internet via an IPv6 address
  - So, if your web service is not ready via dual-stack networks, what will happen?



# Simulating an IPv6-only client...



# If your site is not ready for IPv6...



# 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

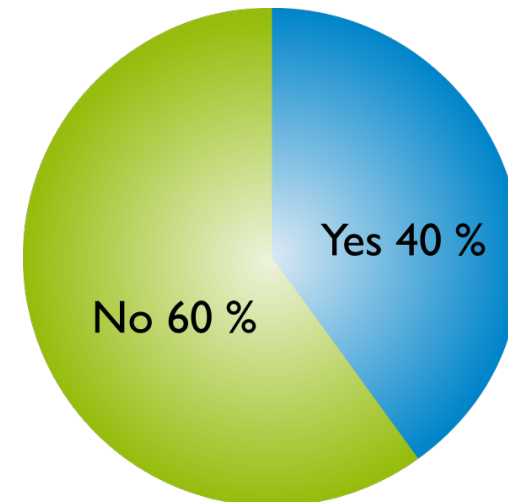
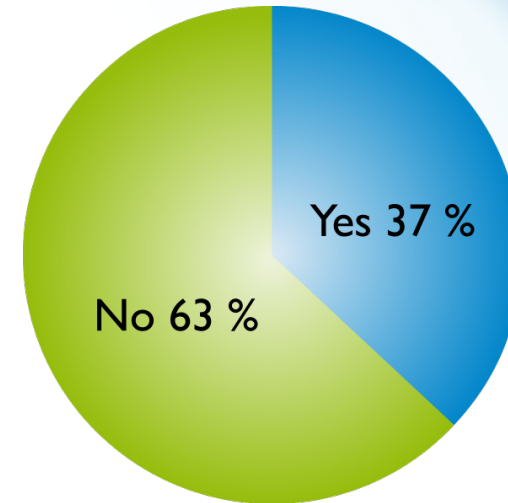
## RIR response

- 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!



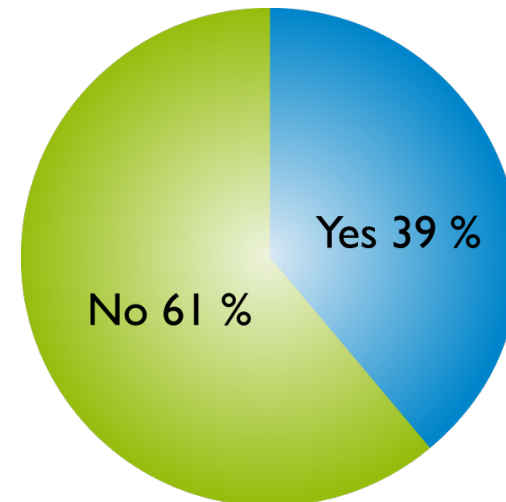
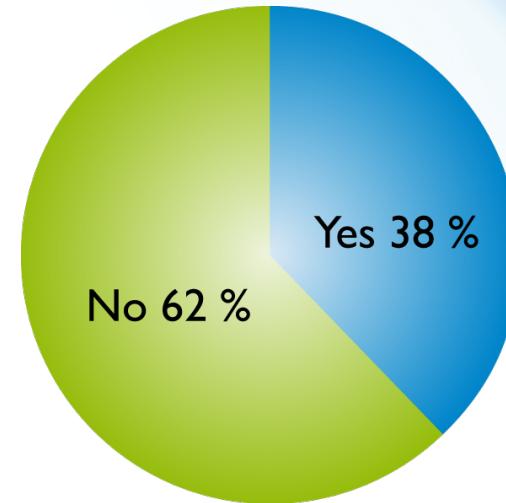
# APNIC IPv6 Readiness Survey 2009

- 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

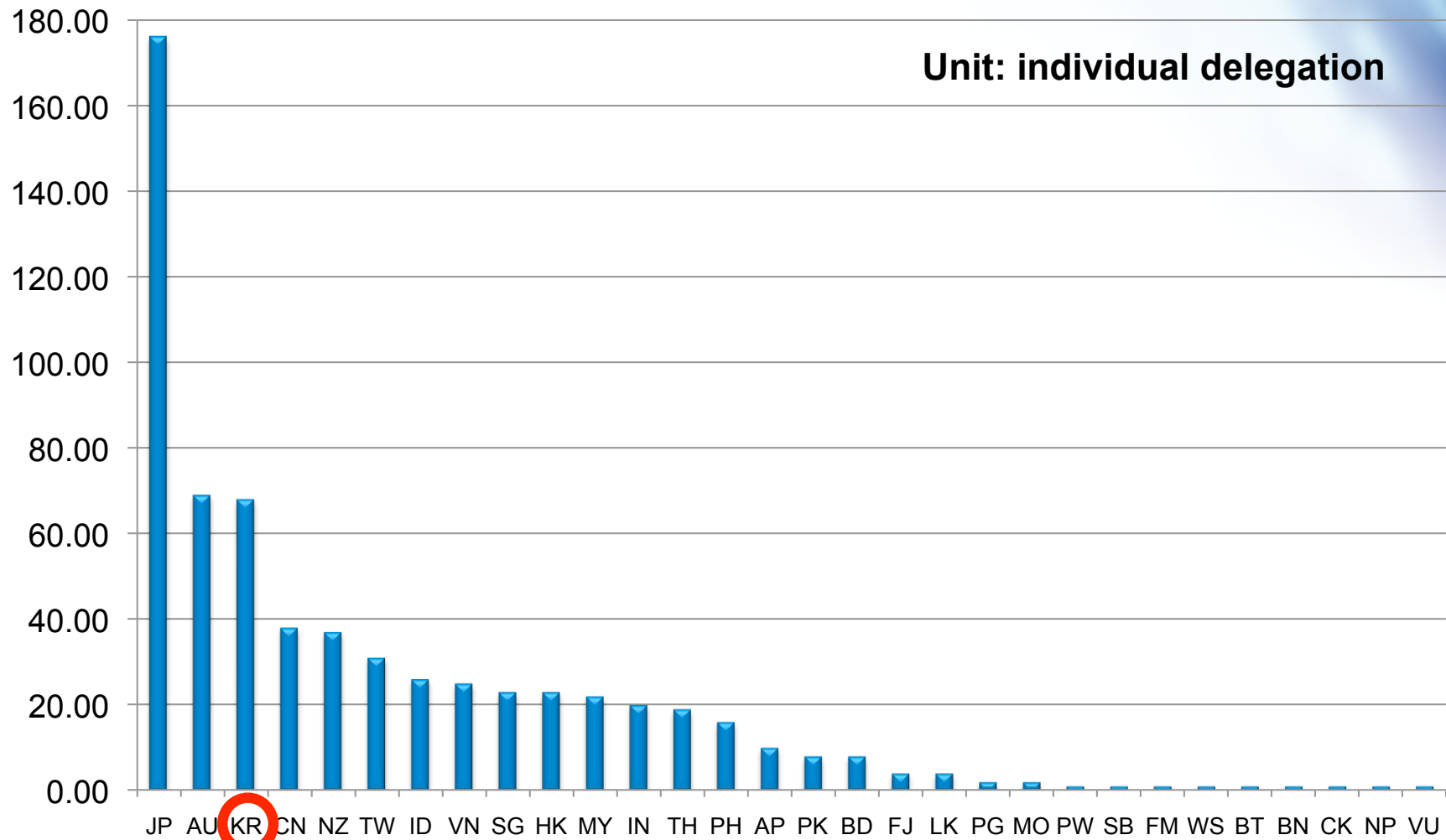
- Your customers - for example, content providers, enterprises etc - will eventually demand IPv6 connectivity
  - Be ready for them!
- Plan for deployment
  - APNIC suggests that network operators and service providers be prepared to support customers and services using IPv6 by 2010
  - Build IPv6 into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



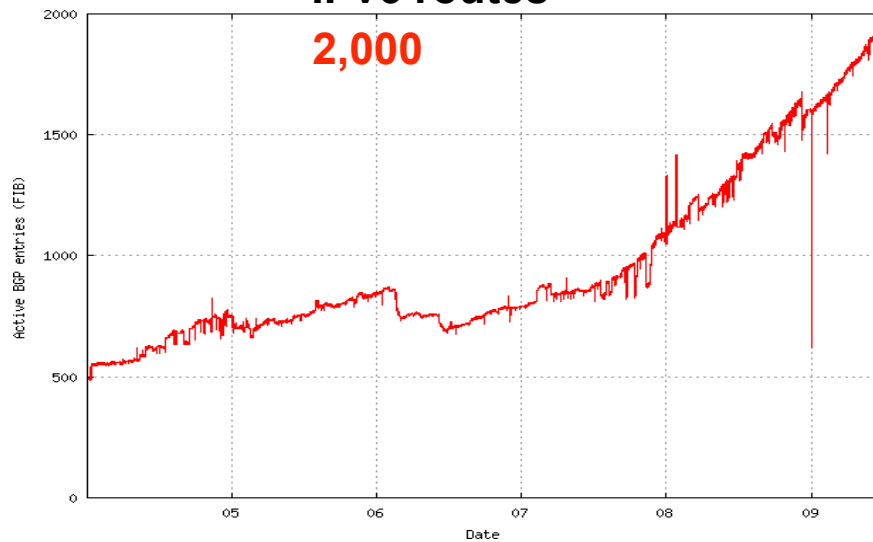
# APNIC IPv6 delegation by economy



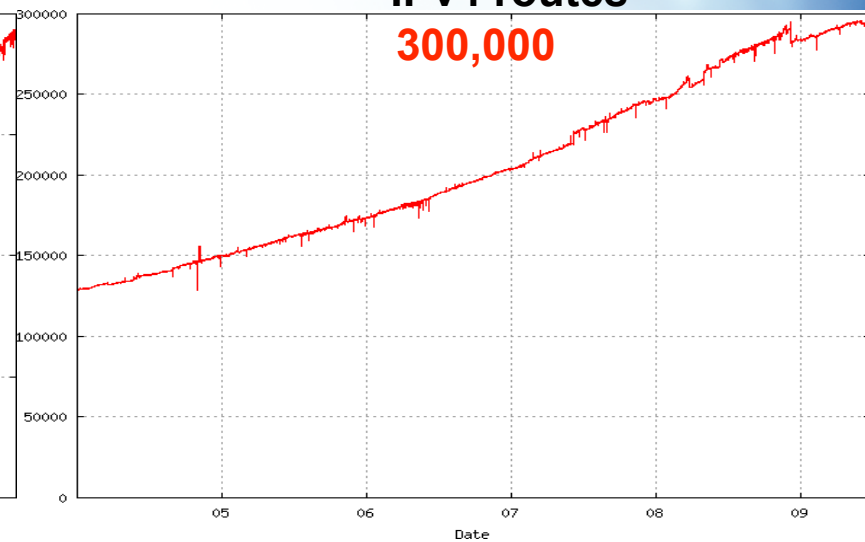
<http://www.apnic.net/stats/o3/> as of 25/06/2009

# How much IPv6 is deployed?

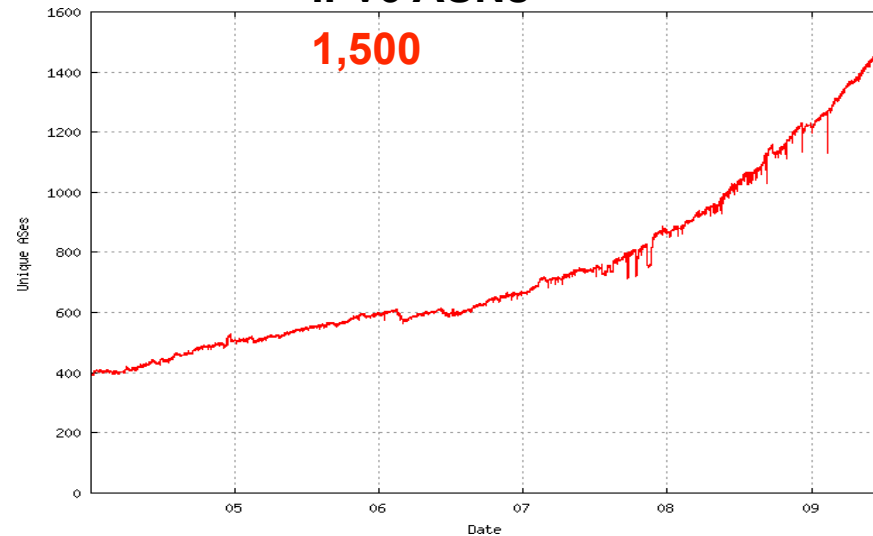
## IPv6 routes



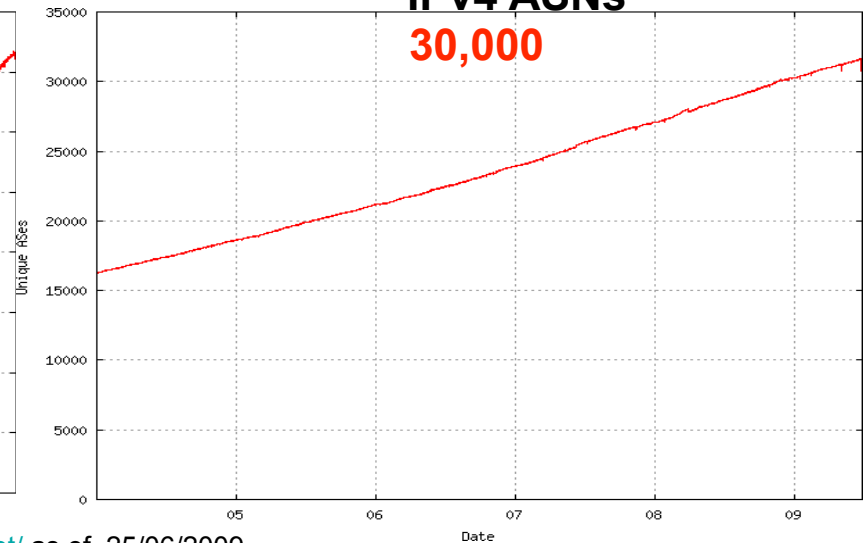
## IPv4 routes



## IPv6 ASNs

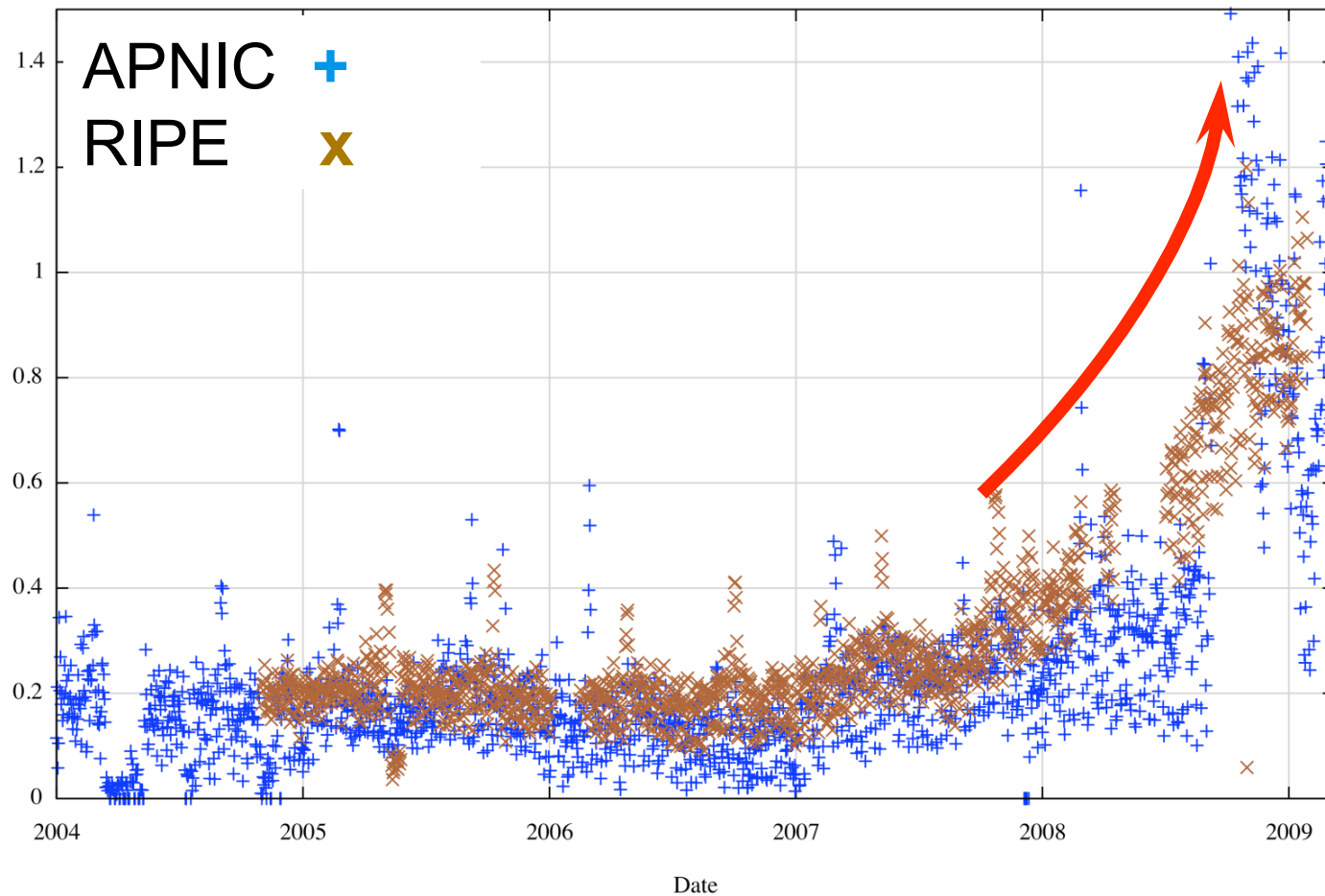


## IPv4 ASNs



# Upward trend

## IPv6 / IPv4 Web Access Daily Ratio



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://sev.prnewswire.com/computer-networks/20090528/3907349en_iCrossing28052009-1.html)  
[http://www.orange.com/en\\_EN/press/press\\_releases/att00012170/print.jsp](http://www.orange.com/en_EN/press/press_releases/att00012170/print.jsp)  
<http://www.geekzone.co.nz/content.asp?contentid=8251>

# Need IPv6 addresses?

한국인터넷진흥원 IPv6 포털 : Vsix에 오신 것을 환영합니다. - Mozilla Firefox

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http://www.vsix.net/

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Firefox prevented this site from opening a pop-up window.

**http://www.vsix.net/**

**Contact NIDA KRNIC**  
**https://ip.nida.or.kr/**

Log-in

아이디 :  
비밀번호 :  
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IPv6 국내외동향 IPv6 교육 장비지원

2008년도 IPv6 동향 결과보고서

IPv6 도구미

IPv6 Dns 서버 설치 가이드 IPv6 연동망 가입신청

IPv6 관련링크

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IPv6 IX BNGIX 6TAP NSPIXP-6

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행사안내

2009년 6월

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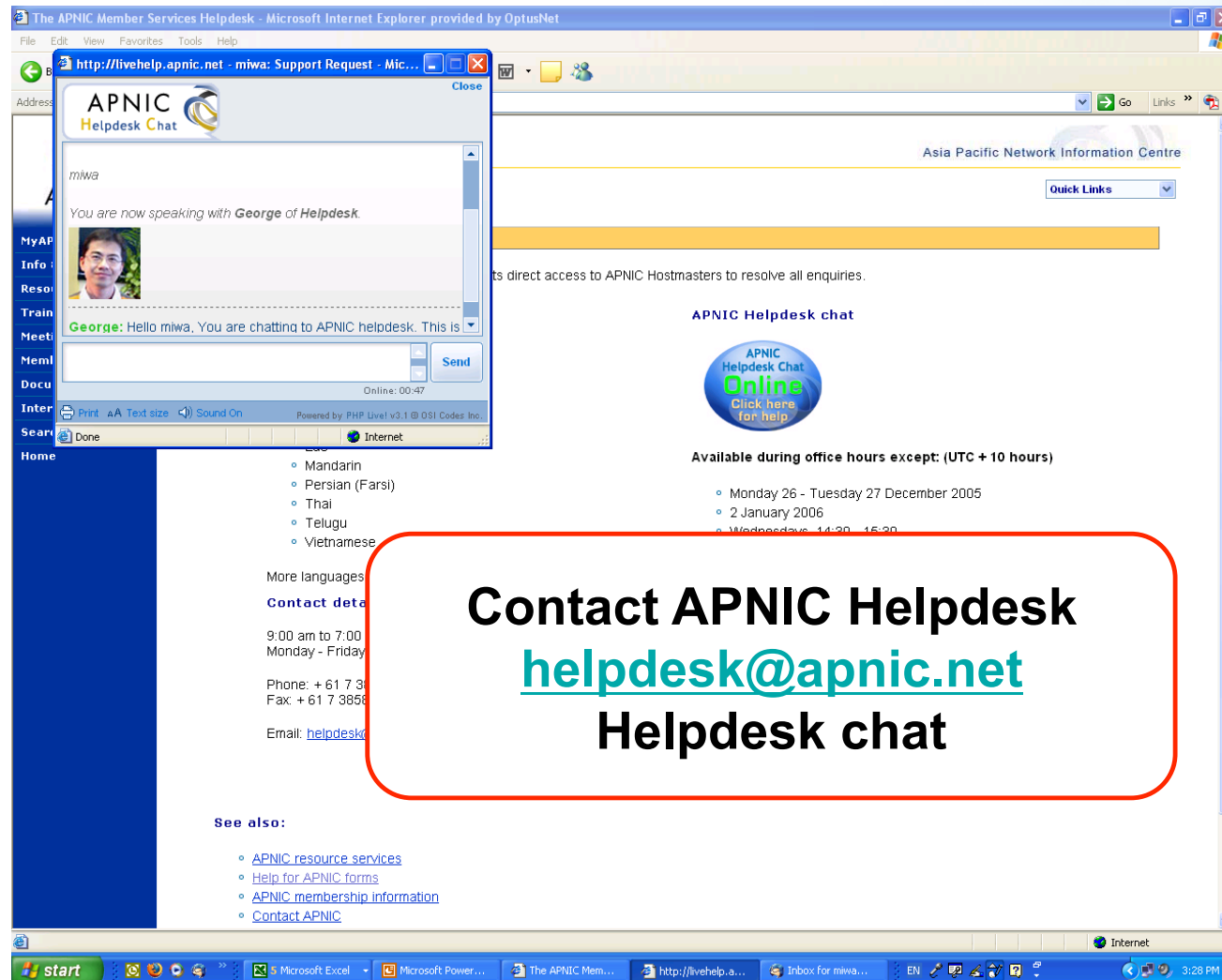
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한국인터넷진흥원 I... 2009-07-09-kr-ipv6-...

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# Need IPv6 addresses?



The screenshot shows the APNIC Member Services Helpdesk website. A chat window is open on the left, displaying a conversation with 'George of Helpdesk'. The main page features the APNIC logo, a 'Quick Links' dropdown, and a section for 'APNIC Helpdesk chat' with a 'Click here for help' button. Below this, it lists available languages (Mandarin, Persian, Thai, Telugu, Vietnamese) and contact details. A red rounded rectangle highlights the contact information.

**Contact APNIC Helpdesk**  
[helpdesk@apnic.net](mailto:helpdesk@apnic.net)  
**Helpdesk chat**

# 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](mailto: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>

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## Why IPv6?

The free pool of IPv4 addresses will be exhausted in a few years - some estimate by 2011. At that time Regional Internet Registries will have no more IPv4 addresses to distribute to APNIC members. As a result, continuous growth of the Internet will be curtailed.

For example, businesses that depend on the Internet may find it difficult to expand their existing customer base.

The free pool of IPv4 addresses can be extended through a number of methods such as developing ISP-NAT, however these methods will only delay the inevitable exhaustion of the free pool of IPv4 addresses.

Most Internet specialists agree that the only viable long-term solution is the deployment of IPv6 networks. APNIC supports pro-active information sharing among the Internet community to further develop the Internet. Sharing of information may be especially critical to the transition of IPv6 given the technical, regulatory, business and public policy challenges such transition presents.

This ICONS Wiki IPv6 page is for the community. Please register and feel free to share relevant information with others. Thank you.

[Any useful information to share?](#)

[IPv6 FAQ](#)  
[IPv6 Deployment and Support - e-learning package by 6deploy-](#) Useful quick learning tool

[Information For Service Providers](#)  
**New items listed!** [Information For Content Providers](#)

ICONS Beta

Done

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# APNIC 28: Beijing, China

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Program Elections

**http://www.apnic.net/meetings**

APNIC 28 - Beijing 2009

Join us in Beijing for APNIC 28!

APNIC and CNNIC invite Internet and networking experts, government representatives, industry leaders, and others to meet in Beijing to learn, discuss, and make decisions about important issues facing the Asia Pacific Internet community.

So come and join us in Beijing! (2 mins)

**25 - 28 August 2009**

**Register now**

Register online to receive an Early Bird Discount.

**Program**

See the highlights from social, technical, and policy programs

**Elections**

Nominate and elect your representative for the APNIC NC election

**Getting to Beijing**

See how and why you can make APNIC 28 the perfect place to start your holiday in China...

**Call for presentations**

Calling on Industry leaders to share interesting and topical presentations with the community

**Fellowship**

APNIC offers fellowship support to assist members of the Internet community to attend APNIC 28

Grand Hyatt Beijing, China  
25-28 August 2009

Local host

**CNNIC**  
中国互联网络信息中心  
CHINA INTERNET NETWORK INFORMATION CENTER

Done

Microsoft PowerPoi... Meetings - APNIC 2...

9:19 AM

# Thank You!

<pwilson@apnic.net>

<miwa@apnic.net>