

Expanding the Internet: IPv4 address exhaustion and IPv6 transition

SANOG 14

23 July 2009, Chennai, India

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Overview

- About RIRs and APNIC
- Current IPv4 address free pool exhaustion status
- Current IPv6 deployment status
- IPv6 implementation cases
- Statistics of IPv6 allocation in the South Asia region
- Action plan

Regional Internet Registries



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

The APNIC region



- The region served by APNIC covers the entire Asia Pacific, comprising 56 economies throughout Asia and Oceania.

APNIC's mission

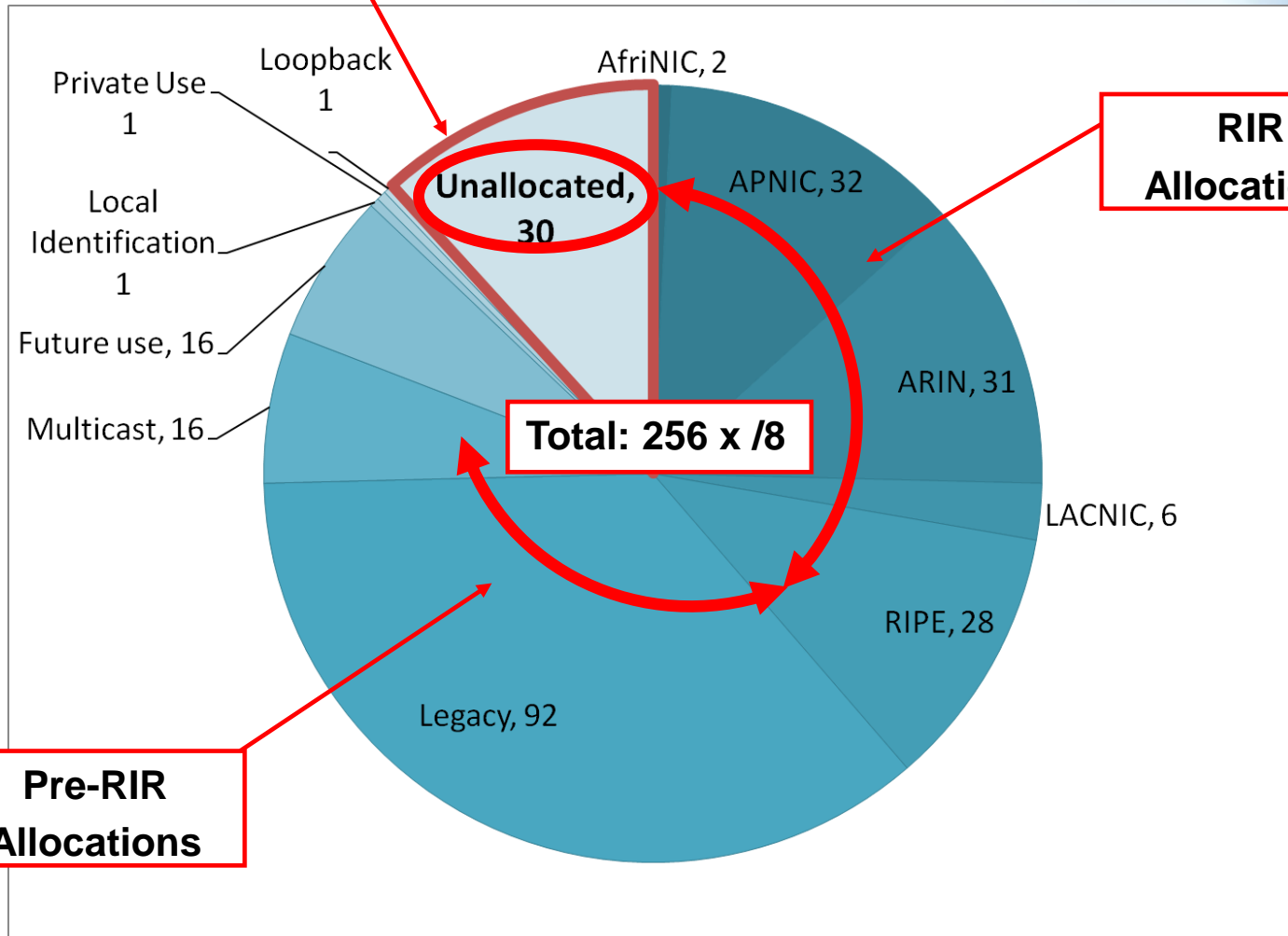
- To provide Internet resource allocation and registration services
- To assist the Asia Pacific community to achieve effective resource management
- To develop public policies and public positions
- To liaise with multi-stakeholders in the Internet community
- To provide educational opportunities

APNIC's services

- Resource registration services
- Policy development
- Training and education
- Liaising and investing
- Informing the community
- The Internet Routing Registry (RIR)
 - Globally distributed routing information database
- Resource certification
 - A robust security framework for verifying the association between resource holders and their Internet resources

Remaining IPv4 /8s at IANA

Remaining at IANA 30 x /8

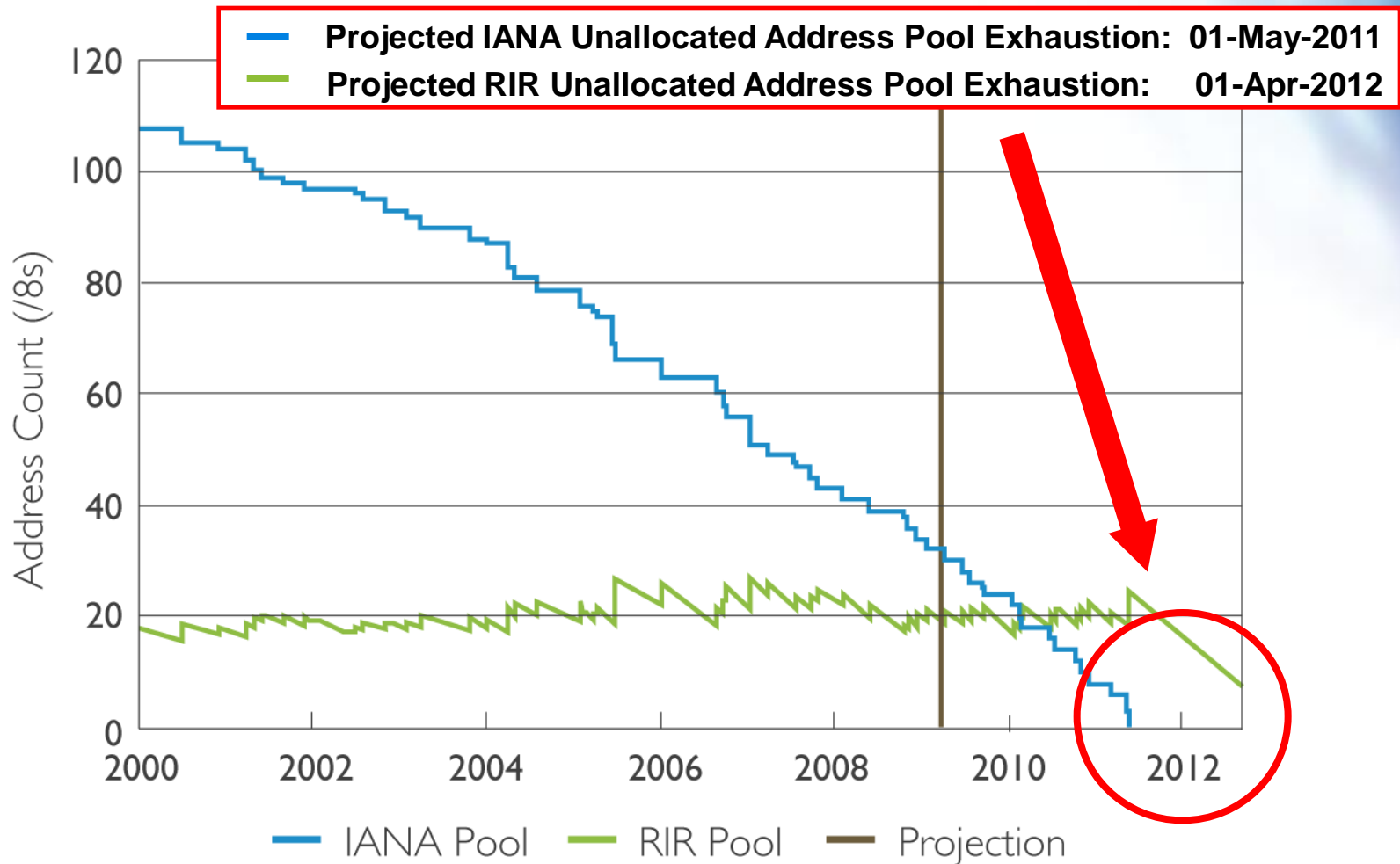


RIR Allocations

Total: 256 x /8

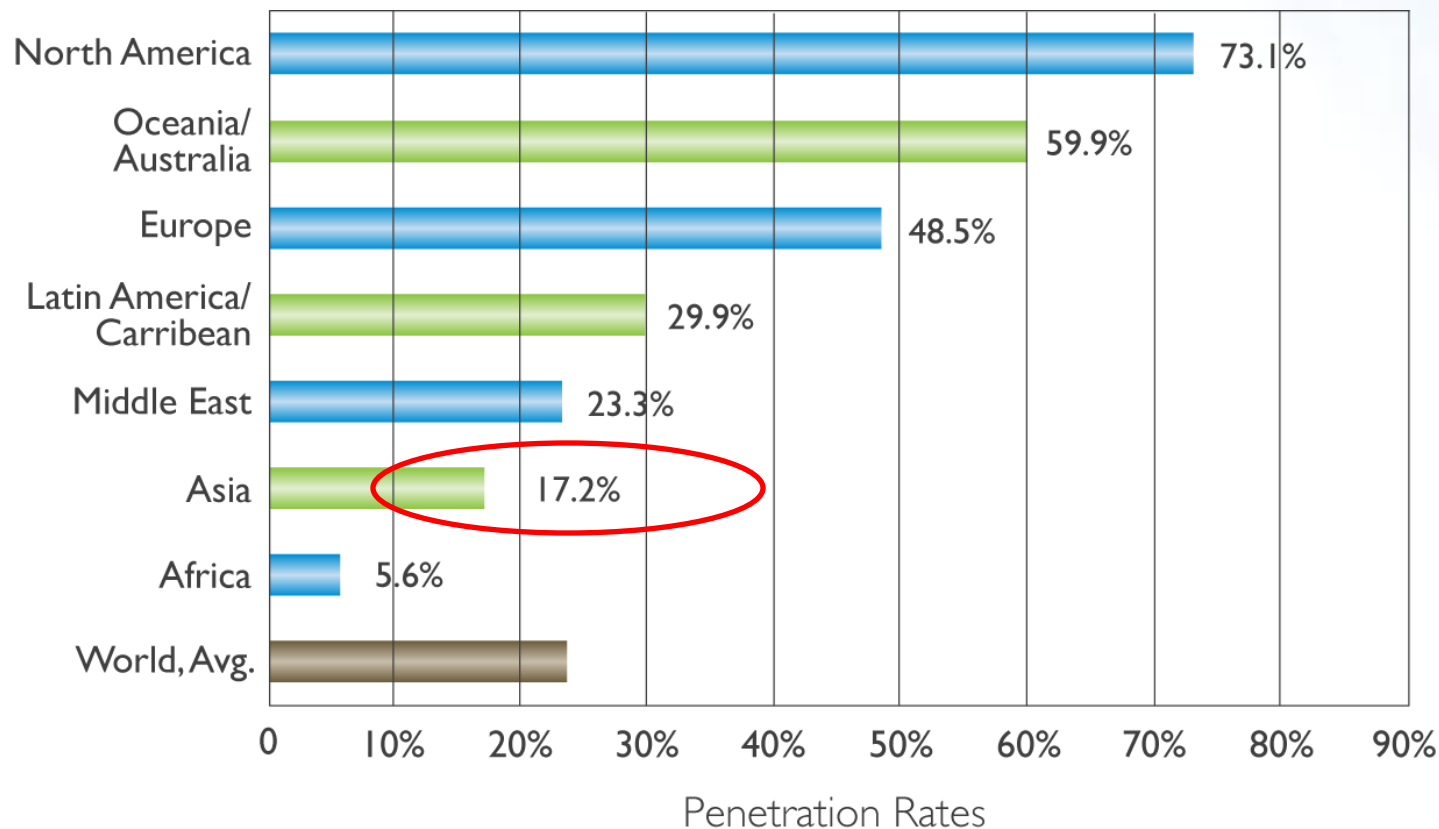
Pre-RIR Allocations

IPv4 consumption – Projection



But not everyone is connected yet

Worlds Internet Penetration Rates by Geographic Regions



Source: Internet World Stats - www.internetworldstats.com/stats.htm

Penetration Rates are based on a world population of 6,710,029,070 for full year 2008 and 1,581,571,589 estimated Internet users.

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and devices need to connect too!

Billions of them



○部分をクリックすると
拡大写真をご覧いただけます。



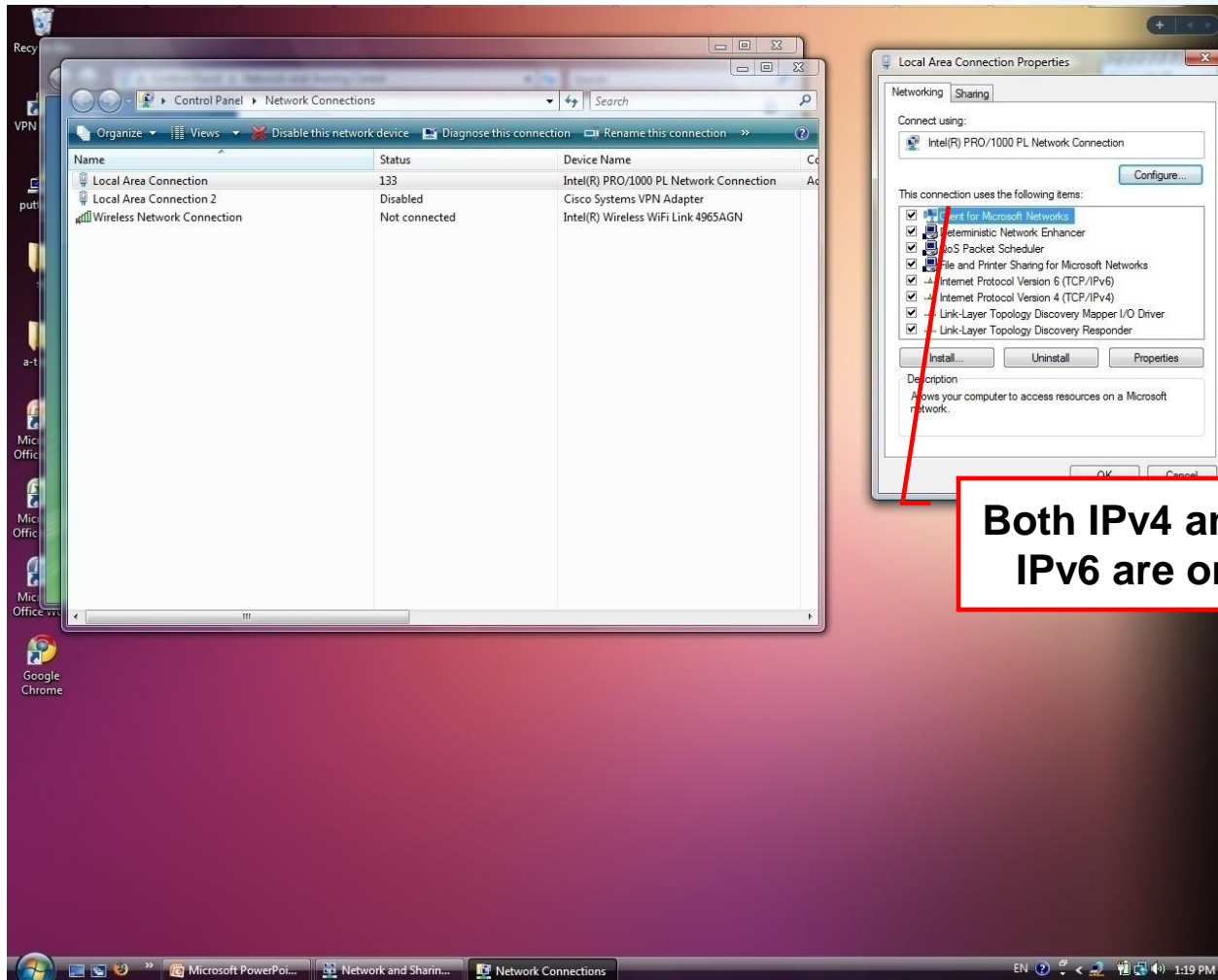
A quick summary

- ➡ IPv4 addresses are a finite numeric asset
 - Only 12 per cent remain
- ➡ But the demand for IPv4 addresses is still growing
 - More devices are requiring IP addresses
 - Especially in the Asia Pacific region
- ➡ The remaining 12 per cent is not large enough to support such demand

What will happen to your customers if your network is not IPv6 ready?

- Researchers predict IPv4 legacy assets (client PCs, servers, routers, switches, OSes, various applications, and so forth) will remain for the next 10 years
 - Dual-stack environments servicing both IPv4 and IPv6 traffic may last for many years
 - IPv4 addresses will be assigned strategically
 - Not everyone can receive global IPv4 addresses
 - An increasing number of end users/devices may be given only IPv6 addresses at some point

While a client is running with IPv4/IPv6...



Both IPv4 and IPv6 are on

...it receives both IPv4/IPv6 addresses: dual-stack

The screenshot shows a Windows desktop with a Command Prompt window open. The Command Prompt displays the following network configuration for the Ethernet adapter Local Area Connection:

```
Ethernet adapter Local Area Connection:
Connection-specific DNS Suffix . : apnic.net
Description . . . . . : Intel(R) PRO/1000 PL Network Connection
Physical Address . . . . . : 00-1C-7E-87-80-24
DHCP Enabled . . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
IPv6 Address . . . . . : 2001:dc0:2001:6:b18f:3c83:f5c5:dcd5(Preferred)
Temporary IPv6 Address . . . . . : 2001:dc0:2001:6:68ef:f18:82fc:dd63(Preferred)
Link-local IPv6 Address . . . . . : fe80::19:5f:f7ef6:2c15%8
IPv4 Address . . . . . : 202.12.29.172(Preferred)
Subnet Mask . . . . . : 255.255.255.128
Lease Obtained . . . . . : Thursday, 15 January 2009 2:20:12 PM
Lease Expires . . . . . : Thursday, 15 January 2009 2:25:16 PM
Default Gateway . . . . . : fe80::19:5f:f7ef6:2c15%8
DHCP Server . . . . . : 202.12.29.254
DNS Servers . . . . . : 2001:dc0:2001:6:204:23ff:fe55:eb93
203.119.0.109
203.119.0.123
202.12.29.9
NetBIOS over Tcpip. . . . . : Enabled
```

Two red arrows point from the desktop icons 'sc' and 'a-temp' towards the Command Prompt window. A red box at the bottom of the screenshot contains the text: **Both IPv4 and IPv6 address are assigned**

Even if a service is only available via IPv4...

Travel - Cheap flights, hotels, car rentals and holiday packages from Expedia Australia - Mozilla Firefox

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http://www.expedia.com.au/

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CREATE & BOOK YOUR PERFECT HOLIDAY

Hotel only Flight + Hotel Flight + Hotel + Car Flight + Car

Book together and SAVE!

Destination: Check-in: Check-out: dd/mm/yy dd/mm/yy

Rooms: Adults (18+) Children (<18)

1 2 0

More hotel search options: Hotel name, hotel class, multiple rooms ... Search

Hotel Deals

Auckland Hotels	\$111*
Cairns Hotels	\$200*
Las Vegas Hotels	\$56*
New York Hotels	\$27*
San Francisco Hotels	\$1*
Singapore Hotels	\$1*

More hotel deals

Cheap Flights

Cheap airfares from 76 international airlines

Departure airport: Adelaide

International Flights

Click here to search for fares from Singapore.

Travel Deals

Auckland Holidays	\$911*
Fiji Holidays	\$766*
Hong Kong Holidays	\$1503*
New York Holidays	\$2794*
Phuket Holidays	\$1282*
Singapore Holidays	\$1798*

More travel deals

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Done

216.251.121.99

Microsoft PowerPoi... Travel - Cheap flight...

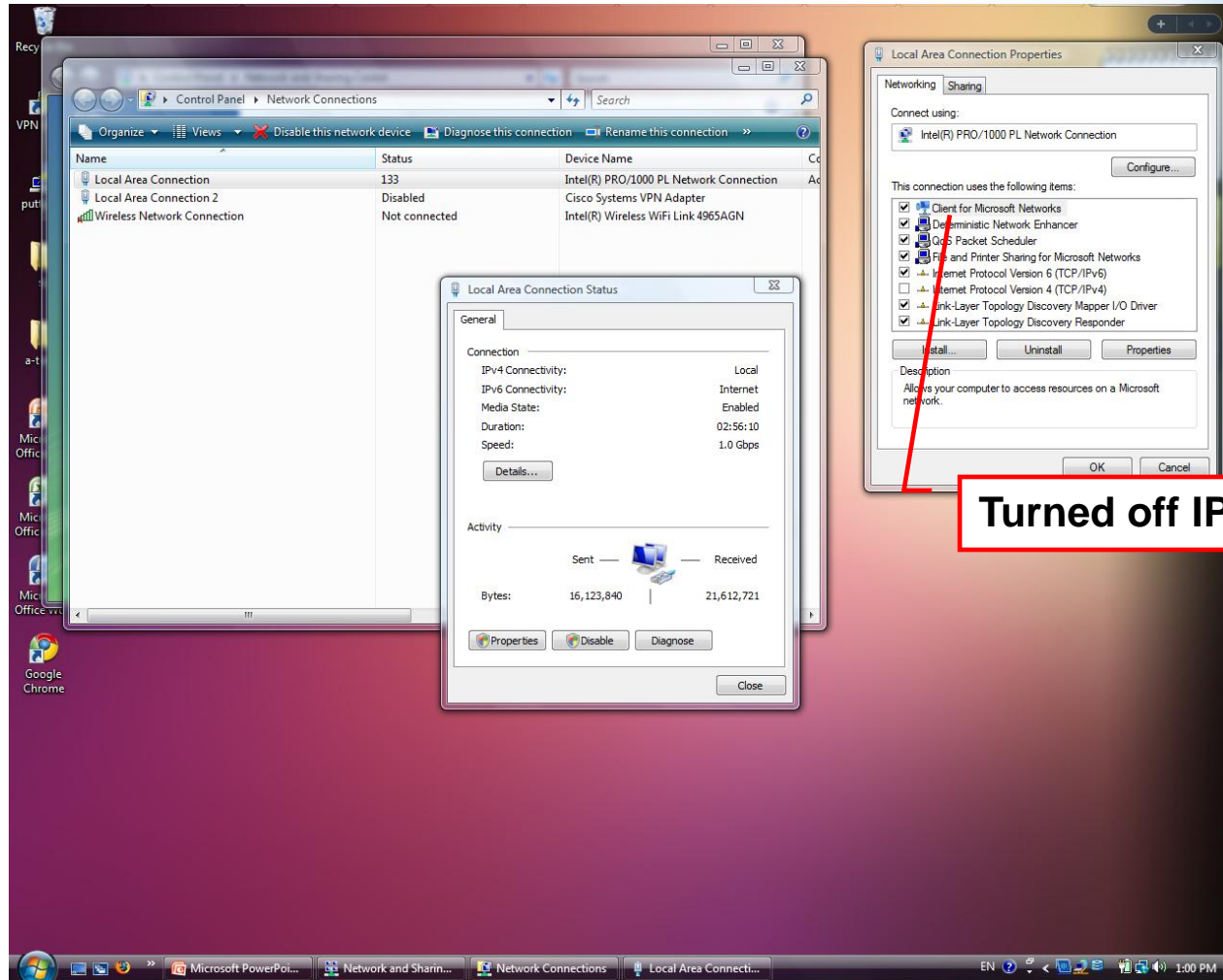
EN 3:45 PM

Your customers can still use your service

One day...

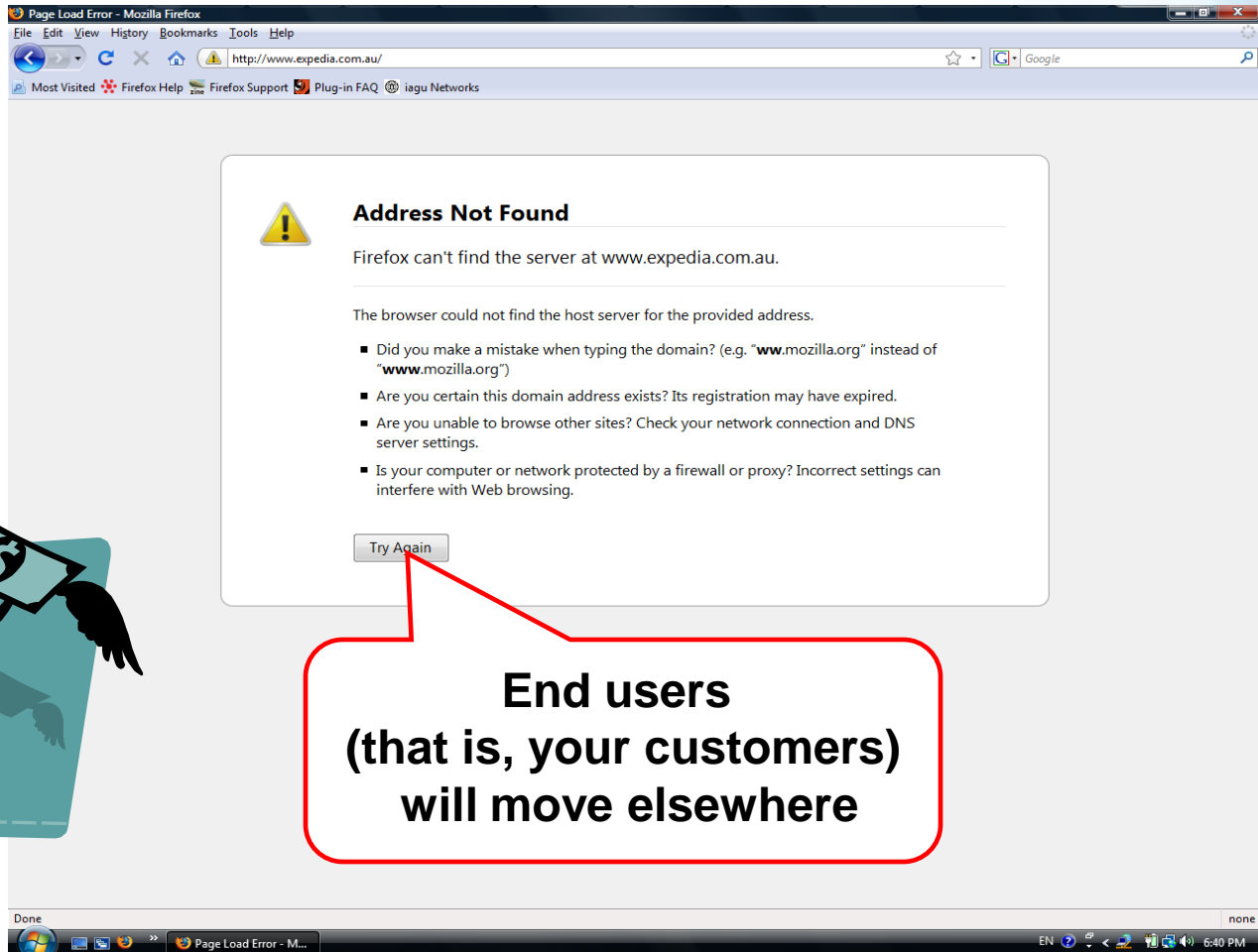
- In the future, many end users will only receive an IPv6 address
 - Many “clients” access the Internet via an IPv6 address
 - If your web service is not on a dual-stack network, what will happen?

Simulating an IPv6-only client



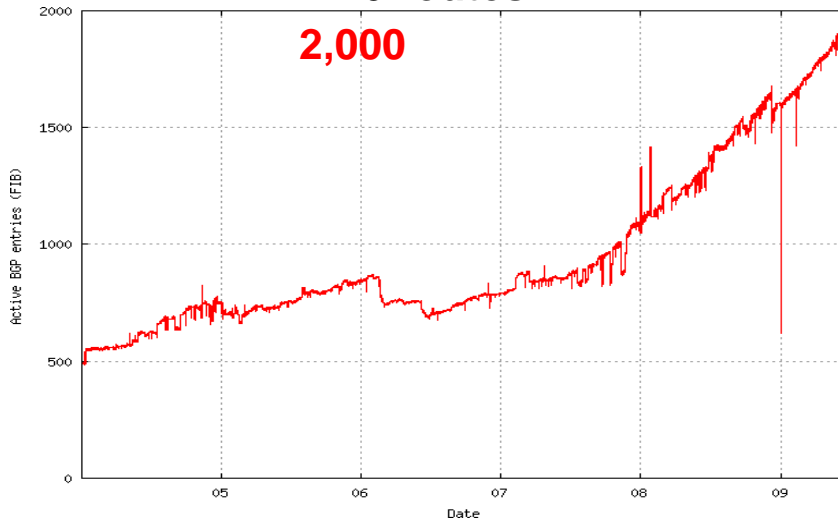
Turned off IPv4

If their site is not ready for IPv6...

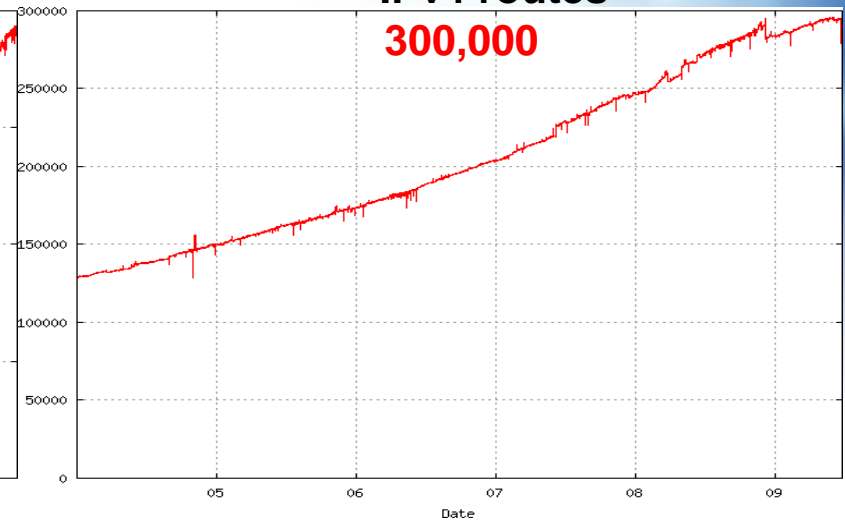


How much IPv6 is deployed?

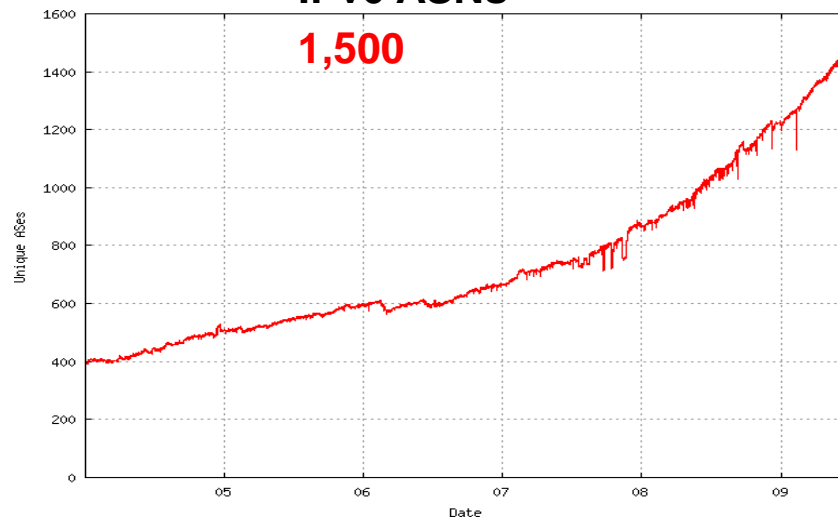
IPv6 routes



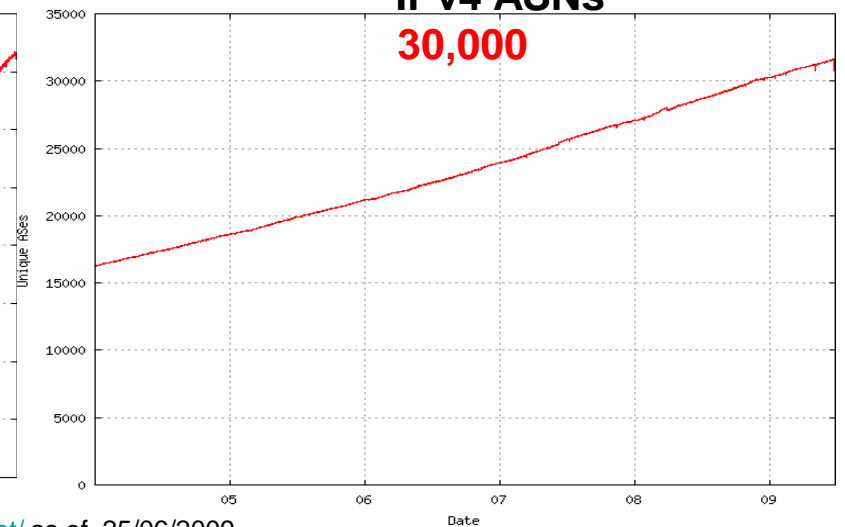
IPv4 routes



IPv6 ASNs

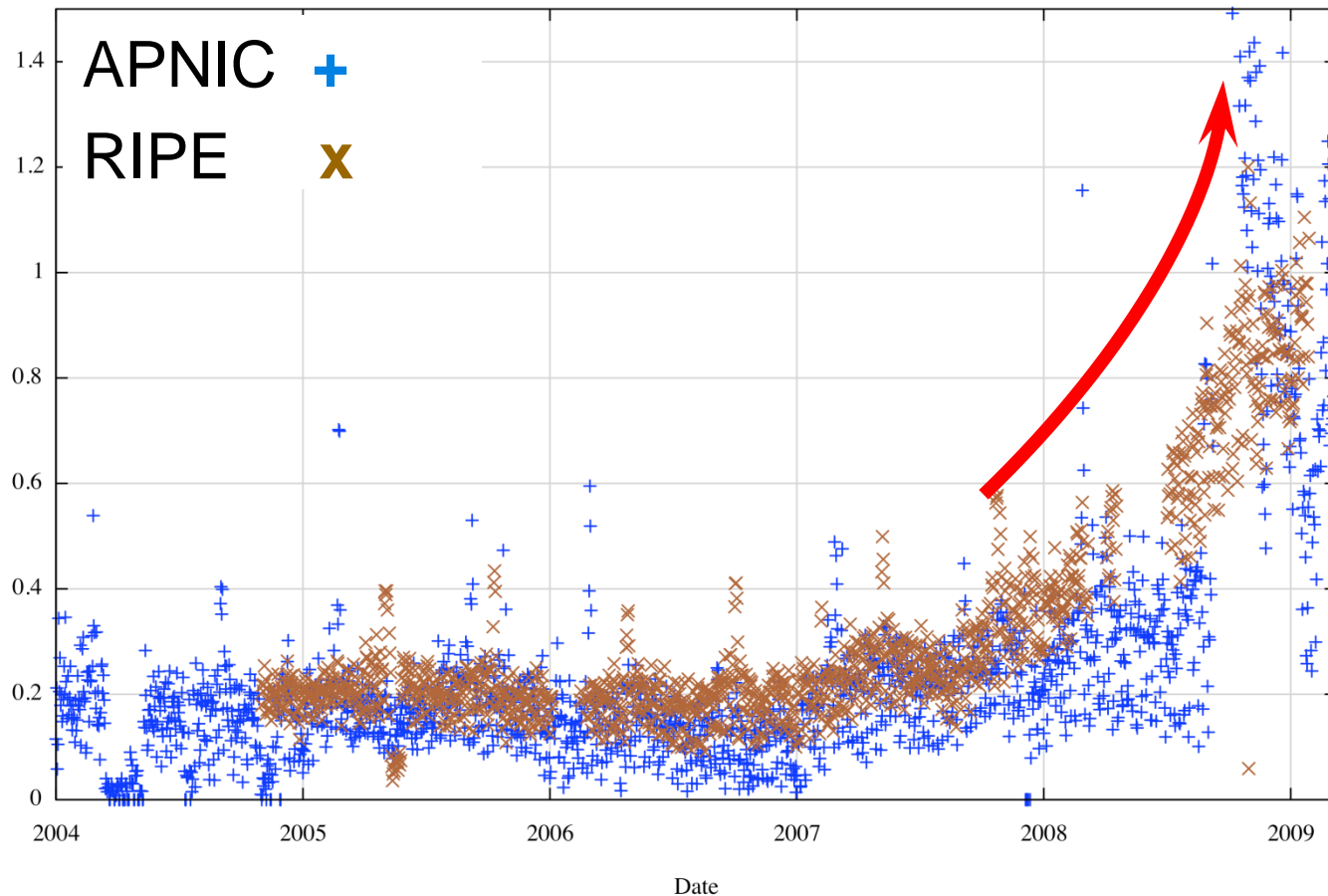


IPv4 ASNs



Upward trend

IPv6 / IPv4 Web Access Daily Ratio

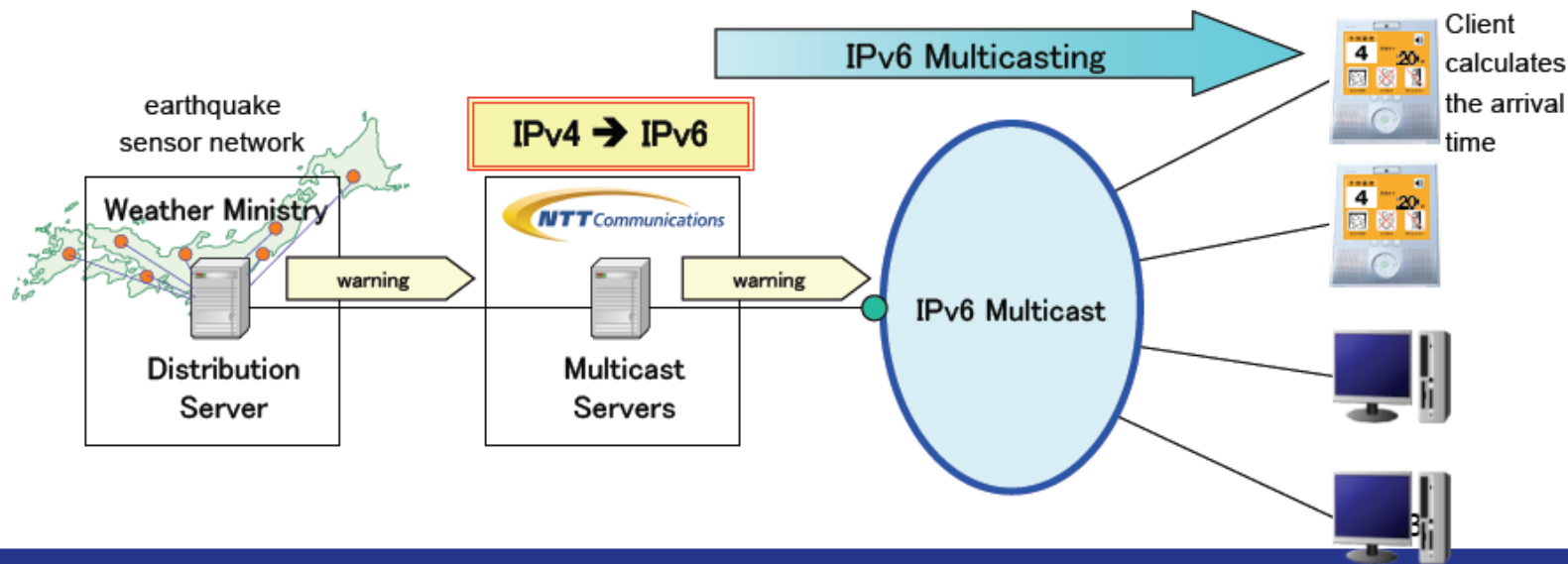


IPv6 deployment opportunities

- 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

- NTT Communications in Japan
 - Earthquake Warning Alert System via IPv6 multicasting



Recent IPv6 implementation case

- A pioneer providing IP-based wireless sensor network technology and services
- Energy efficiency goals through real-time visibility and analysis from fine-grained electrical, environmental and thermal sensor data.

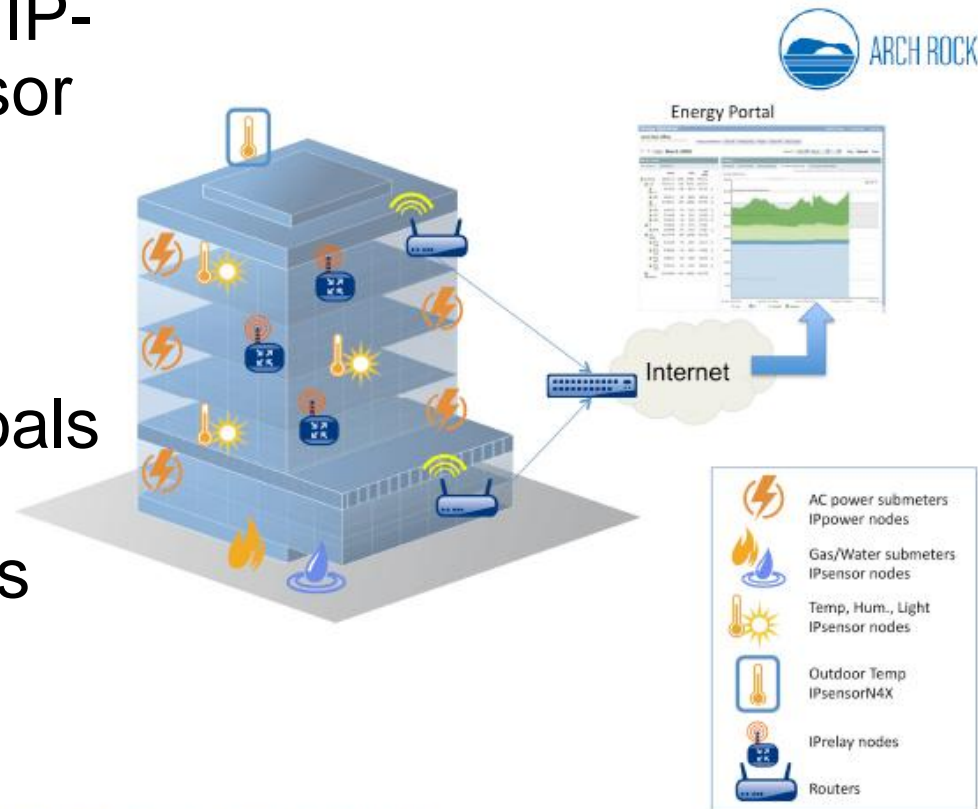


Figure 1 AREO in action – Commercial office building

Recent IPv6 implementation case Q2, 2009

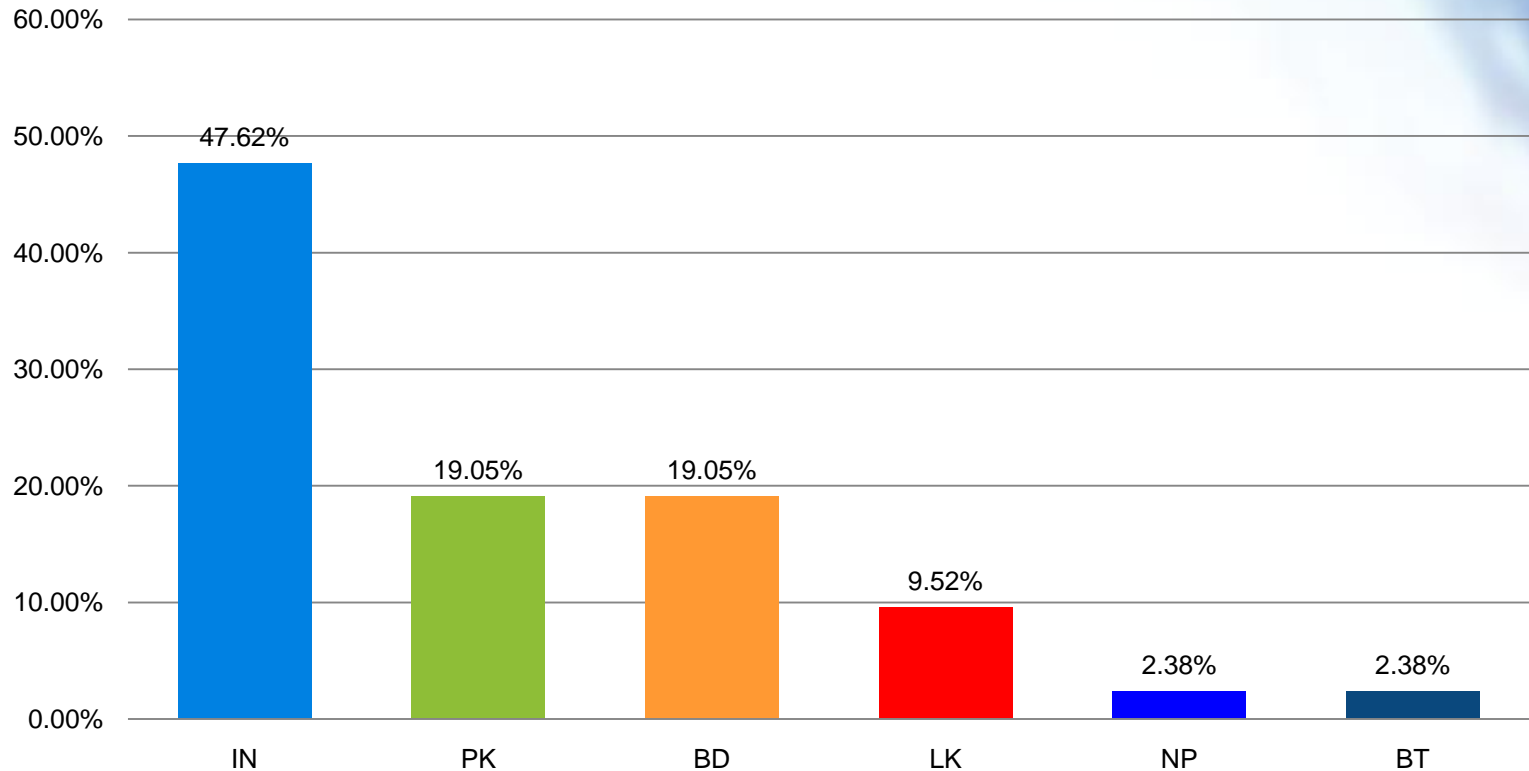
- Sify.com India enabled their services with IPv6
 - Internet access to enterprise customers
 - MPLS-based IP-VPN services
- Orange Business Services deployed IPv6 in its MPLS IP VPN backbone
 - Available in 35 countries in Q2 2009
 - Gradually extended to more than 100
- FX Networks in NZ
 - High performance 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>

IPv6 delegations in South Asia



	20	8	8	4	1	1
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Mem	285	54	78	12	16	4
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Your role in this transition period

- How can you support your CIO to make the deployment of IPv6 efficient?
 - Identify how reliant your current business growth plan is on IPv4
 - Identify technical impact of transition to IPv6
 - Include network plan for implementing dual stack on your core networks
 - Integrate IPv6 spending into your 2010 budgets
 - Include budget allocation for IPv6 test beds and initial deployment
 - Make a plan to up-skill your staff
 - ICONS Wiki IPv6
 - <http://wiki.icons.apnic.net/display/IPv6/Home>
 - Obtain IPv6 addresses from APNIC
 - helpdesk@apnic.net
 - Design and build IPv6 test beds to test applications and services
 - Implement IPv6 on core equipment and services

APNIC and IPv6 support

- APNIC appointed an IPv6 Program Manager in August 2008
 - Miwa Fujii <miwa@apnic.net>
 - Rolling out various IPv6-related activities
 - ICONS IPv6 Wiki and IPv6 ICONS Forum
 - IPv6 information site for the community
 - <http://icons.apnic.net/display/icons/Home>
 - Your participation will help the Internet community
- APNIC IPv6 services include:
 - APNIC IPv6 Training
 - Resource allocation
 - IPv6 policy development



In summary

- IPv4 exhaustion will impact businesses
- IPv6 is the long-term solution
- IPv6 deployment is happening
- Network operators have an important role to play in IPv6 deployment
- APNIC support is available

helpdesk@apnic.net

APNIC 28 in Beijing, China

25 – 28 August 2009

APNIC 28 - Mozilla Firefox
http://www.apnic.net/meetings/28/

APNIC 28 Beijing 2009

APNIC 28 Program Elections Beijing Sponsors Fellowship

Home / Meetings / 28

APNIC 28

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.

Why should I attend?

What are APNIC meetings and why should my organization attend?

Program

See the highlights from social, technical, and policy programs

Elections

Nominate and elect your representative for the APNIC NC election

When and where

Grand Hyatt Beijing, China
24-28 August 2009

Getting to Beijing

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

Sponsorship

Promote your product or service to the Asia Pacific Internet community

Fellowship

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

Local host

Done
2009-04-cn-ipv6-su... Microsoft PowerPo...
2001.dc0-2001.0-4608.20: +1
EN 1:29 PM

APNIC 28 draft agenda

August 2009				
Tuesday 25 August		Wednesday 26 August	Thursday 27 August	Friday 28 August
9:00AM Training		9:00AM Plenary	9:00AM Plenary	9:00AM APNIC Member Meeting
11:00AM Training	11:00AM NIR SIG	11:00AM APOPS	11:00AM Policy SIG	11:00AM APNIC Member Meeting
2:00PM Internet governance		2:00PM APOPS	2:00PM Policy SIG	2:00PM APNIC Member Meeting
4:00PM Internet governance		4:00PM Policy SIG: setting the scene	4:00PM Policy SIG	4:00PM APNIC Member Meeting
5:30PM Newcomers' welcome			6:00PM Lightning talks	
6:30PM Opening event		6:30PM APNIC social event		6:30PM Informal APNIC dinner

APNIC 28 registration

- Early bird registration
 - Closes 25 July 2009
 - Save money
 - Go into early bird rego draw
 - Win a Acer Aspire One D150
 - Intel® Atom™ processor N270
 - 10.1" WSVGA Acer CrystalBrite TFT LCD
 - 1.6G memory
 - 160 HDD
 - LAN, Wi-Fi, Webcam, etc



Thank You!

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