Expanding the Internet:
IPv4 address exhaustion and IPv6 transition

SANOG 14

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Srinivas (Sunny) Chendi
External Relations Manager, APNIC

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.
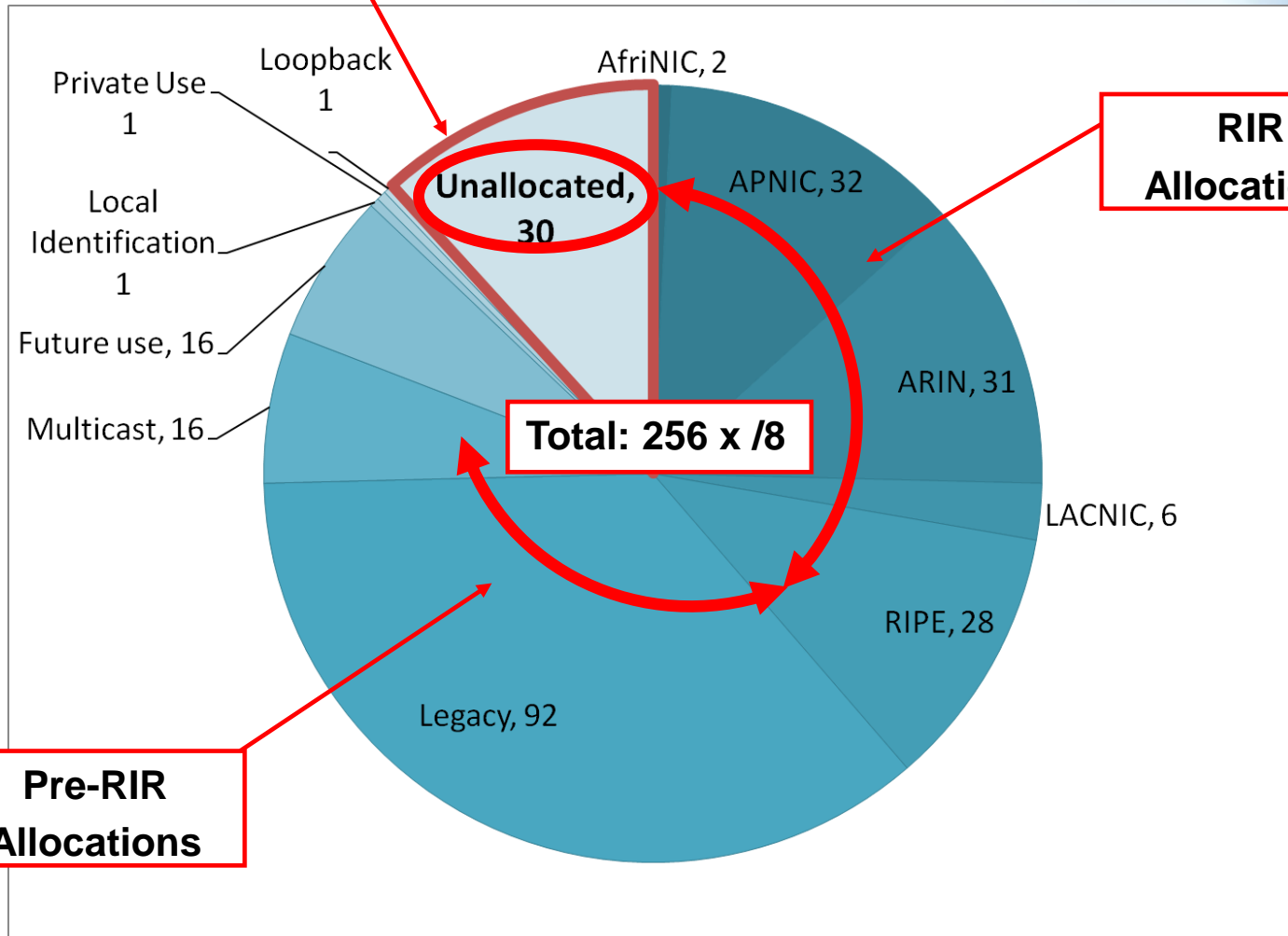
APNIC's mission

- 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

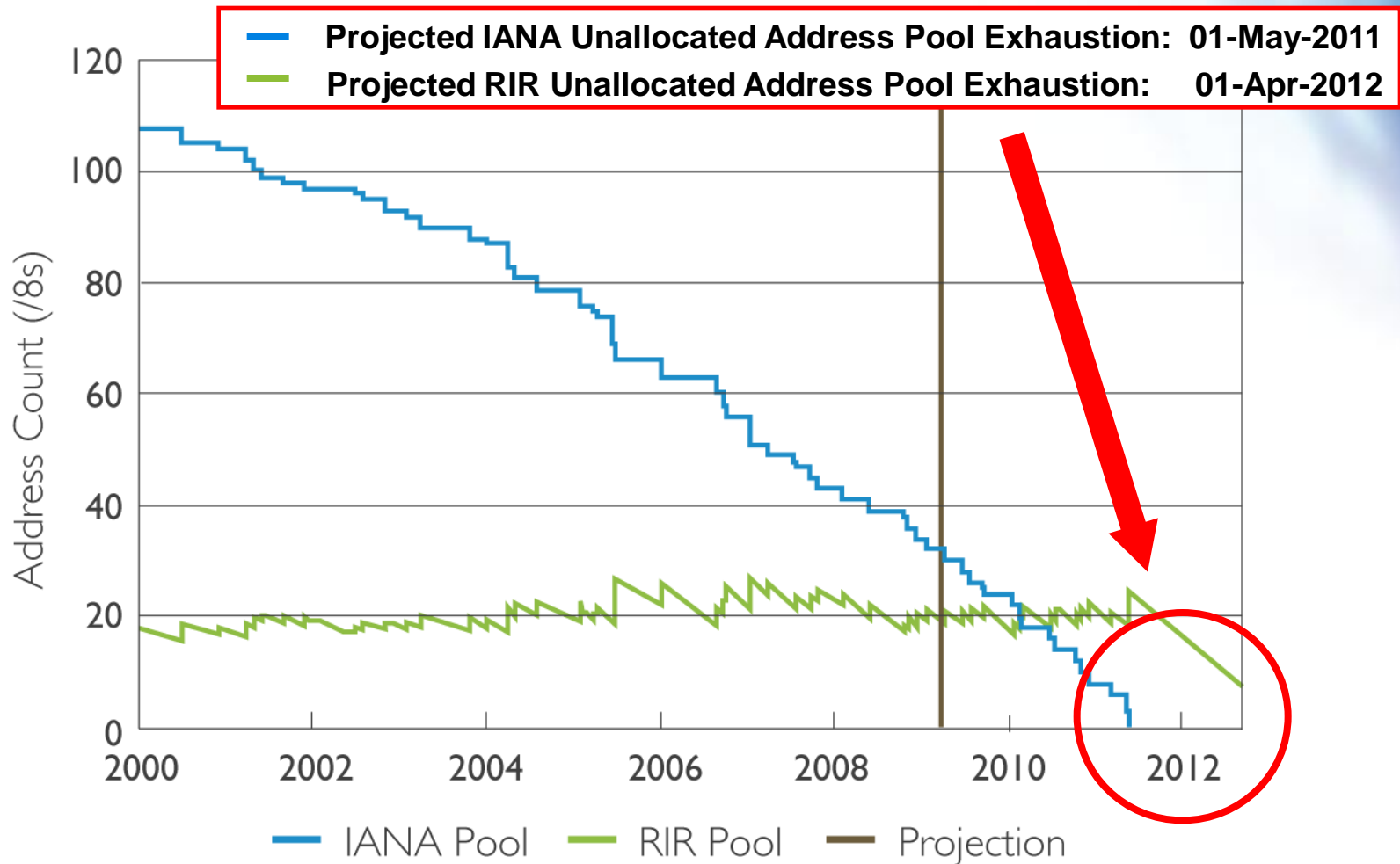# Remaining IPv4 /8s at IANA

Remaining at IANA 30 x /8

RIR Allocations

Pre-RIR Allocations

Loopback 1

Private Use 1

Local Identification 1

Future use, 16

Multicast, 16

Unallocated, 30

AfriNIC, 2

APNIC, 32

ARIN, 31

LACNIC, 6

RIPE, 28

Legacy, 92

Total: 256 x /8

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

But not everyone is connected yet

Worlds Internet Penetration Rates by Geographic Regions
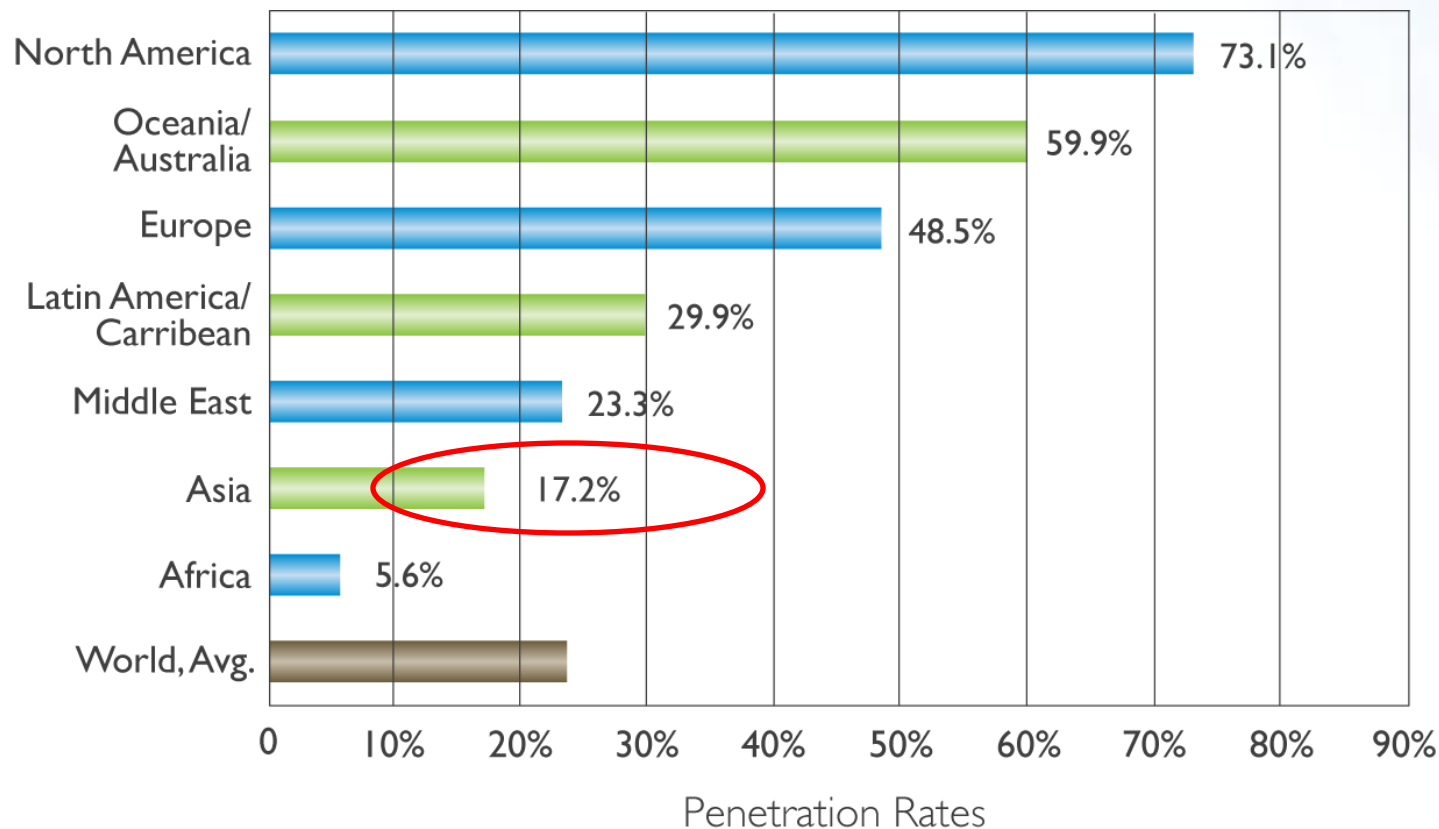
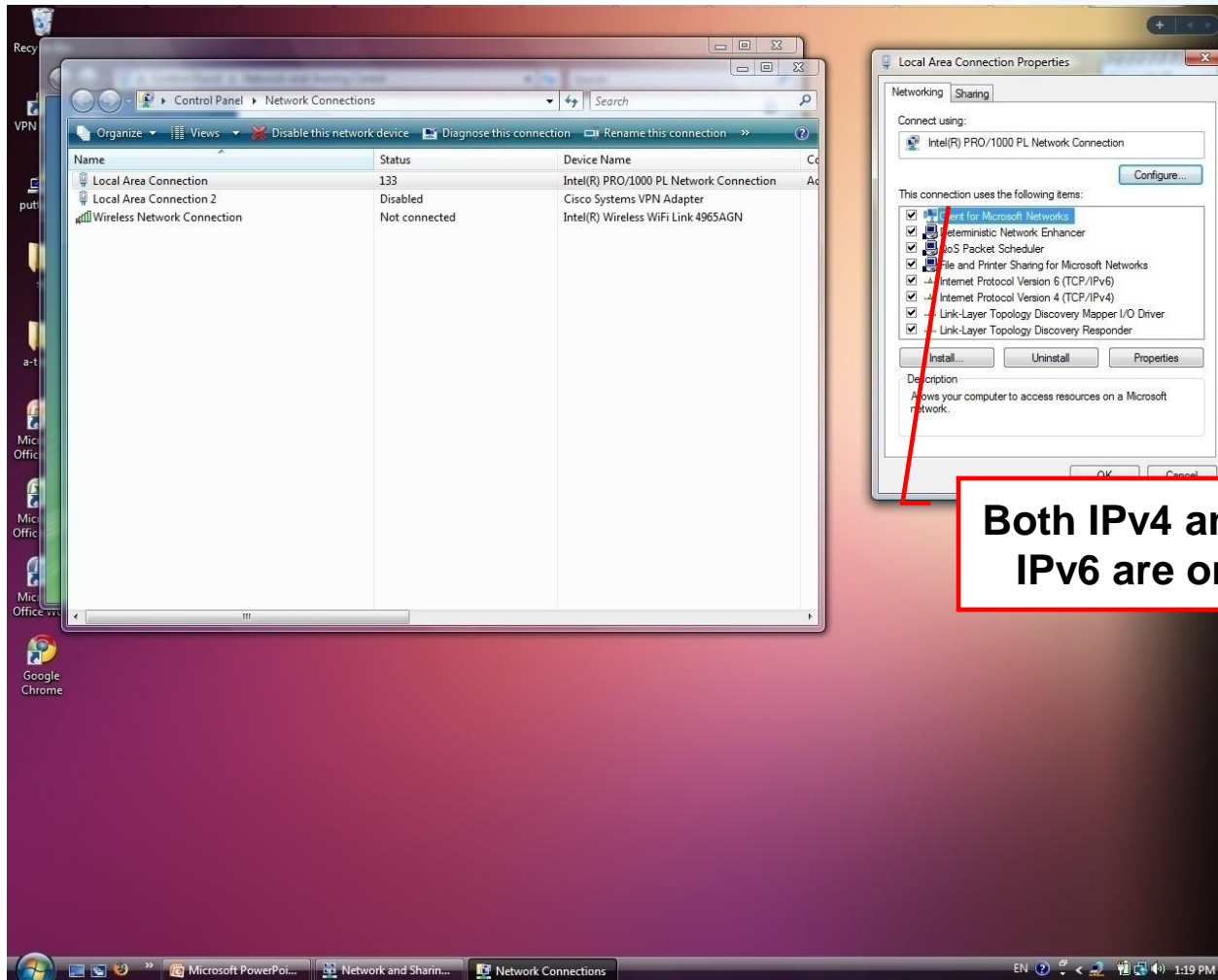# and devices need to connect too!

Billions of them

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

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While a client is running with IPv4/IPv6…

Both IPv4 and IPv6 are on

13

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

Both IPv4 and IPv6 address are assigned

Even if a service is only available via IPv4…

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
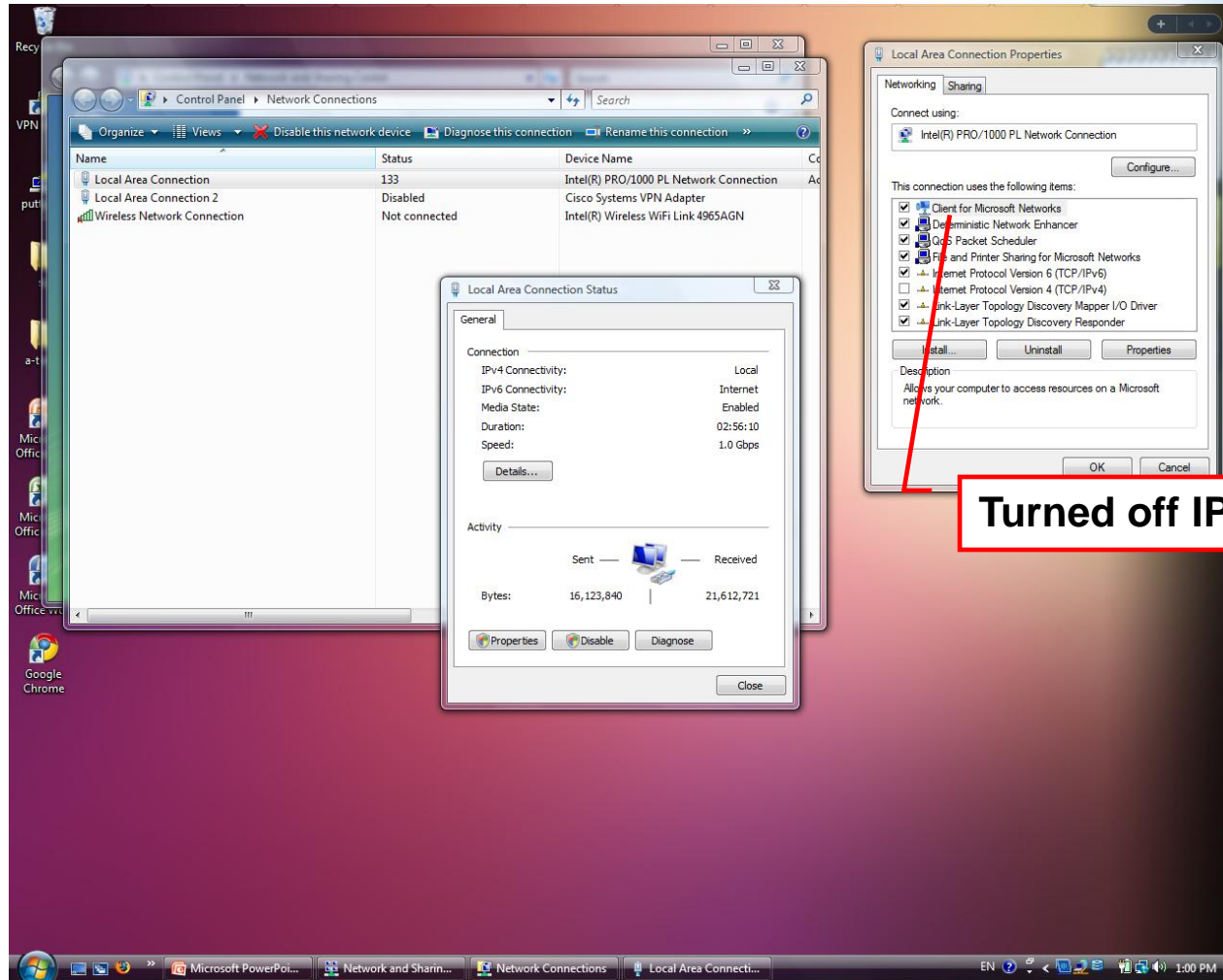
Turned off IPv4

If their site is not ready for IPv6…

End users
(that is, your customers)
will move elsewhere
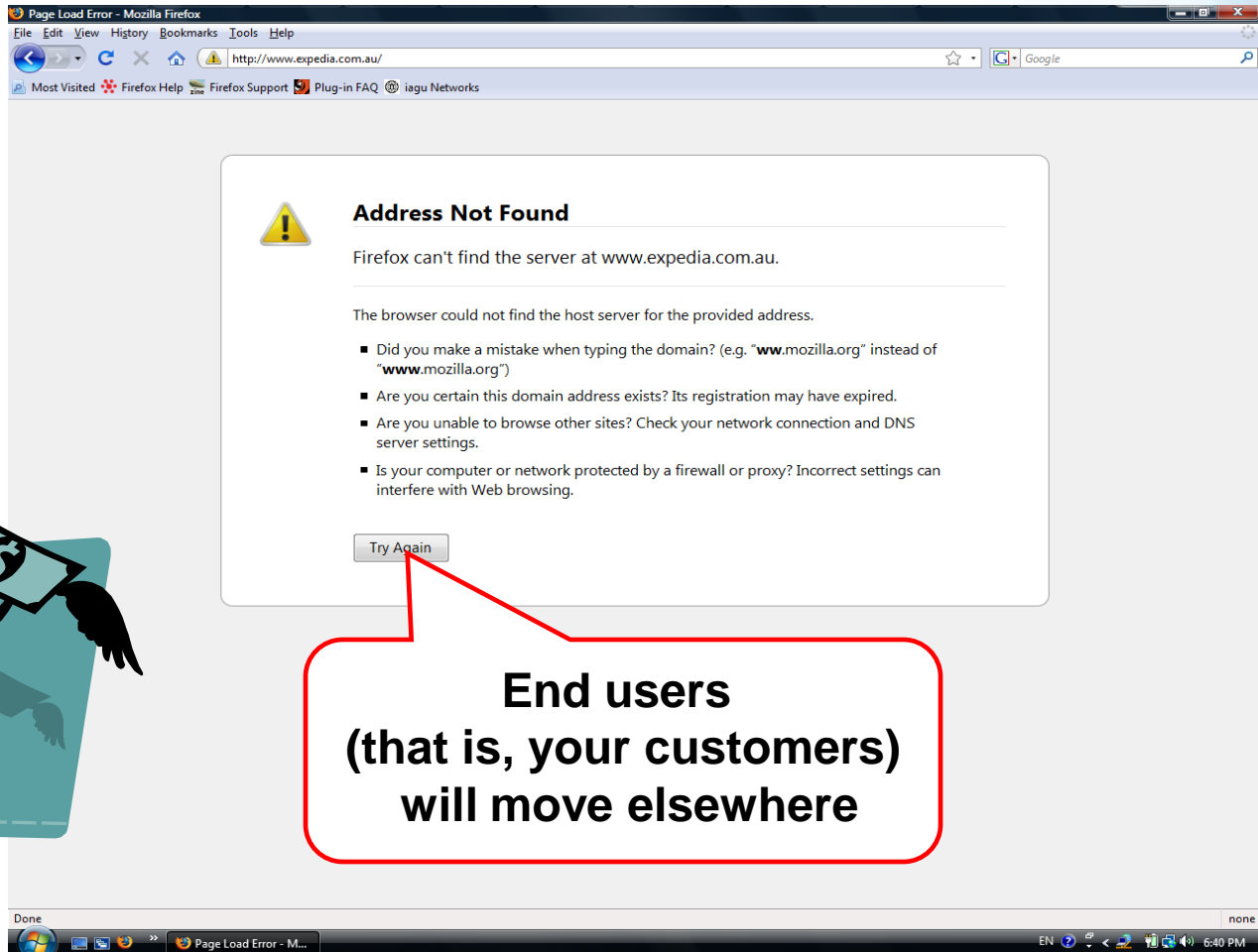
How much IPv6 is deployed?

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

Asia Pacific Network Information Centre

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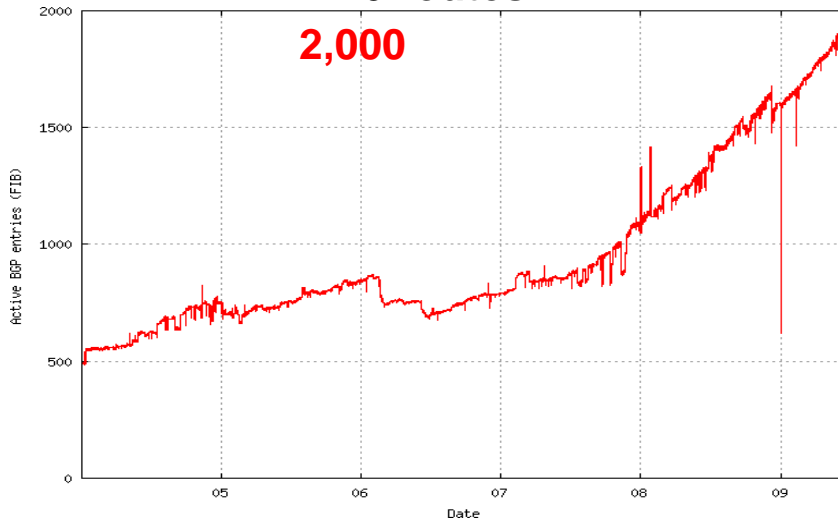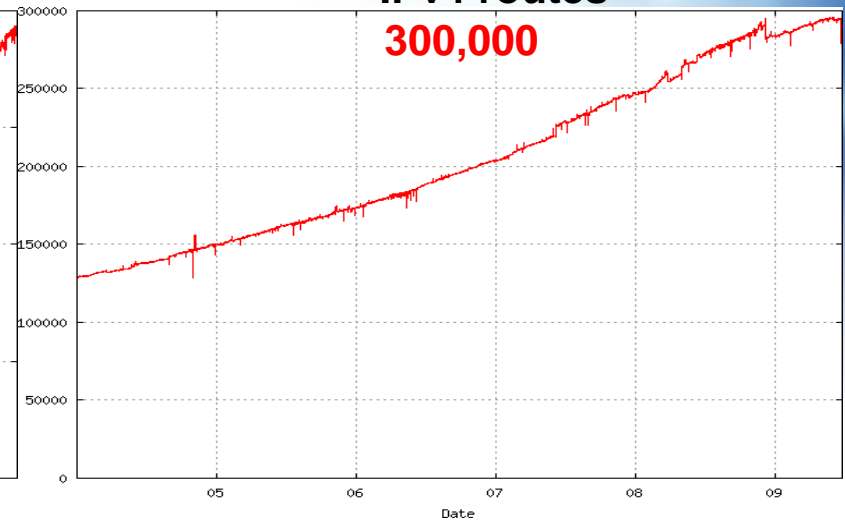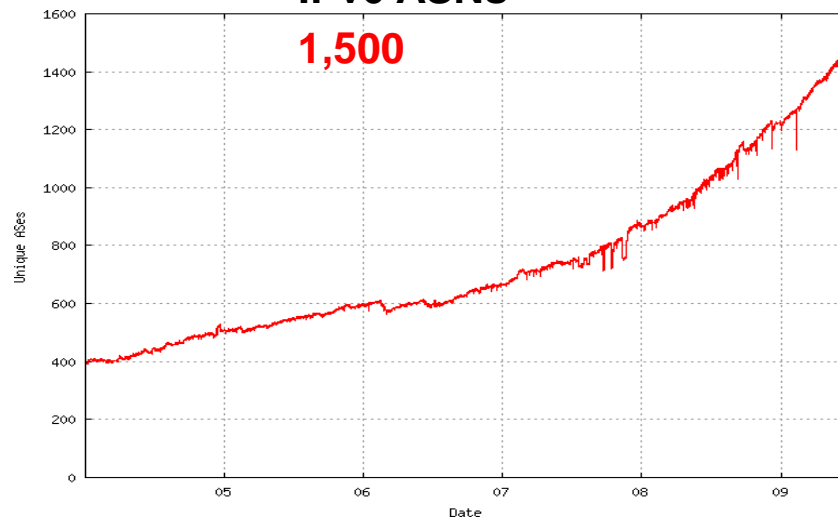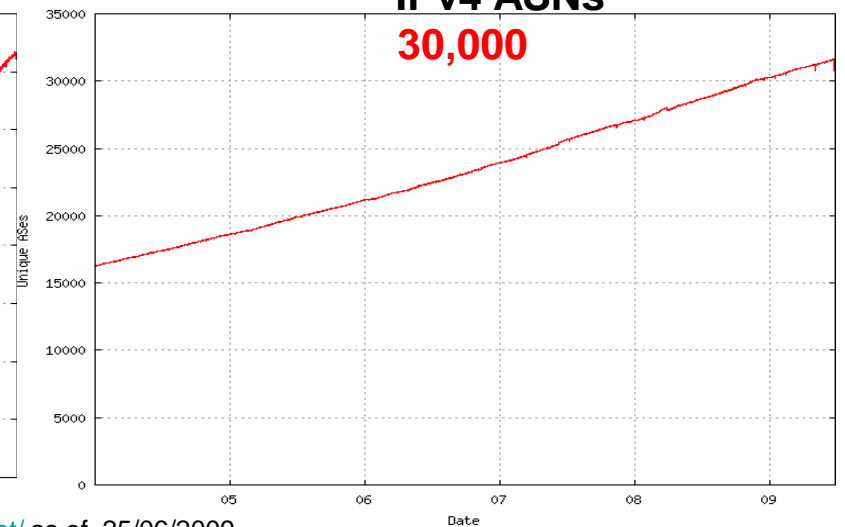
Upward trend

IPv6 / IPv4 Web Access Daily Ratio

APNIC R&D data as of 01/06/2009
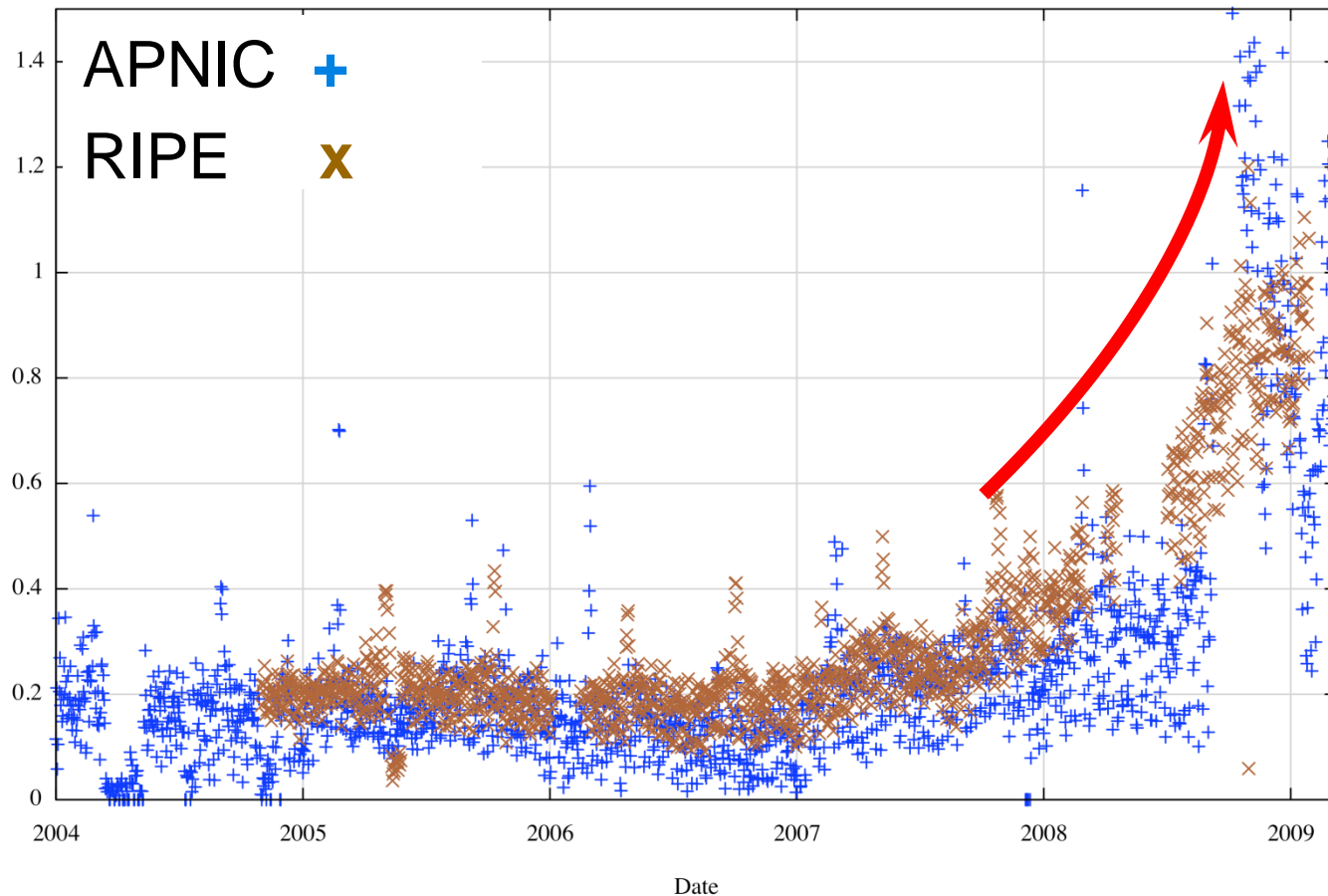
IPv6 deployment opportunities

- 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

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

https://sites.google.com/site/ipv6implementors/conference2009/agenda
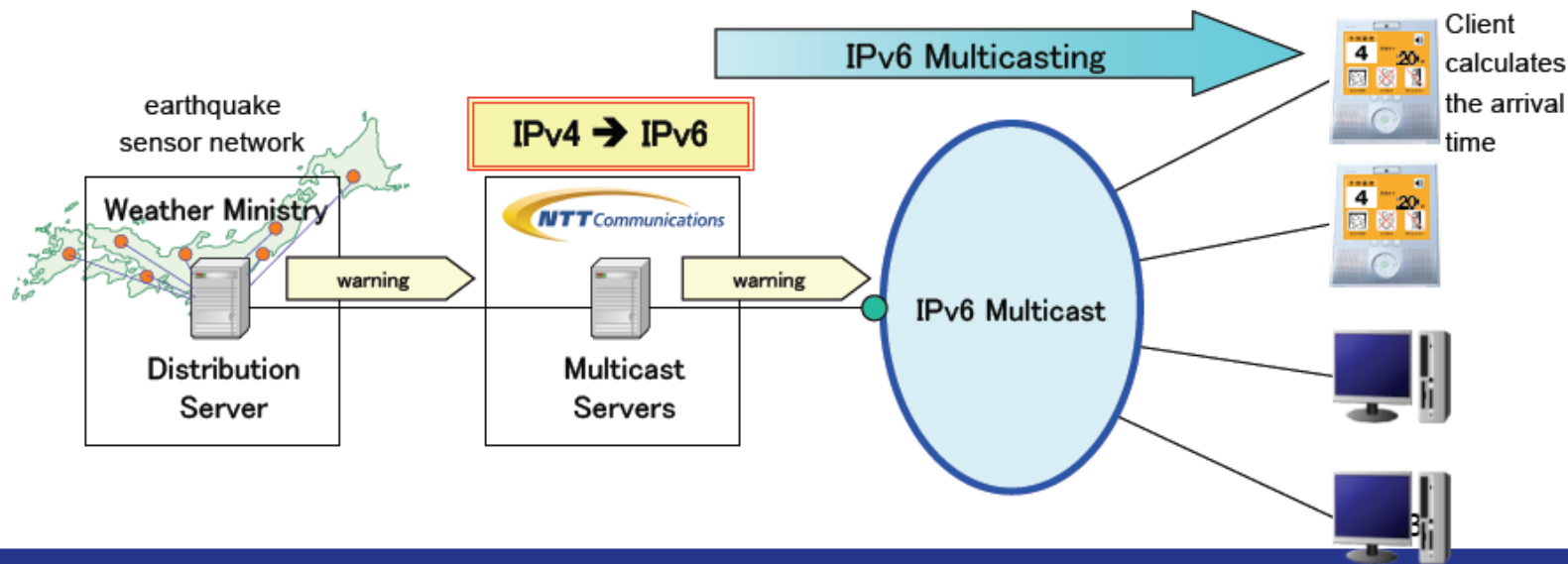
Recent IPv6 implementation case

- 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.

ARCH ROCK

Energy Portal

Internet

AC power submeters
IPpower nodes

Gas/Water submeters
IPsensor nodes

Temp, Hum., Light
IPsensor nodes

Outdoor Temp
IPsensorN4X

IPrelay nodes

Routers
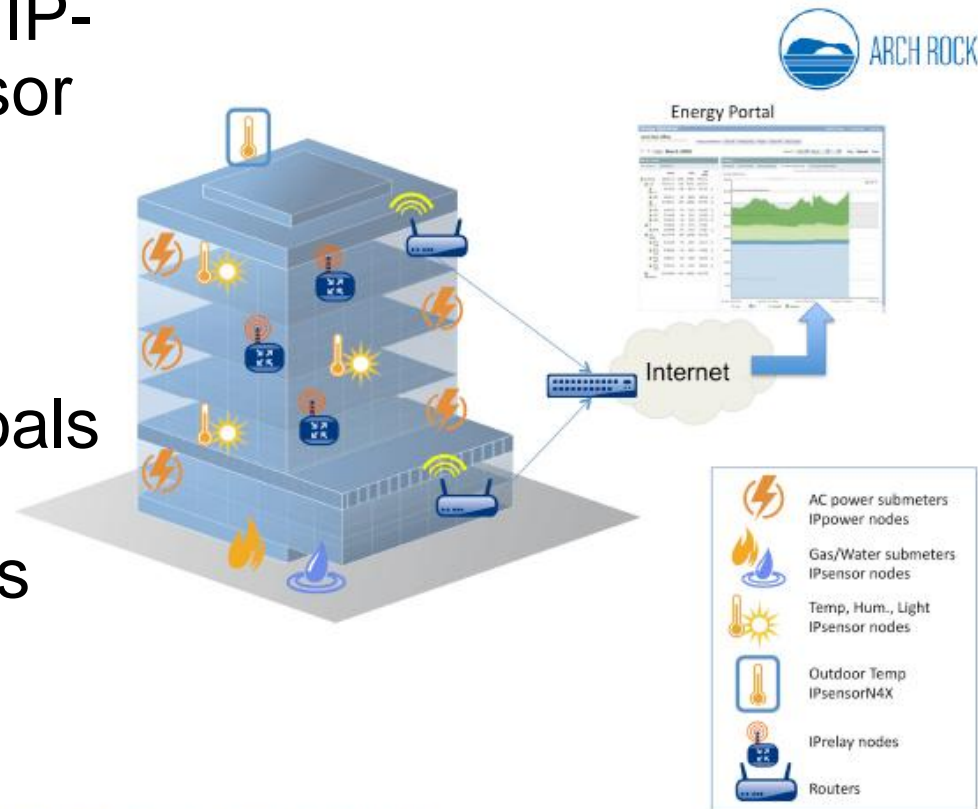
Figure 1 AREO in action -- Commercial office building

http://www.archrock.com/downloads/AR_WhitePaper_CommercialBuildingEnergy.pdf

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
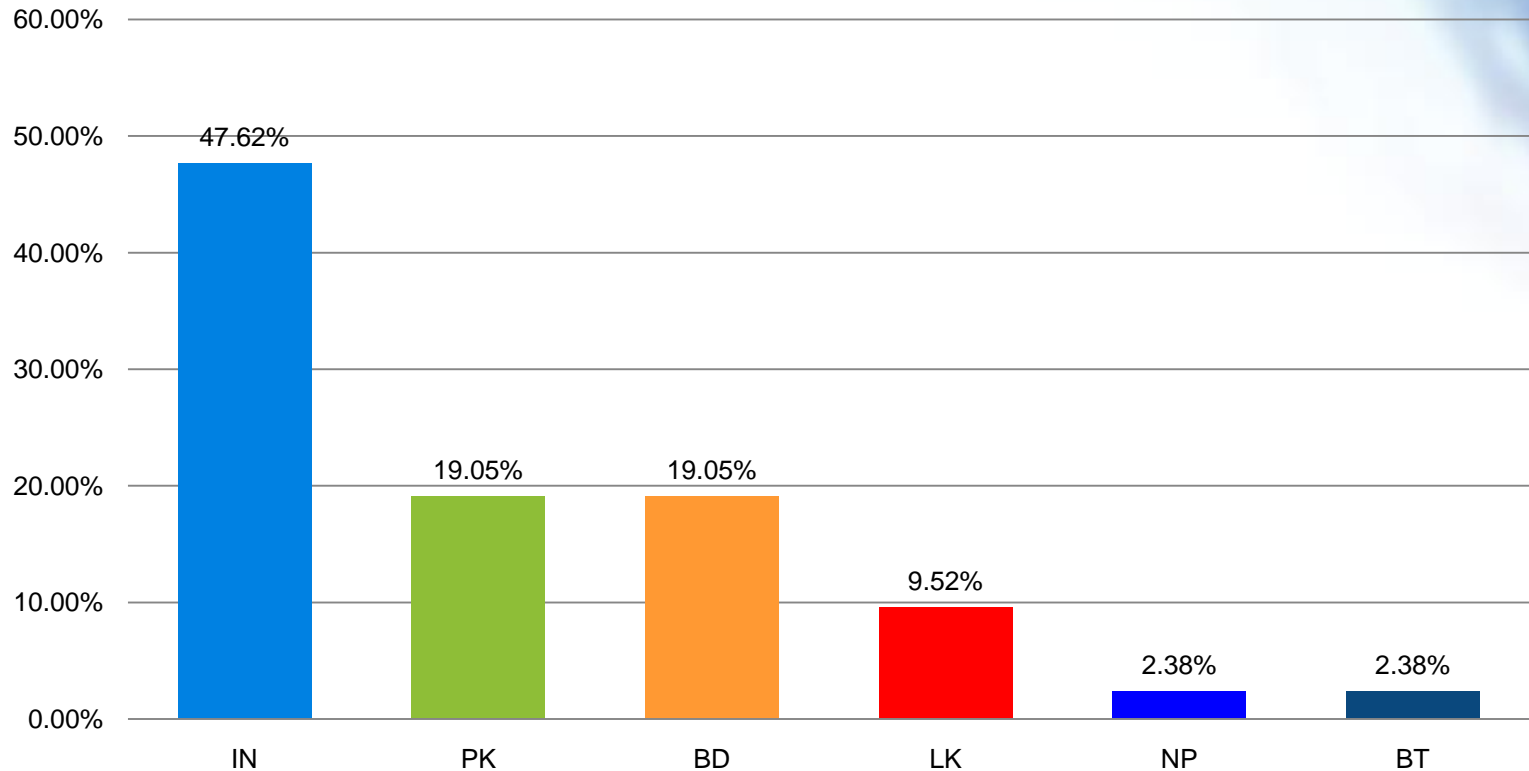
	IN	PK	BD	LK	NP	BT
	20	8	8	4	1	1
Mem	285	54	78	12	16	4

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

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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

http://www.apnic.net/meetings/28/

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

Asia Pacific Network Information Centre

Thank You!

srinivas@apnic.net

sunny@apnic.net