# ITU-APNIC collaboration on the transition from IPv4 to IPv6

ITU Regional Development Forum

"ICTs for Smart Sustainable Asia-Pacific"

Manila, Philippines

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APNIC

# Agenda

- Introduction
- ICT growth and economic development
- Scalable growth of IP-based services and IPv6
- Collaboration between ITU and APNIC
- IPv6 capacity development
- Way forward – APNIC Development Program

# APNIC

- **Primary function: Distribution and management of Internet number resources**
  - IPv4 and IPv6 addresses
  - Autonomous System Numbers (ASNs)
- **Not-for-profit, membership organization**
  - 5,000+ Members (10,000+ Members in total)
- **How we achieve APNIC's vision:**
  - Technical training and assistance
  - Support for community development (NOGs, CERTs etc.)
  - Supporting infrastructure development
    - IPv6, IXPs, root server deployment

*"A global, open, stable, and secure Internet that serves the entire Asia Pacific community"*

# Securing scalable growth of IP-based services

- The Internet is a global system of interconnected networks
- The most prominent component of the Internet is the Internet Protocol (IP)
  - IP addresses are unique and essential numbers required to identify the source and destination of digital packets
  - Vast supply and management of IP addresses is the key in supporting future growth
  - **IP version 6 (IPv6) needs to be widely deployed to secure future growth of the Internet**

# IPv6 capacity development

- 20 plus years of APNIC training
  - Hundreds of IPv6 training courses delivered for APNIC members and the wider community
    - About 4000 people participate in APNIC trainings annually
- Collaboration with the ITU
  - APNIC – ITU Asia Pacific (ASP) Centre of Excellence
  - Training network operators, policy makers and regulators from developing AP economies on IPv6 deployment
  - IPv6 migration strategies for telecom service providers (2011, 2012)
  - IPv6 infrastructure network security (2013, 2014, 2015, 2016)
  - ITU country direct engineering assistance in Lao PDR (2014), Mongolia (2015) and Cambodia (2016)

# Collaboration with ITU

- Our focus is on IPv6 capacity development in developing economies
  - Together we educate key network engineers and technical staff from various economies in the Asia Pacific
- Supported by:
  - Ministry of Information and Communication Technology, Thailand
  - ToT Academy, Thailand
- To deliver hands-on practical training courses and direct engineering assistance to support smooth IPv6 adoption in developing economies

# Collaboration with ITU

IPv6 infrastructure network security workshop

- Held in Bangkok, Thailand in May
- 5 days; hands-on workshop
- 42 participants from 10 economies in the Asia Pacific
- Topics
  - IPv6 protocol, IPv6 addressing, configuration of IPv4 and IPv6 networks, Hardening IPv6 network devices, IPv6 transition technologies, Securing transition technologies, lots of hands-on labs

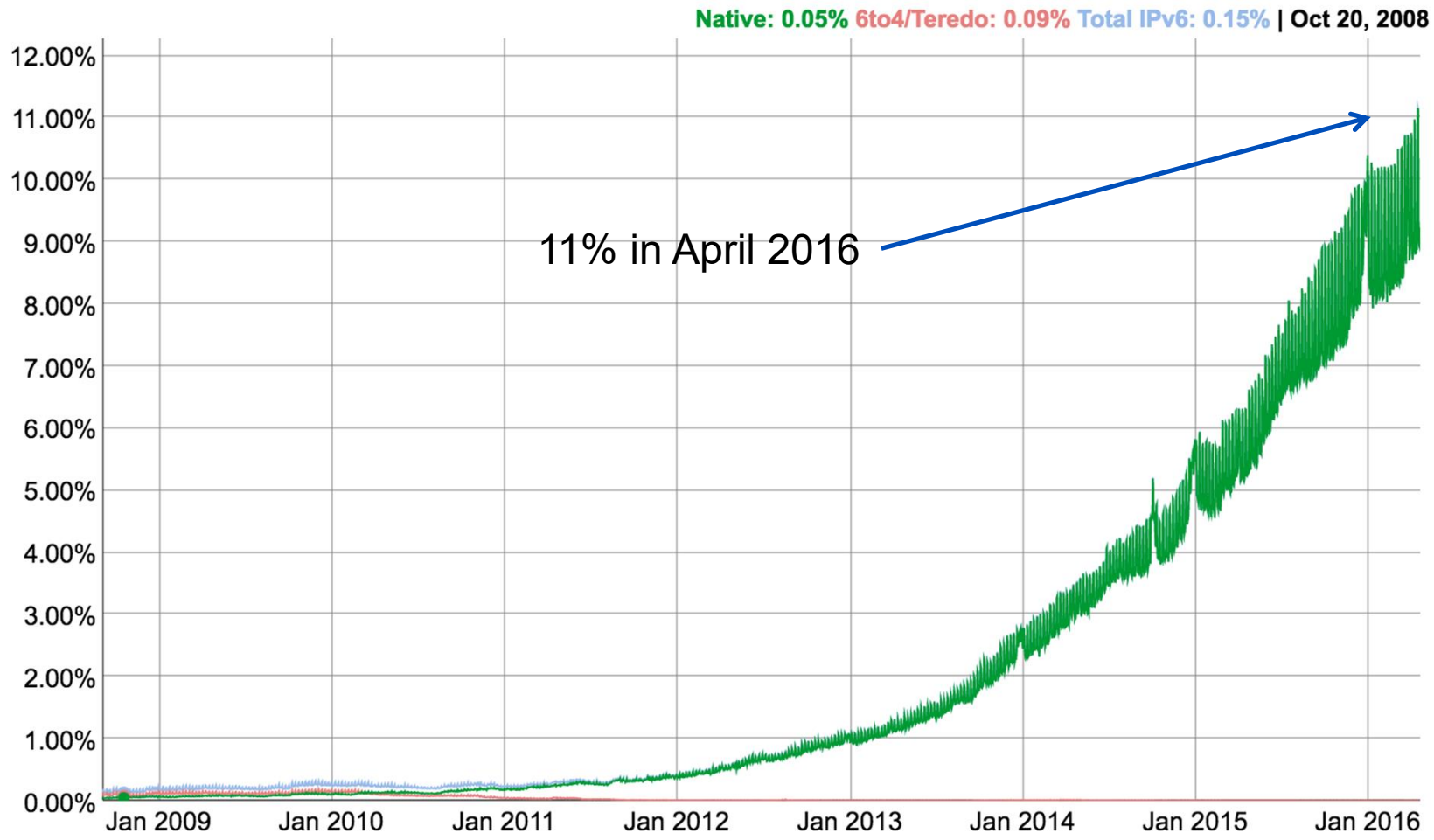
# Collaboration with ITU

## ITU Country Direct  Engineering Assistance (EA)

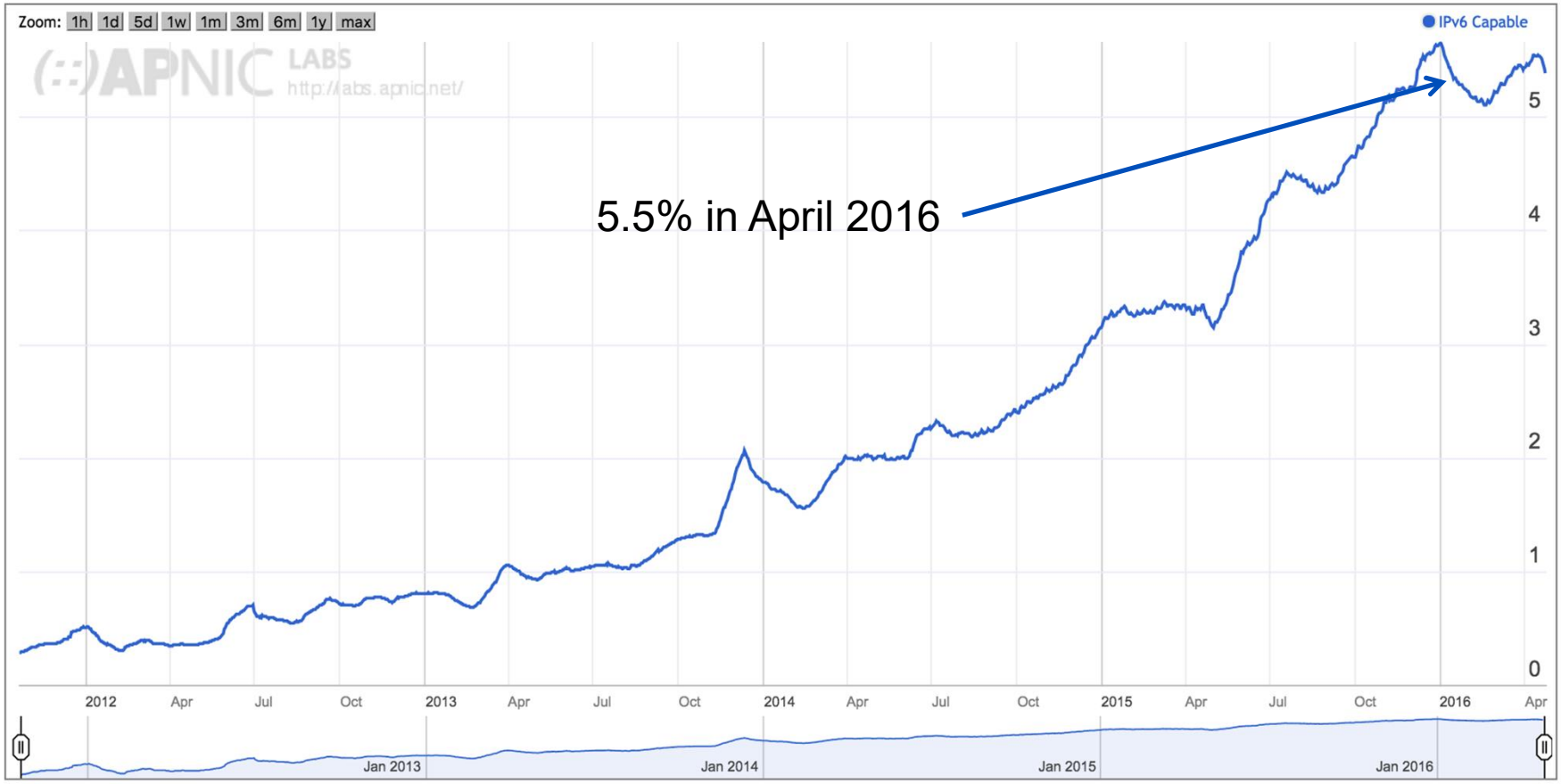
- On IPv6
- Held in Ulaanbaatar, Mongolia in July 2015
- 3 days; hands-on workshop (48 participants) + EA at 3 organizations
- Individual EA on how to deploy IPv6 in each networks

Next collaboration: Cambodia June 20-23 2016

# Global IPv6 users (Google)



# Global IPv6 capability (APNIC)



# Major ISPs – Examples

| CC | ASN | AS Name | Capable |
|---|---|---|---|
| **BE** | AS6848 | TELENET-AS Telenet N.V. | 70.73% |
| **BE** | AS12392 | ASBRUTELE Brutele SC | 70.59% |
| **US** | AS7922 | COMCAST-7922 - Comcast Cable | 60.01% |
| **US** | AS7018 | ATT-INTERNET4 - ATT Services, Inc. | 78.04% |
| **US** | AS22394 | CELLCO - Verizon Wireless | 89.88% |
| **US** | AS21928 | T-MOBILE-AS21928 - T-Mobile USA, Inc. | 45.36% |
| **AU** | AS1221 | ASN-TELSTRA Telstra Pty Ltd | 8.52% |

# Why are we waiting…?

Some frequent answers…

- We have more IPv4 addresses than we need
- We have more IPv4 addresses than people!
- Our content is offshore, in the cloud, etc.
- IPv4 works well enough

Ok, but things are changing….

# Drivers: network access

## Without IPv6 (IPv4 only)

- New deployments must use NAT (eg mobile)
- Carrier Grade NAT is expensive
- Increasing costs: x users x bandwidth

## With IPv6 (dual stack)

- Addresses for every device
- Offload traffic from NATs
- Competitive advantage
- IPv4 is eventually irrelevant, no more NAT
- LTE can use IPv6 immediately
- Also: “Internet of Things”

# Drivers: content and services

## Without IPv6 (IPv4 only)

- Degrading customer/client experience
- Mobile users at particular disadvantage (all NAT)

## With IPv6 (dual stack)

- Direct connection to all customers
- Best performance for all
- Better user experience, competitive advantage (esp mobile)

# Australia

| | |
|---|---|
| 24,244,056 | people |
| 21,068,084 | users |
| 87% | penetration |
| 1,941 | ASes |

| IPv4 | |
|---|---|
| 48,613,120 | addresses |
| 2.01 | per head |
| 87% | visible |

| IPv6 | |
|---|---|
| 3.44% | capability |
| 37,735,639 | M addresses |
| 1,556,490 | per head |
| 47% | visible |

# China

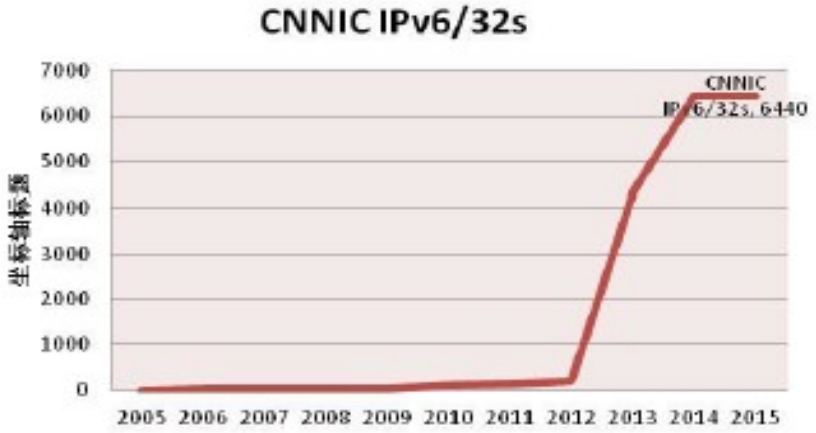
| | |
|---|---|
| 1,381,842,009 | people |
| 692,302,846 | users |
| 50% | penetration |
| 1,273 | ASes |

| IPv4 | |
|---|---|
| 337,457,152 | addresses |
| 0.24 | per head |
| 88% | visible |

| IPv6 | |
|---|---|
| 89,154,932 | M addresses |
| 64,518 | per head |
| 1% | visible |

# IPv6 Allocation

- CNNIC has allocated 6440 /32s




- A new large IPv6 allocation to China Highway Information System, consists of:
  - Operation monitoring system
  - Billing system
  - ETC system
  - Emergency broadcast system

**Large IPv6 requests in China**
- Operators, Internet service provider
- e-Government
- Industry users

# Korea

| | |
|---|---|
| 50,487,786 | people |
| 46,600,226 | users |
| 92% | penetration |
| 1,019 | ASes |
| 0.00 | GDP |

| IPv4 | |
|---|---|
| 112,411,136 | addresses |
| 2.23 | per head |
| 94% | visible |

| IPv6 | |
|---|---|
| 22,535,693 | M addresses |
| 446,359 | per head |
| 0% | visible |

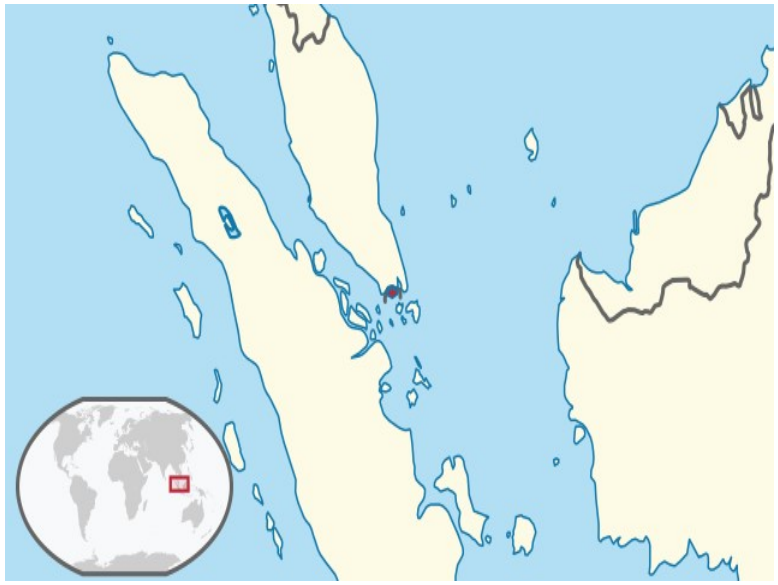
# Philippines

| | |
|---|---|
| 102,131,172 | people |
| 43,916,403 | users |
| 43% | penetration |
| 357 | ASes |
| 284.74B | GDP |

| IPv4 | |
|---|---|
| 5,445,376 | addresses |
| 0.05 | per head |
| 91% | visible |

| IPv6 | |
|---|---|
| 244,814 | M addresses |
| 2,397 | per head |
| 11% | visible |

# Singapore



| | |
|---|---|
| 5,689,390 | people |
| 4,665,299 | users |
| 82% | penetration |
| 425 | ASes |

| IPv4 | |
|---|---|
| 6,290,944 | addresses |
| 1.11 | per head |
| 85% | visible |

| IPv6 | |
|---|---|
| 794,576 | M addresses |
| 139,659 | per head |
| 12% | visible |

# APNIC Development Program

## Capacity building

- Face-to-face workshops
- Virtual lab
- eLearning
- Fellowships

## Technical Assistance

- IPv6 deployment planning (e.g. ASEAN)
- IXP operation and support
- Routing architecture

# You're Invited!


**29 September to 6 October**
https://conference.apnic.net

## Coming training events

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- 21-24 June IPv6 Infrastructure workshop (ITU) Phnom Penh, Cambodia
- 4-8 July – PACNOG 19, Port Moresby, Papua New Guinea
- 19-22 July DNSSEC workshop with ICANN Hanoi, Vietnam
- 25-27 July Advanced Routing workshop Jakarta, Indonesia

https://training.apnic.net