IPv6 Deployment: Where are we now?

APrIGF, Seoul, Korea

5th September 2013

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APNIC

Agenda

- A quick overview of IPv6 readiness in the AP region
  - Review of several statistics
  - Transit providers and CPs
- Governments' initiative in the AP region
  - National guidelines and mandates
  - Access networks' readiness
- Conclusion

IPv6 readiness in the AP region

Review of several statistics

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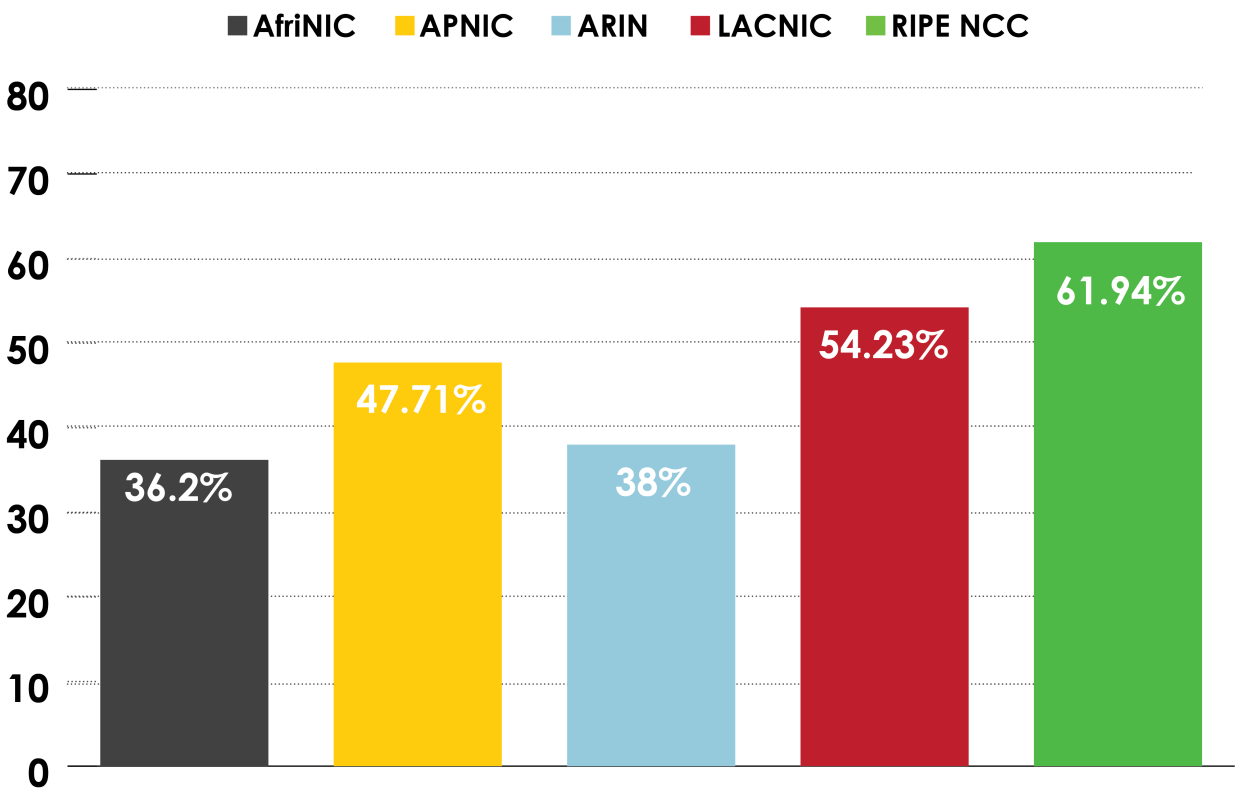
Percentage of members with both IPv4 and IPv6 in each RIR

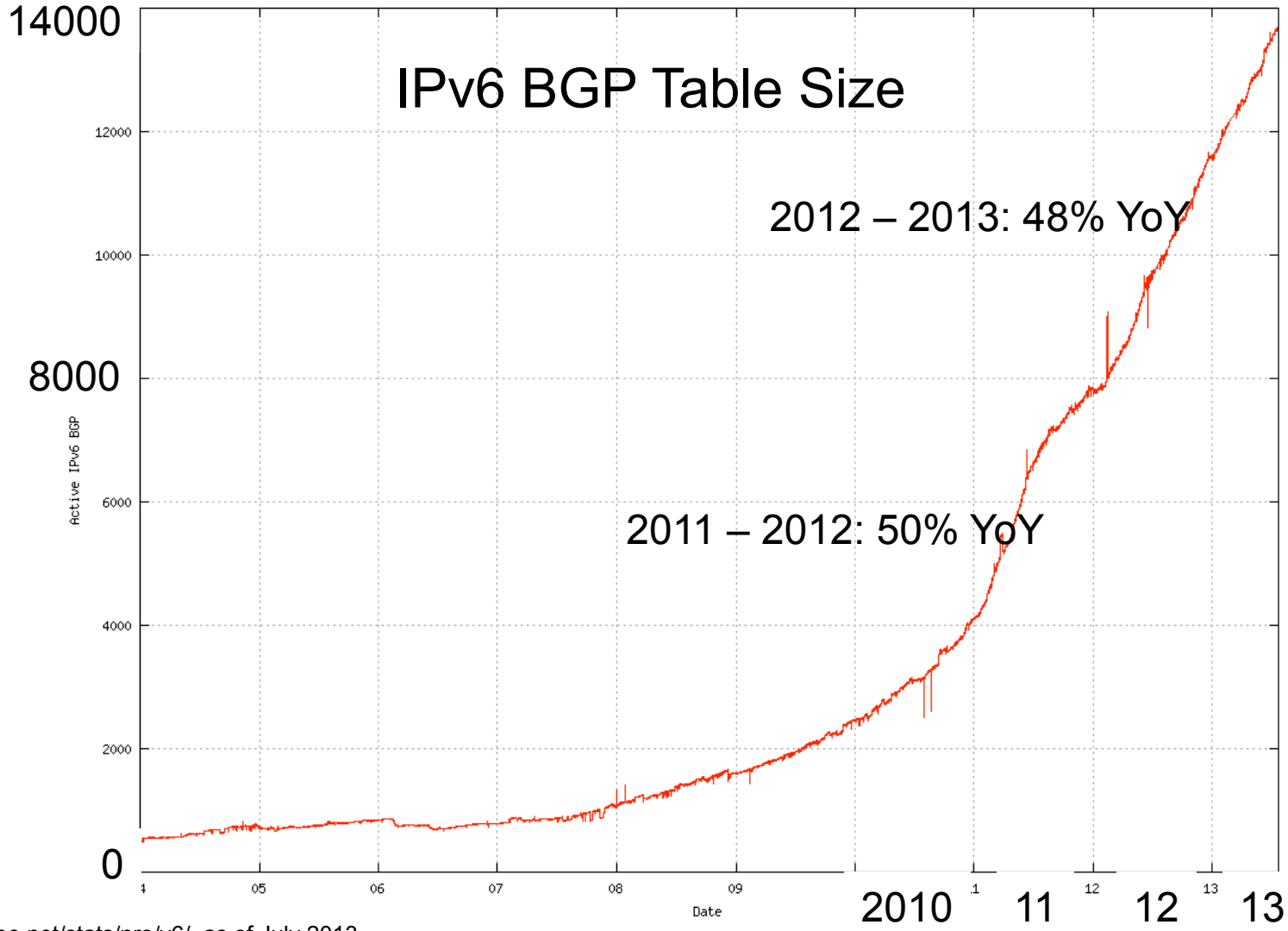
NRO

NRO data: June 2013



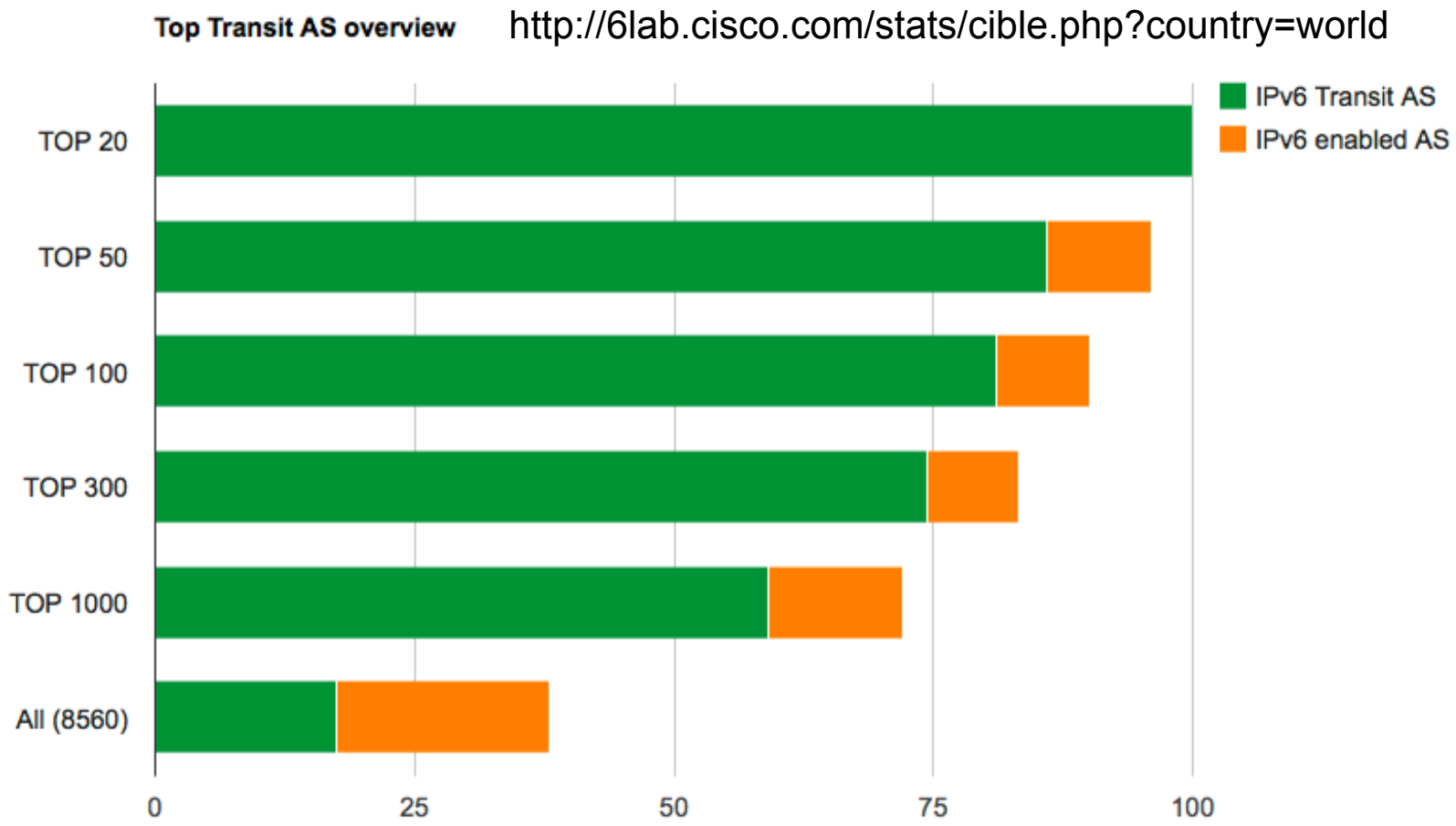
http://www.nro.net/wp-content/uploads/NRO_Q2_2013-3.pptx

Network with IPv6

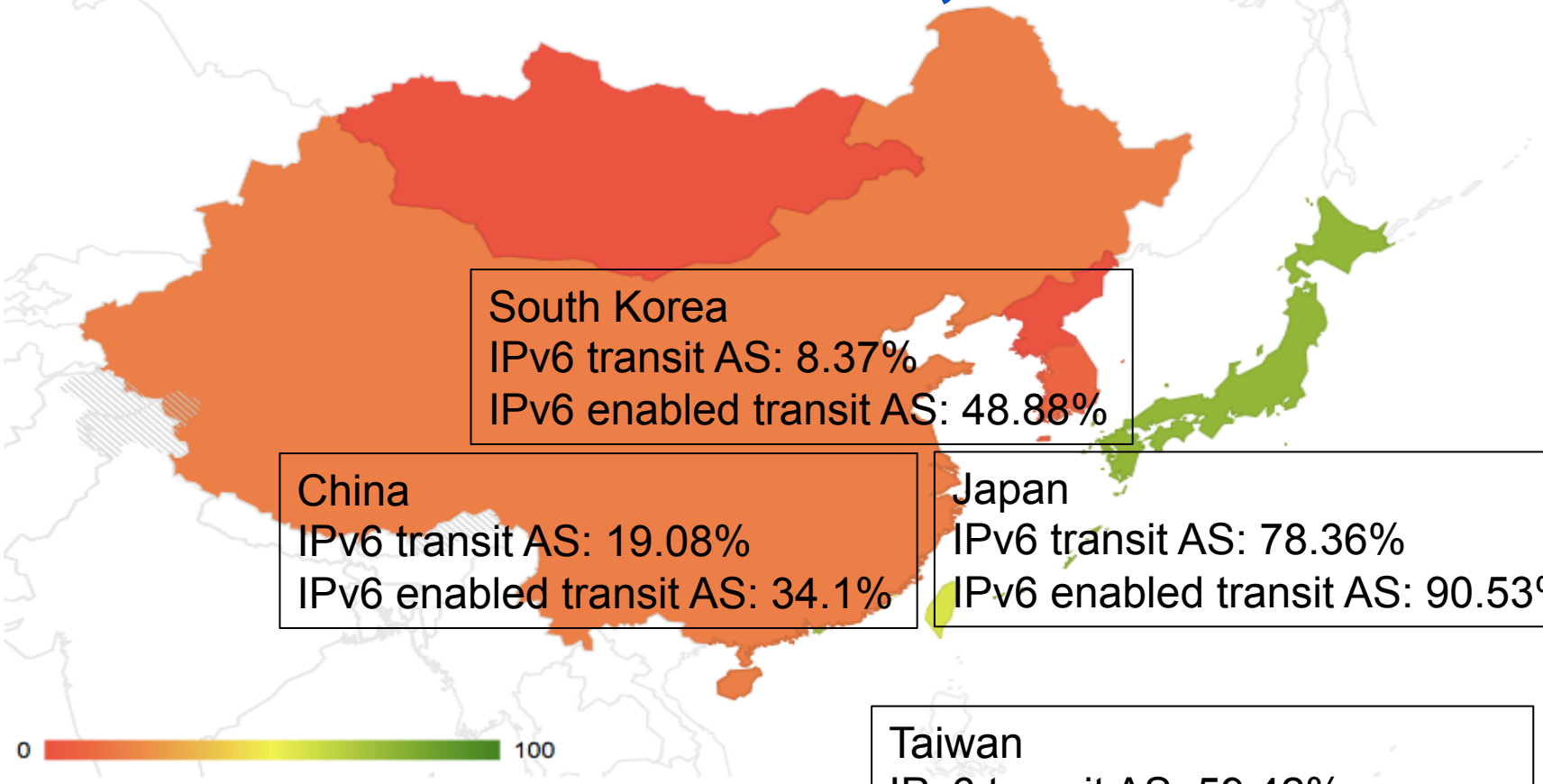


http://bgp.potaroo.net/stats/nro/v6/ as of July 2013

IPv6 adoption in Internet core networks



Level of IPv6 readiness of the core of the Internet: Local view, Eastern Asia



South Korea
IPv6 transit AS: 8.37%
IPv6 enabled transit AS: 48.88%

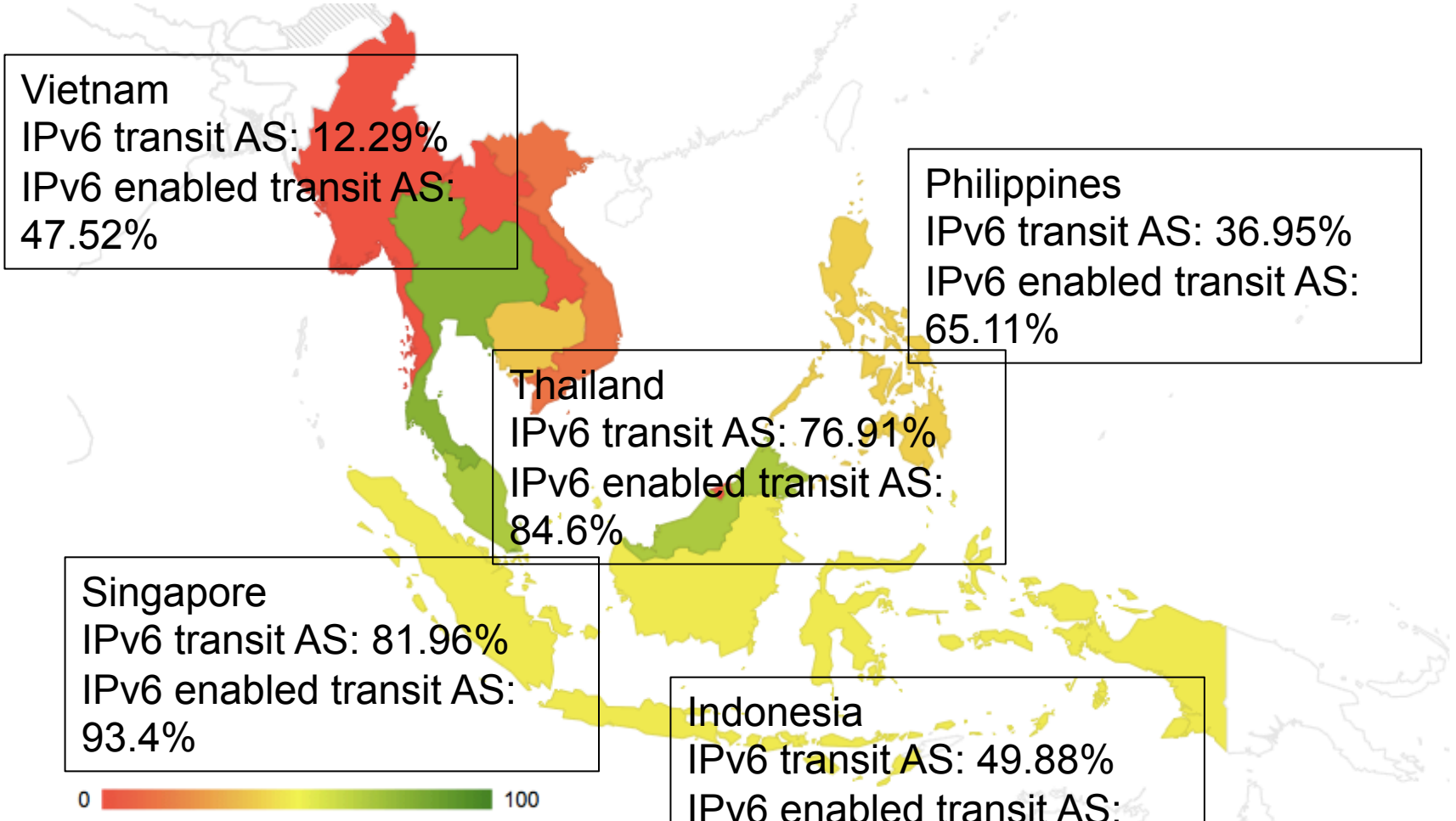
China
IPv6 transit AS: 19.08%
IPv6 enabled transit AS: 34.1%

Japan
IPv6 transit AS: 78.36%
IPv6 enabled transit AS: 90.53%

Taiwan
IPv6 transit AS: 59.42%
IPv6 enabled transit AS: 67.81%

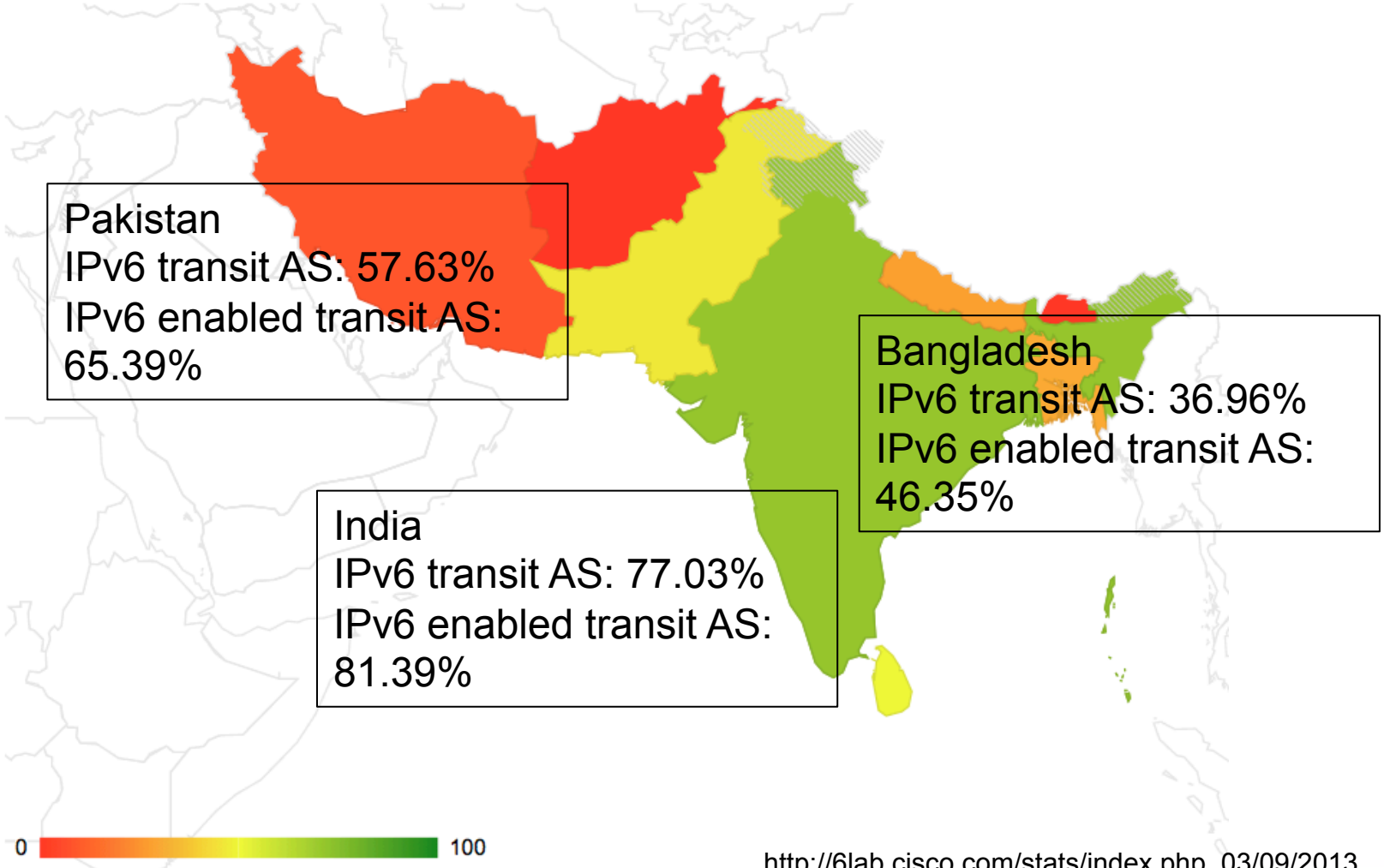
http://6lab.cisco.com/stats/index.php 03/09/2013

Level of IPv6 readiness of the core of the Internet: Local view, South-Eastern Asia



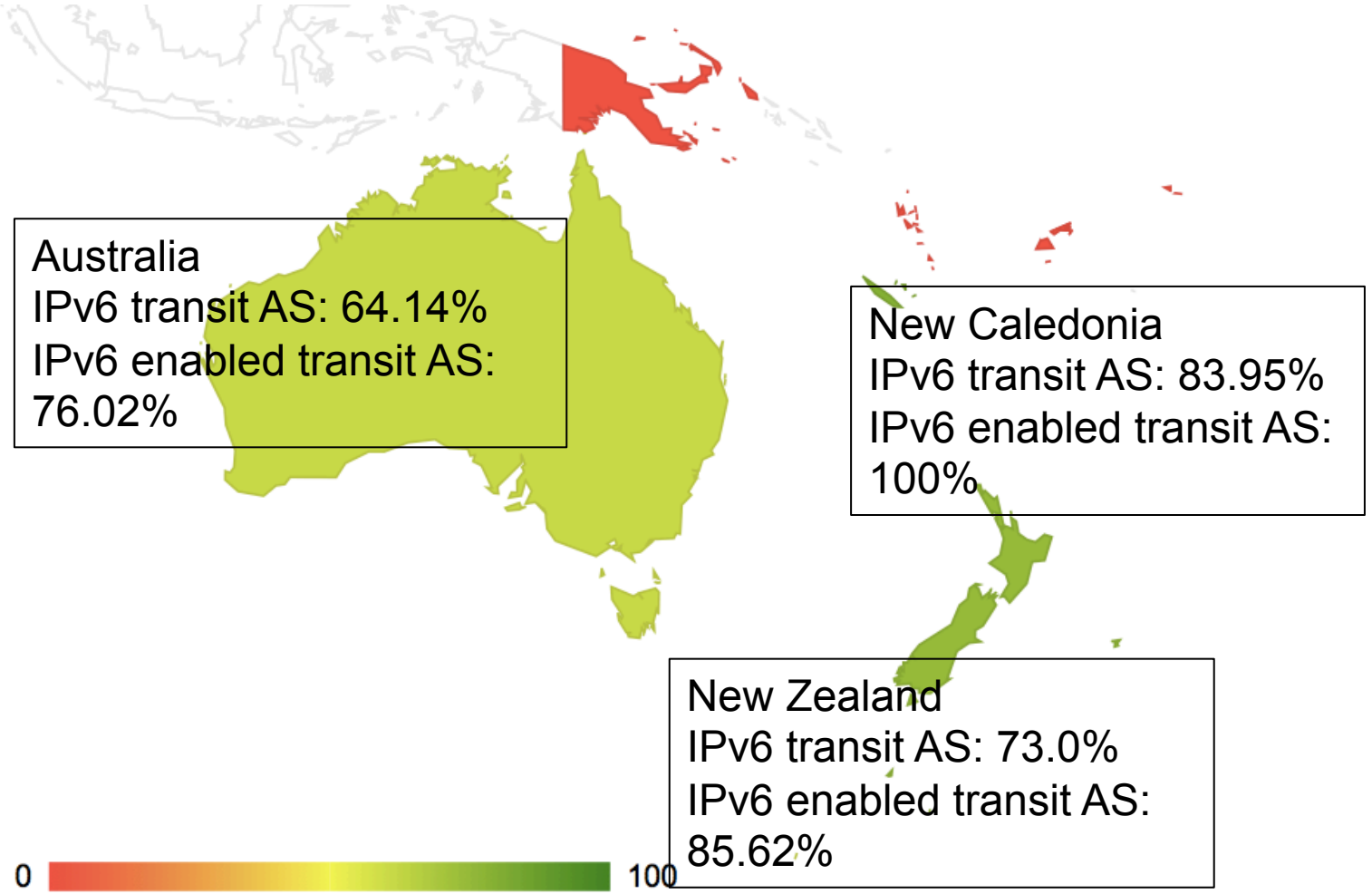
http://6lab.cisco.com/stats/index.php 03/09/2013

Level of IPv6 readiness of the core of the Internet: Local view, Southern Asia



http://6lab.cisco.com/stats/index.php 03/09/2013

Level of IPv6 readiness of the core of the Internet: Local view, Oceania



http://6lab.cisco.com/stats/index.php 03/09/2013

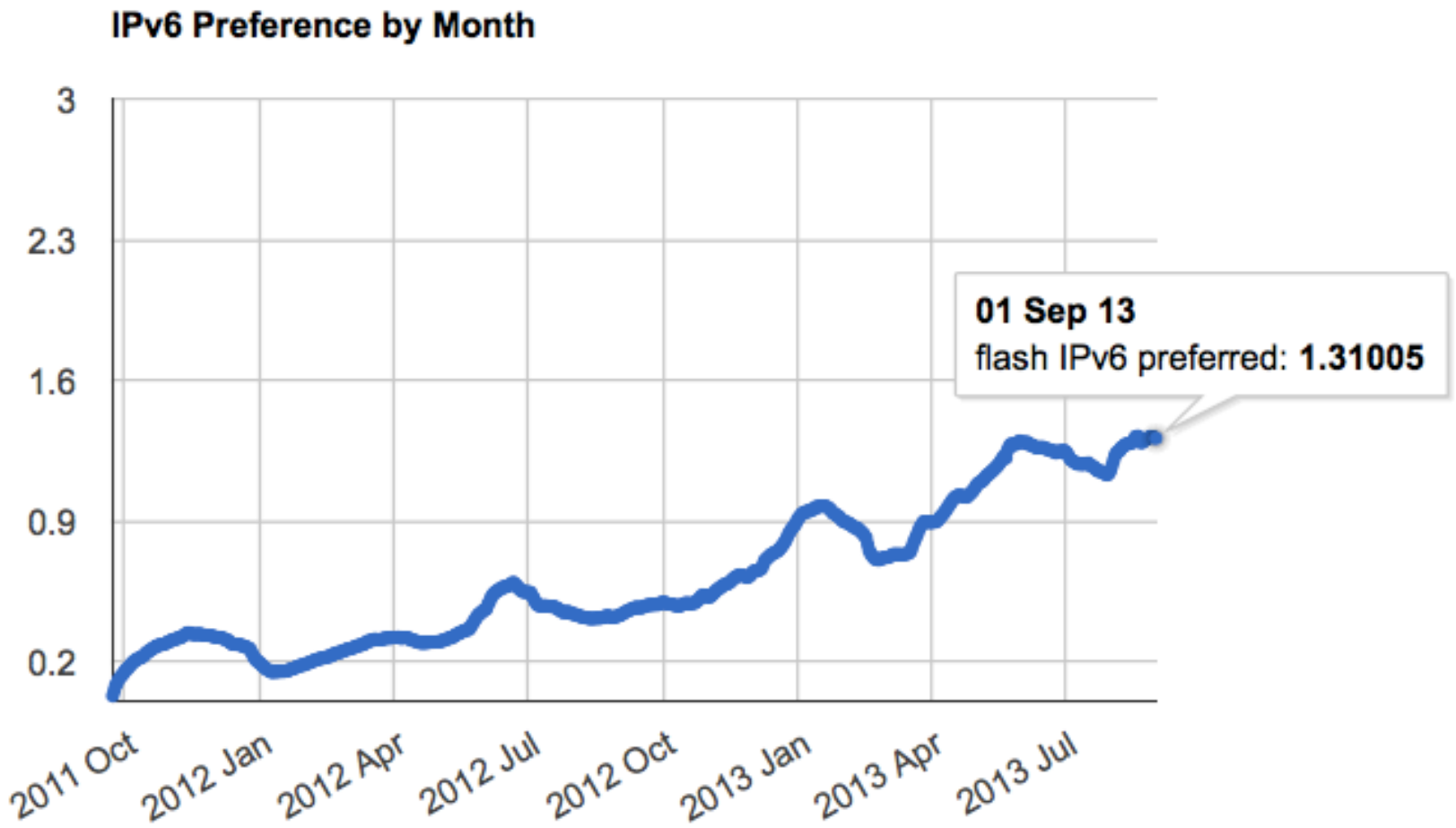
World ranking

IPv6 ready web sites http://www.vyncke.org/ipv6status/

Rank	Country	Sample	Green	Orange
1	Slovenia	50	32.0% (16)	0.0% (0)
2	Czech Republic	50	32.0% (16)	0.0% (0)
3	Brazil	50	28.0% (14)	0.0% (0)
4	United States of America	50	24.0% (12)	2.0% (1)
5	Singapore	50	20.0% (10)	0.0% (0)
6	Netherlands	50	18.0% (9)	4.0% (2)
7	Norway	50	16.0% (8)	4.0% (2)
8	Denmark	50	16.0% (8)	0.0% (0)
9	Greenland	13	15.4% (2)	0.0% (0)
10	Congo (Democratic Republic)	13	15.4% (2)	0.0% (0)
11	Thailand	50	14.0% (7)	4.0% (2)
12	Portugal	50	14.0% (7)	0.0% (0)
13	Switzerland	50	14.0% (7)	0.0% (0)
14	Tokelau	50	14.0% (7)	0.0% (0)
15	Reunion	33	12.1% (4)	3.0% (1)
16	Japan	50	12.0% (6)	4.0% (2)
17	Sweden	50	12.0% (6)	0.0% (0)
18	Germany	50	12.0% (6)	0.0% (0)
19	Estonia	50	12.0% (6)	0.0% (0)
20	Hungary	50	12.0% (6)	0.0% (0)
21	Poland	50	10.0% (5)	4.0% (2)
22	Sri Lanka	50	10.0% (5)	4.0% (2)
23	Spain	50	10.0% (5)	2.0% (1)
24	France	50	10.0% (5)	2.0% (1)
25	India	50	10.0% (5)	2.0% (1)

http://www.vyncke.org/ipv6status/ 03/09/2013

IPv6 measurement
End user readiness: World



http://labs.apnic.net/ipv6-measurement/Regions/001%20World/ as of 03/09/013

IPv6 deployment leaderboard in the AP region

ASN	Entity	Economy	IPv6 preferred rate
2516	KDDI KDDI CORPORATION	JP	29.73
18126	CTCX Chubu Telecommunications Company; Inc.	JP	27.92
4739	INTERNODE-AS Internode Pty Ltd	AU	13.62
4773	MOBILEONELTD-AS-AP MobileOne Ltd. Mobile/Internet Service Provider Singapore	SG	9.78
23655	SNAP-NZ-AS Snap Internet Limited	NZ	8.72
7470	TRUEINTERNET-AS-AP TRUE INTERNET Co.;Ltd.	TH	6.31
55430	STARHUBINTERNET-AS-NGNBN Starhub Internet Pte Ltd	SG	2.72

http://labs.apnic.net/ipv6-measurement/AS/ 03/09/2013

Observation

- IPv6 deployment status is varied among regions, economies and individual ASN (network operators)
- Have we been here before?
- Let's look into some statistics and anecdotal evidences of some economies in the AP region

Governments' initiative in the AP region

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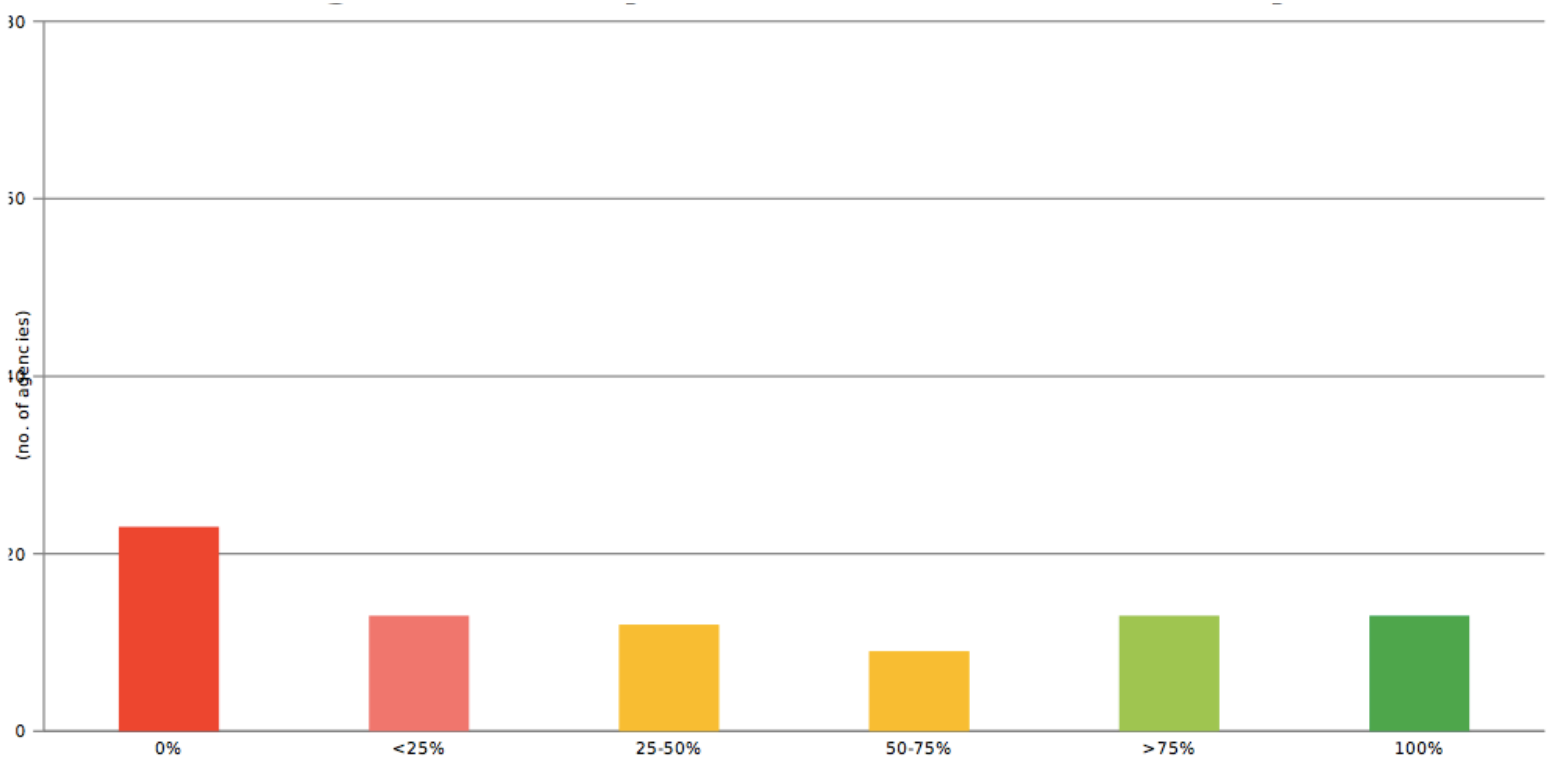
Australia

- A Strategy for the Implementation of IPv6 in Australian Government Agencies
  - Version 1 in 2007, Version 2 in 2009
  - All government agencies should have IPv6 capable hardware and software platforms by 2012
  - To operate dual stack IPv4 and IPv6 environment by 2015
    - Stage 1: Preparation (Jan 2008 – Dec 2009)
    - Stage 2: Transition (Jan 2010 – Dec 2011)
    - Stage 3: Implementation (Jan 2012 – Dec 2012)

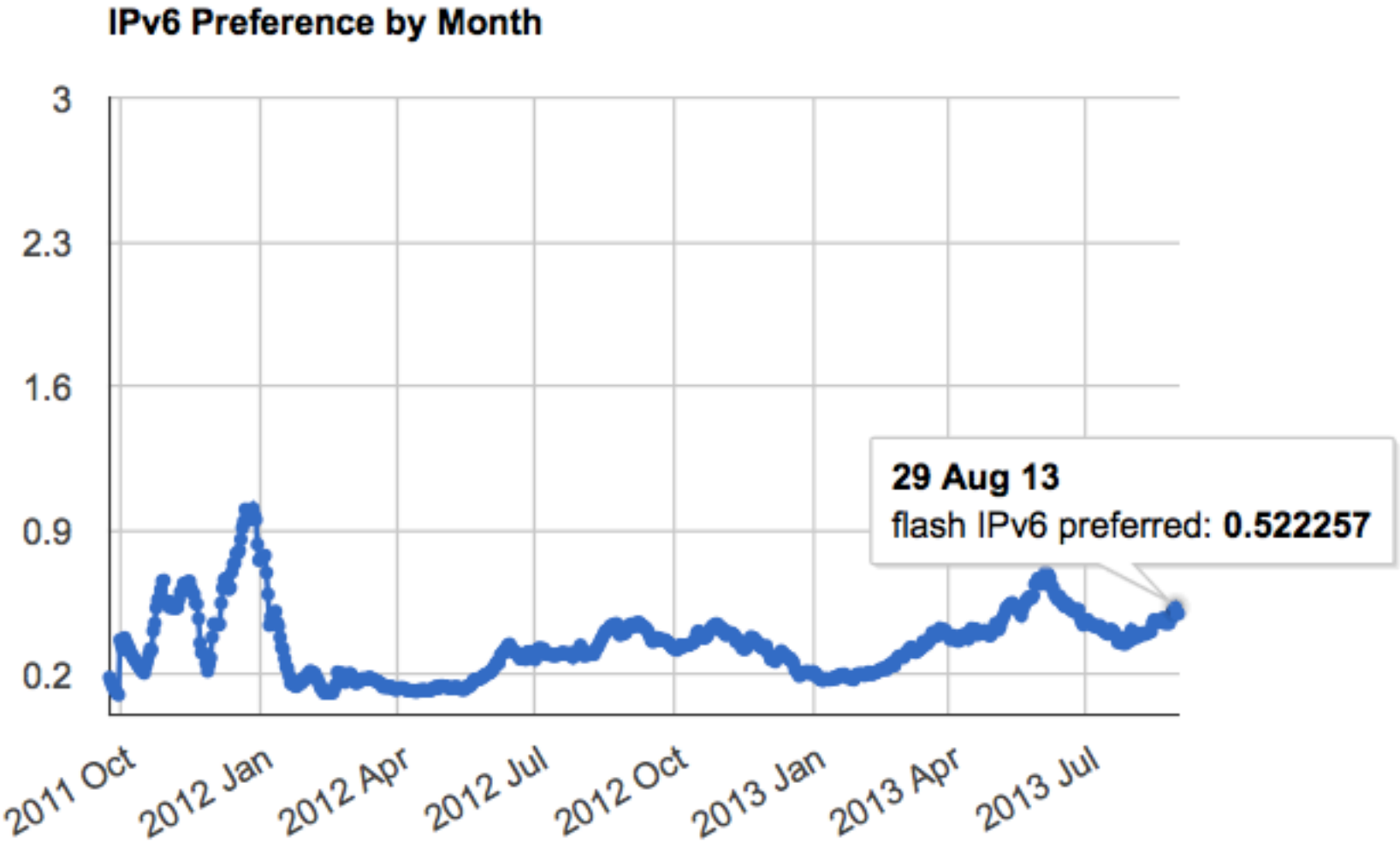
Australia: Stats

- Reported update on the current Stage 3 implementation level (as of 2012) reported by AGIMO



http://www.ipv6.org.au/summit/talks/JohnHillier_AGIMO_IPv6Summit12.pdf

Australia: Stats



http://labs.apnic.net/ipv6-measurement/Economies/AU/

China

- Announcement made by the Chinese State Council in Nov 2011
  - IPv6 mandates to the Industry
    - "China will put Internet Protocol version 6 (IPv6) into small-scale commercial pilot use and form a mature business model by the end of 2013, the State Council recently said at an executive meeting about the main goals and road map for the China Next Generation Internet project" (People's Daily Online, Jan 2012, http://english.people.com.cn/90778/7696495.html)
    - 3 million users for each operators by 2013
    - 25 million users by 2015
  - SPs in China are responding to this mandate

China

IPv6 Plan of e-Government Extranet

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

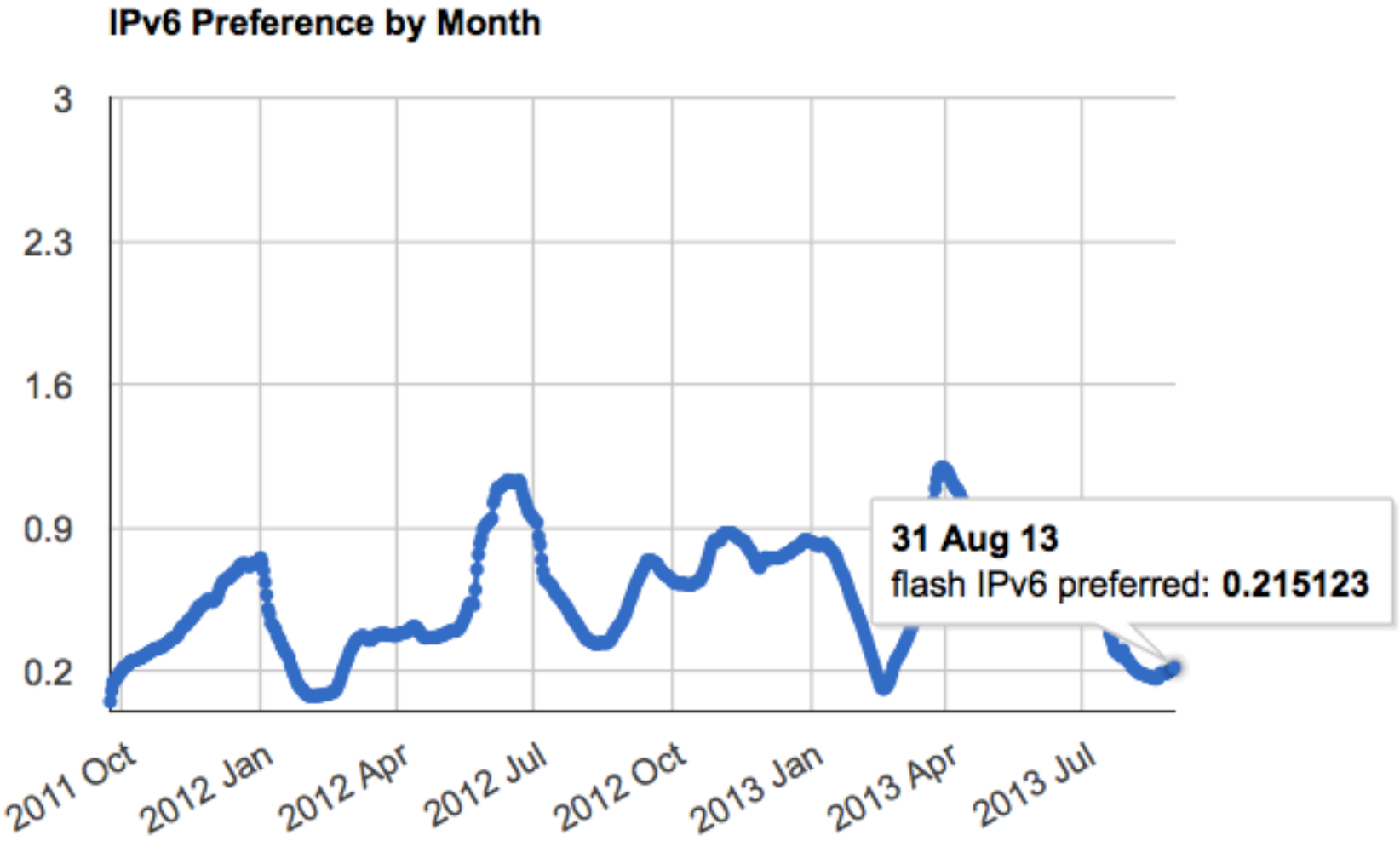
■Chinese authorities pay great attention on the Next Generation Internet based on IPv6 and have issued a series of announcements to specify the target and roadmap of development of next generation Internet, providing policy and financial supporting measures

■Following the important principle 'Government network must go first for the informatization', national e-government extranet (e-government public infrastructure) will take the lead in the field of e-government planning, deployment and pilot IPv6 related technologies

■IPv6 is a must for the e-government extranet, because with the expanding coverage of e-government network and increasing services& applications, IPv4 shortage is a big barrier for system deployment and providing new services

http://conference.apnic.net/data/36/cnnic-update_2013.8.27_1377563880.pdf

China: Stats



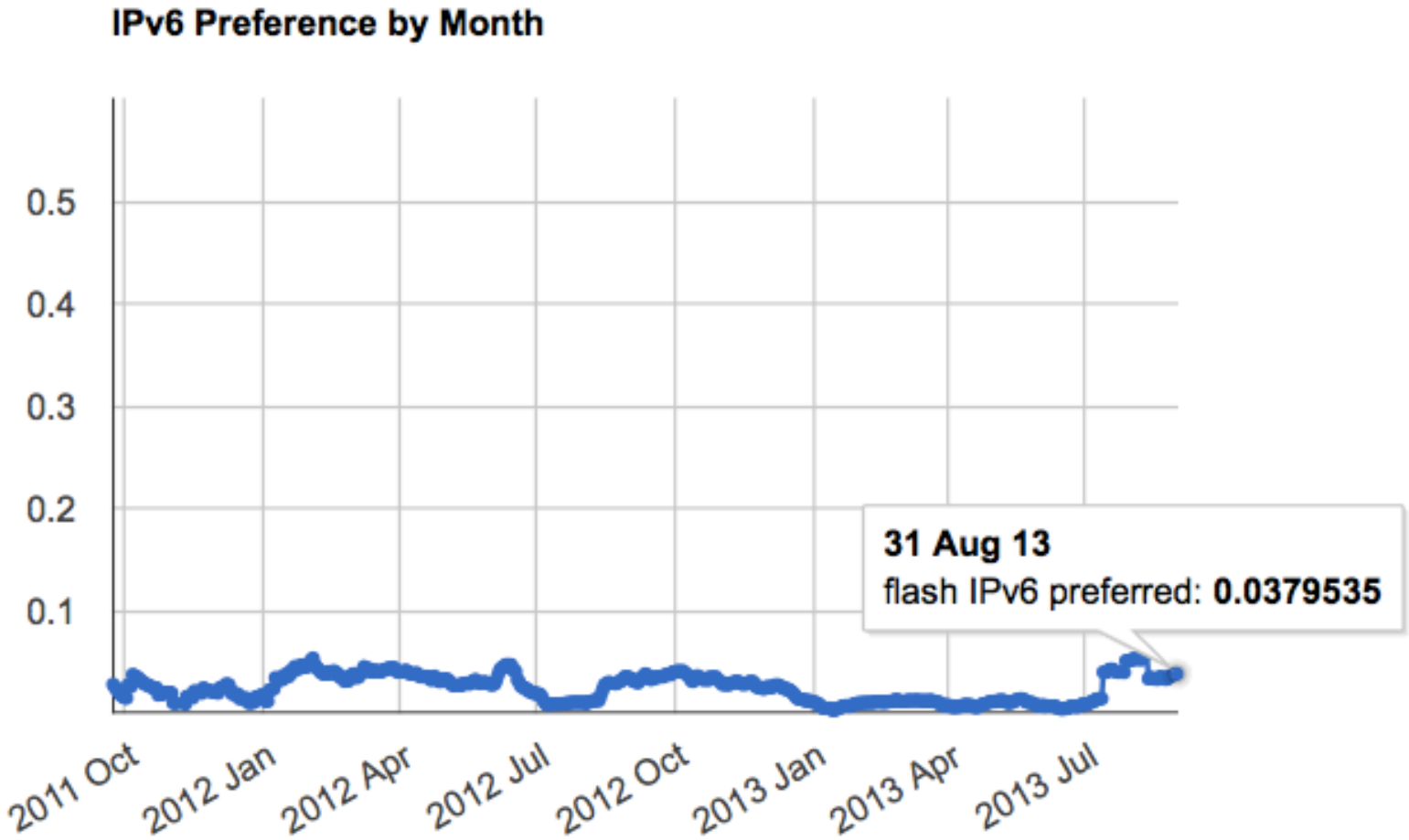
http://labs.apnic.net/ipv6-measurement/Economies/CN/

India

- National IPv6 deployment roadmap (version 2)
  - The original version was issued in June 2010
- Recommendations for Internet multi-stakeholders
  - Enable IPv6 services at all new enterprise customers (connecting to the Internet after Jan 2014)
  - Enable IPv6 services at all new retail wire line customers (connecting to the Internet after July 2014)
  - Enable IPv6 services for LTE customers (connecting to the Internet after June 2013)
  - All content and application providers to adopt iPv6 for new contents and applications by June 2014
  - All new .in domain to be compulsorily on dual stack from Jan 2014
  - All governments complete transition to IPv6 by Dec 2017

http://conference.apnic.net/__data/assets/pdf_file/0006/58533/DOT-PPT-APIPv6TF-Agarwal-ver2.pdf

India: Stats



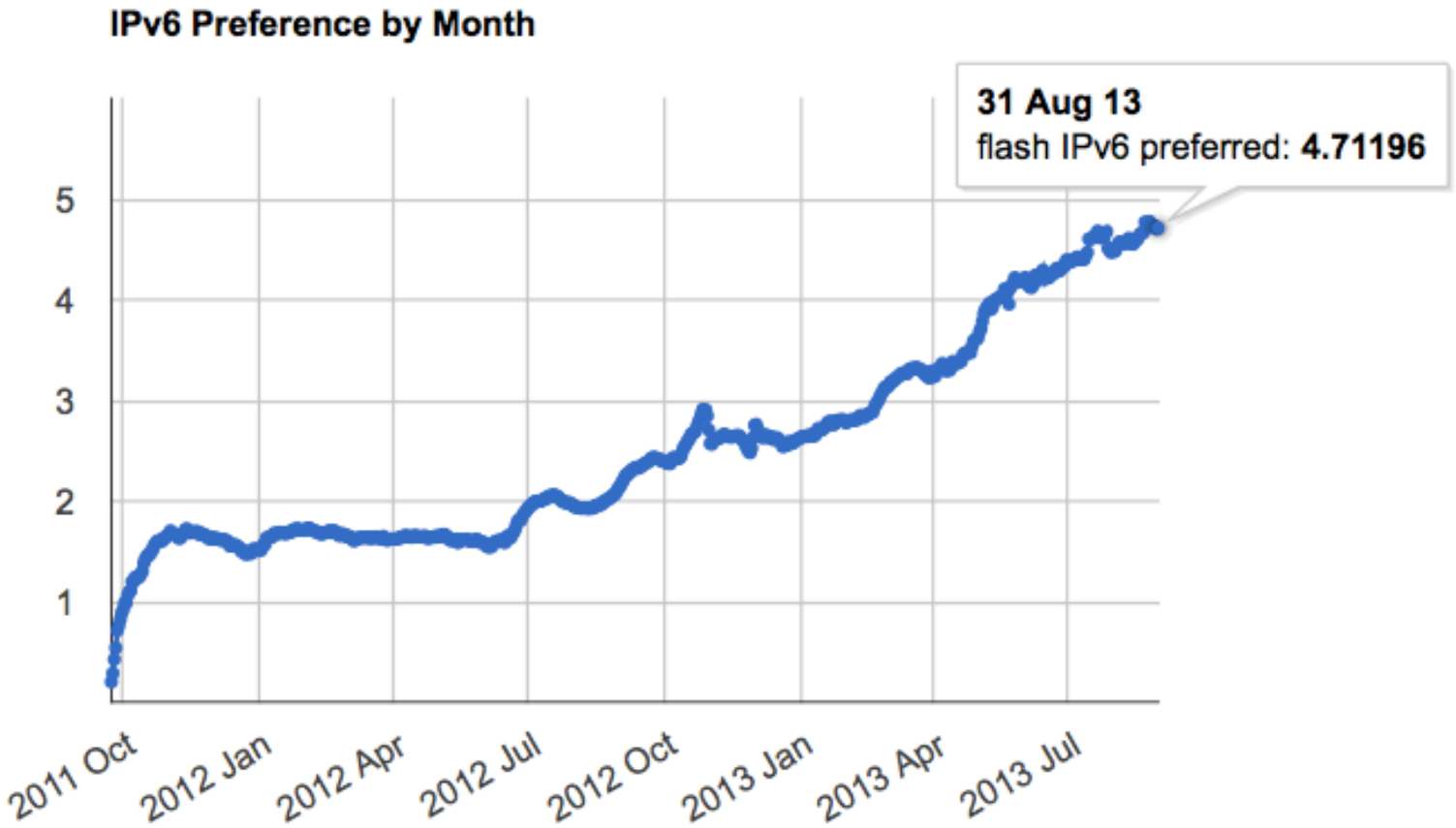
http://labs.apnic.net/ipv6-measurement/Economies/IN/

Japan

- Ministry of Internal Affairs and Communications conducts regular IPv6 Study Group
  - Partnership between the public and private sectors
    - Detailed field level discussions
  - Most recent one on July 2013
    - Active discussion on CGN: concerns on its relatively high costs, possible negative impact to end users
    - Update on usage of existing IPv6 test bed (APs and CPs)
    - Discussion on potential formats of IPv6 service deliveries: Default IPv6 services
    - Discussion on possibility to have an “IPv6 Launch Japan” to increase IPv6 deployment in multiple SPs including CPs

http://www.soumu.go.jp/main_sosiki/joho_tsusin/policyreports/chousa/ipv6_internet/02kiban04_03000222.html

Japan: Stats



http://labs.apnic.net/ipv6-measurement/Economies/JP/

Korea

- IPv6 interconnection agreement among ISPs in Korea
  - Wired network: 3 major ISPS (KT, SKB, LGU+) adopted IPv6 at their backbone and IXs (Dec 2012)
- Mobile network: A joint project of Korea Internet & Security Agency (KISA) and SK Telecom (Number one mobile network operator in Korea) to test IPv6 on LTE mobile network (Dec 2012)
  - Android devices on NAT64 successfully worked
  - http://www.youtube.com/watch?v=wYzN0c7go4M
  - IPv6 traffic monitoring and billing system etc. need to be prepared before commercializing the service

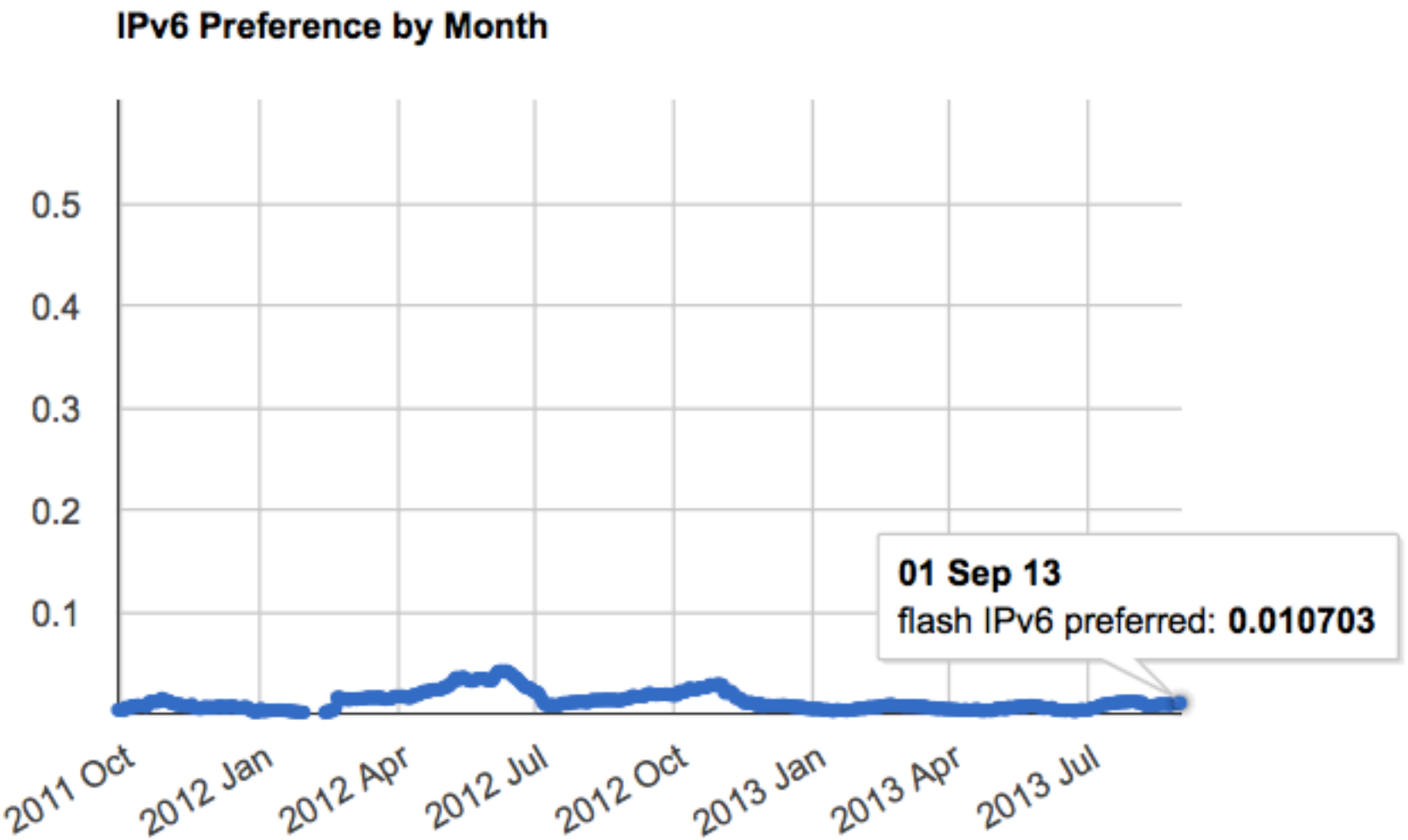
http://conference.apnic.net/__data/assets/pdf_file/0009/58455/ipv6-deployment-update-from-koreakisa_youngsun-la_1361361191.pdf

Korea

- IPv6 industry survey conducted by KISA (2013)
  - Relatively low response rate: level of interest toward IPv6?
  - Identified IPv6 challenges and requirements
    - Lack of experts and IPv6 technical knowledge
    - Lack of R&D test environment
    - Market's needs and government's plans
- Development of guideline document by the government
- Conducting performance measurement

http://conference.apnic.net/data/36/apnic36_nirsig_krnic_updateyoungsun-la_20130822_1377152839.pdf

Korea: Stats



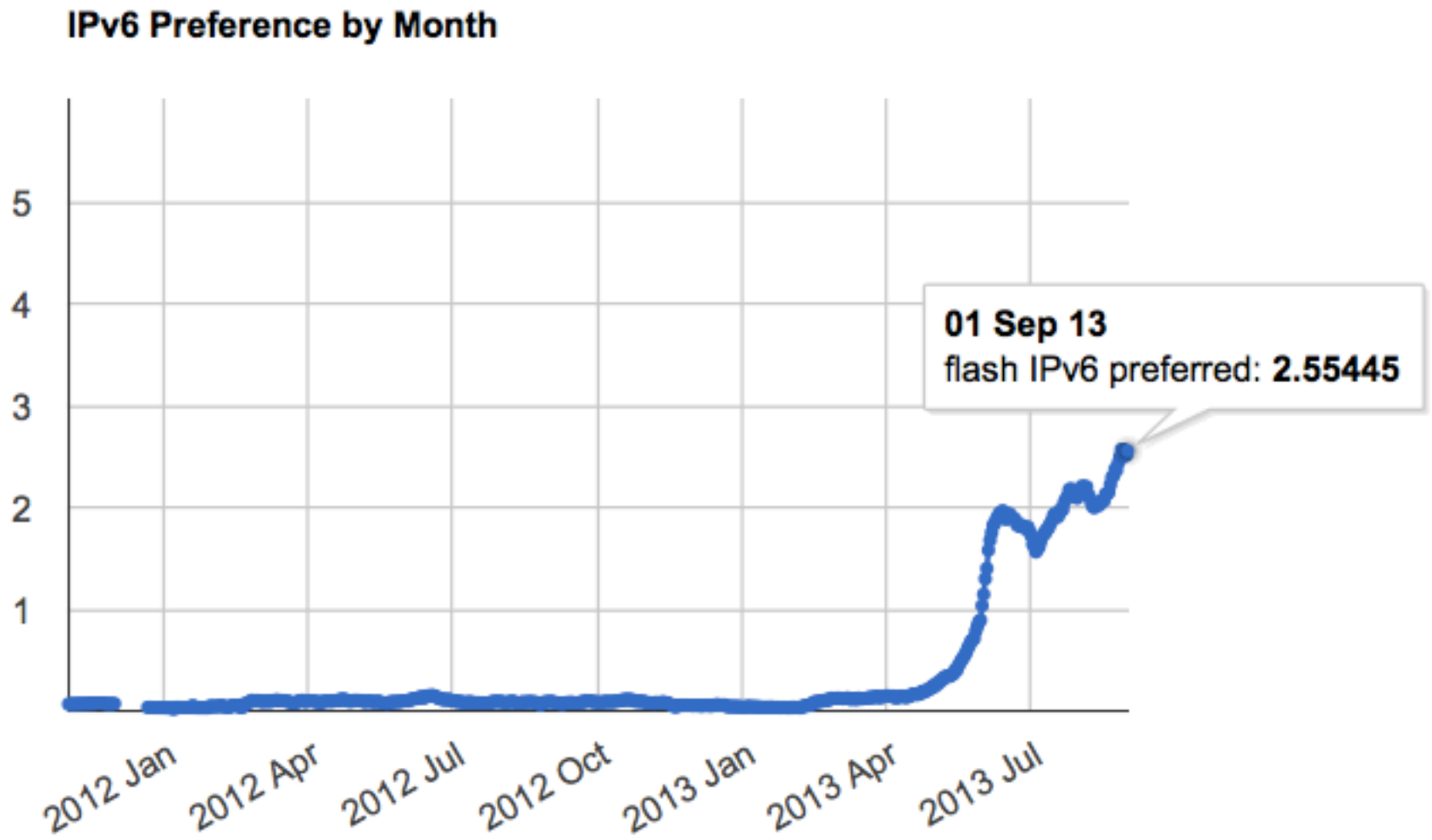
http://labs.apnic.net/ipv6-measurement/Economies/KR/

Singapore

- IPv6 Transition Program lead by Infocomm Development Authority (iDA) of Singapore
  - To apply multi-stakeholder approach in conjunction with “pull” and “push” strategies to support IPv6 adoption
    - Create Initial IPv6 demand by enterprises, government agencies, content and application providers
    - Create IPv6 supply by network providers
    - Drive competency across multi-stakeholders
    - Ensure IPv6 and IPv4 performance equity by hardware and software vendors
    - Raise awareness on IPv6 across multi-stakeholders
    - Managing IPv4 address exhaustion mainly by network providers
  - To address the issue of IPv4 exhaustion and to facilitate the smooth transition of the Singapore inforcomm ecosystem to IPv6
  - To promote IPv6 adoption in the local industry

http://www.ida.gov.sg/Infocomm-Landscape/Technology/IPv6

Singapore: Stats



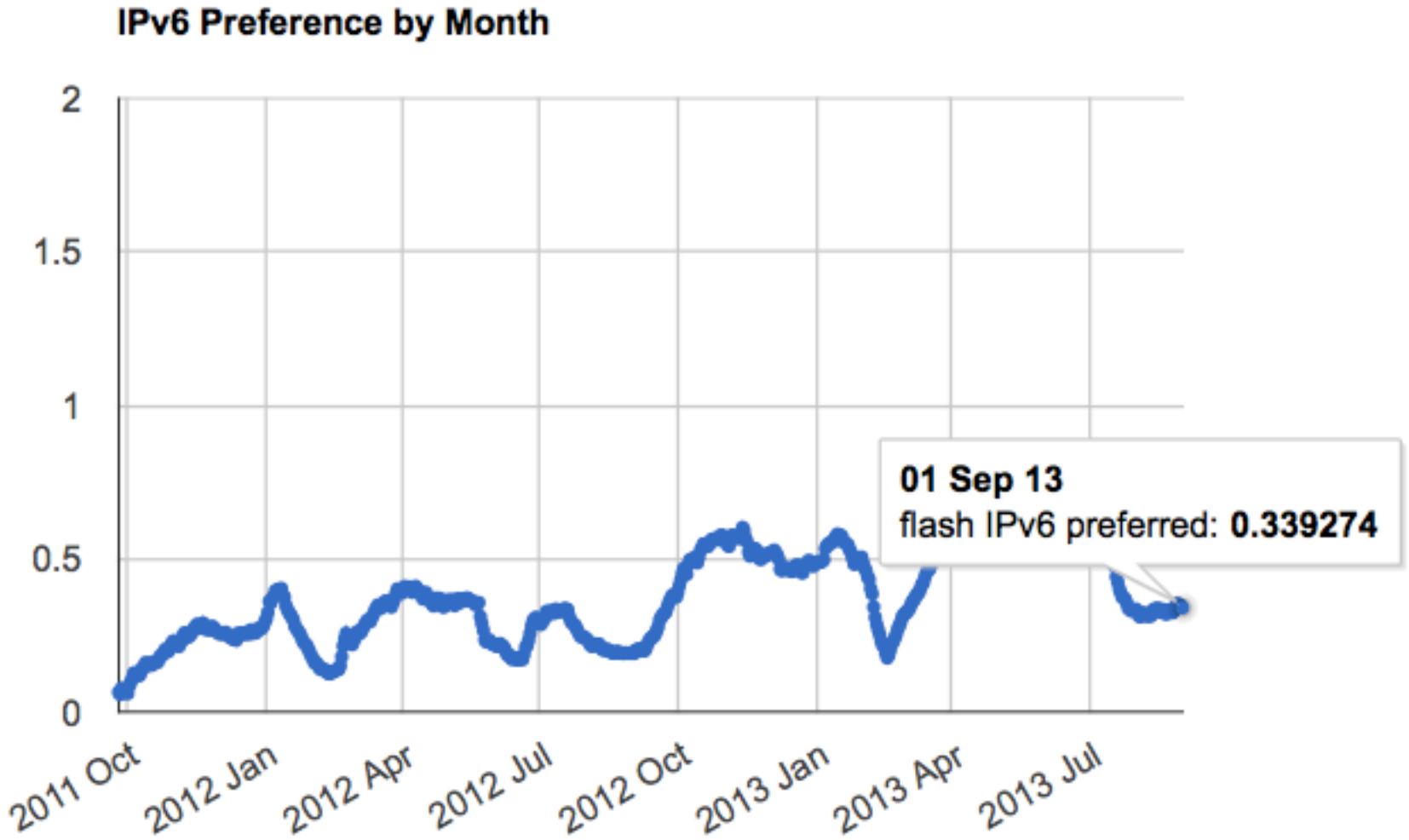
http://labs.apnic.net/ipv6-measurement/Economies/SG/

Taiwan

- “IPv6 Upgrade Promotion Program” lead by Ministry of Transportation and Communications
  - 2012 – 2013: Enable dual stack among 50% of public network services (Web, DNS, email)
  - 2014 – 2015: Enable dual stack the remaining public network services
  - Monitoring IPv6 deployment status in Taiwan
  - TWNIC’s active engagement

http://conference.apnic.net/36/program#/speaker/Sheng-Wei%20Kuo

Taiwan: Stats

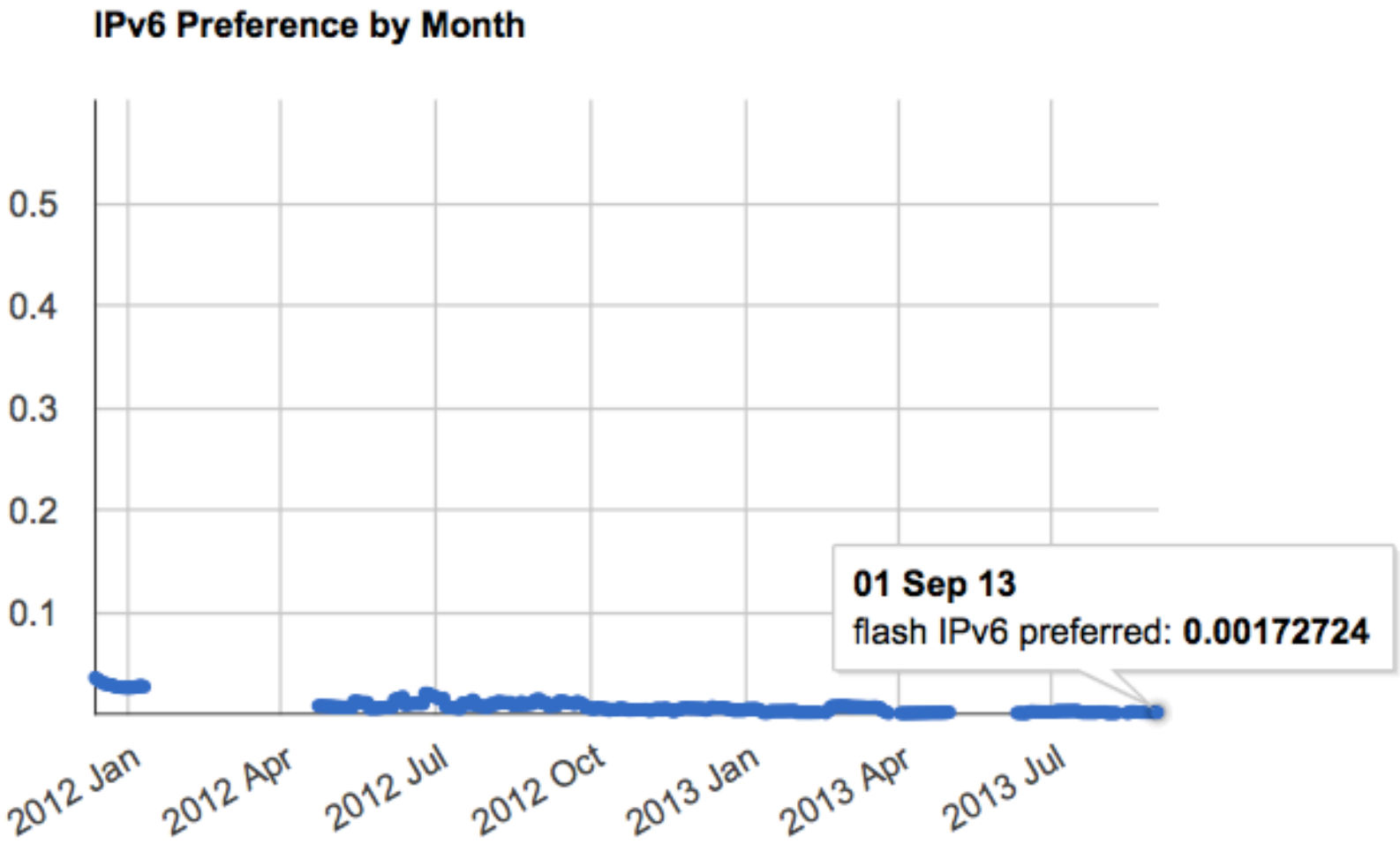


http://labs.apnic.net/ipv6-measurement/Economies/TW/

Vietnam

- Continuous support provided by Ministry of Information and Communications, Vietnam National IPv6 Task Force and VNNIC to raise IPv6 awareness and skill up trainings
  - Vietnam IPv6 Day Conference in 2012 and 2013
  - Vice Minister of MIC and CEOs of top 8 local ISPs officially launched IPv6 service, May 2013
  - IPv6 infrastructure security workshop for network engineers coordinated by VNNIC
    - Collaboration with JANOG members

Vietnam: Stats



http://labs.apnic.net/ipv6-measurement/Economies/VN/

Conclusion

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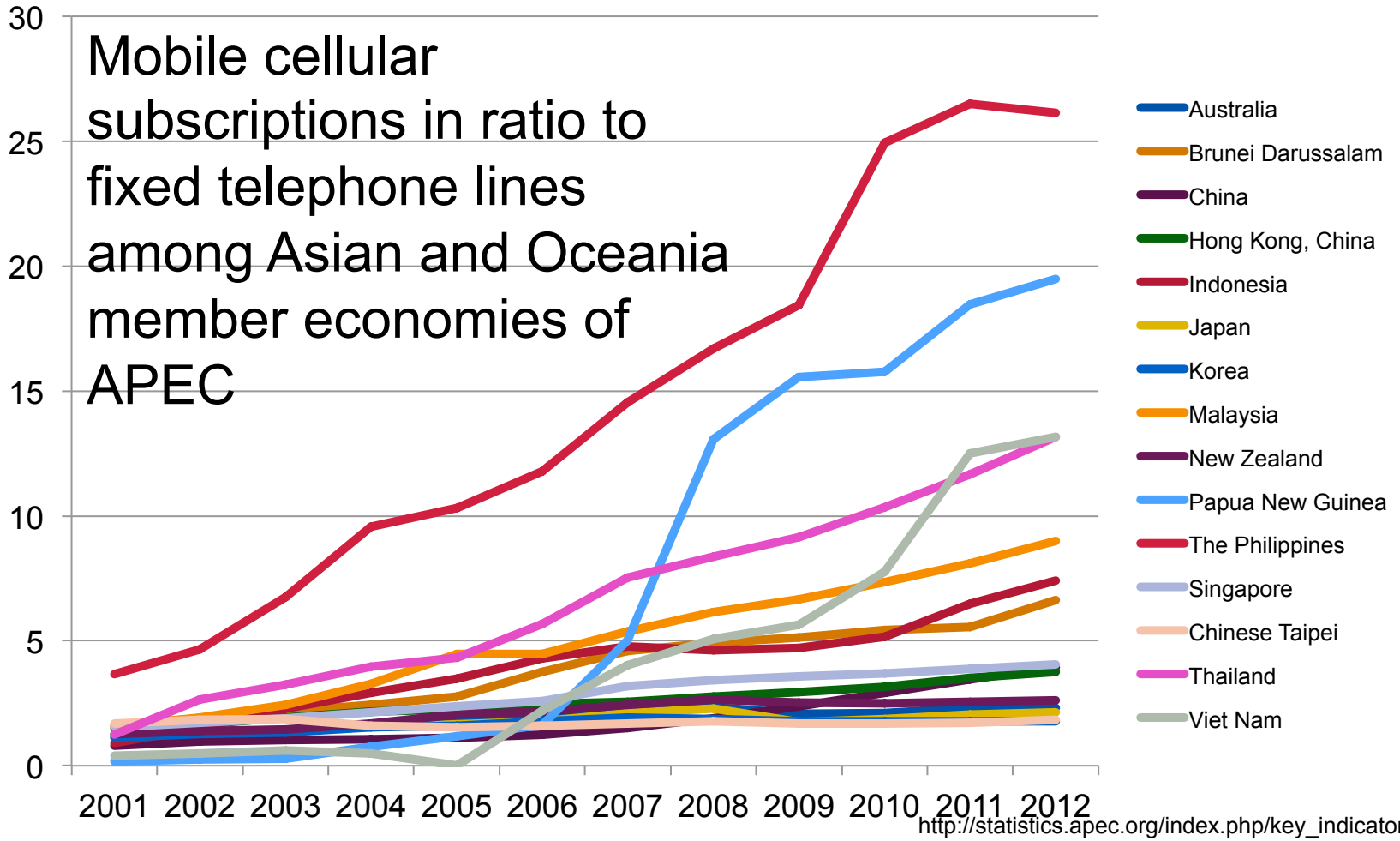
Governments' support

- IPv6 awareness among governments' in the AP region is very high
  - Many initiatives from governments has been implemented
    - Partnership between the public and private sectors in various forms
    - Developing national policies and guidelines and roadmaps to enable IPv6
    - Enabling IPv6 in government networks
    - Mandating for IPv6 readiness in government procurement for ICT goods and services
    - Raising IPv6 awareness among key people in the government and industry
    - Providing timely skill up training
    - Monitoring IPv6 deployment measurement and share information with industry
    - Include the necessity of IPv6 deployment in ministerial statements
- Continuous engagement with industry will help

Attention to the future growth path



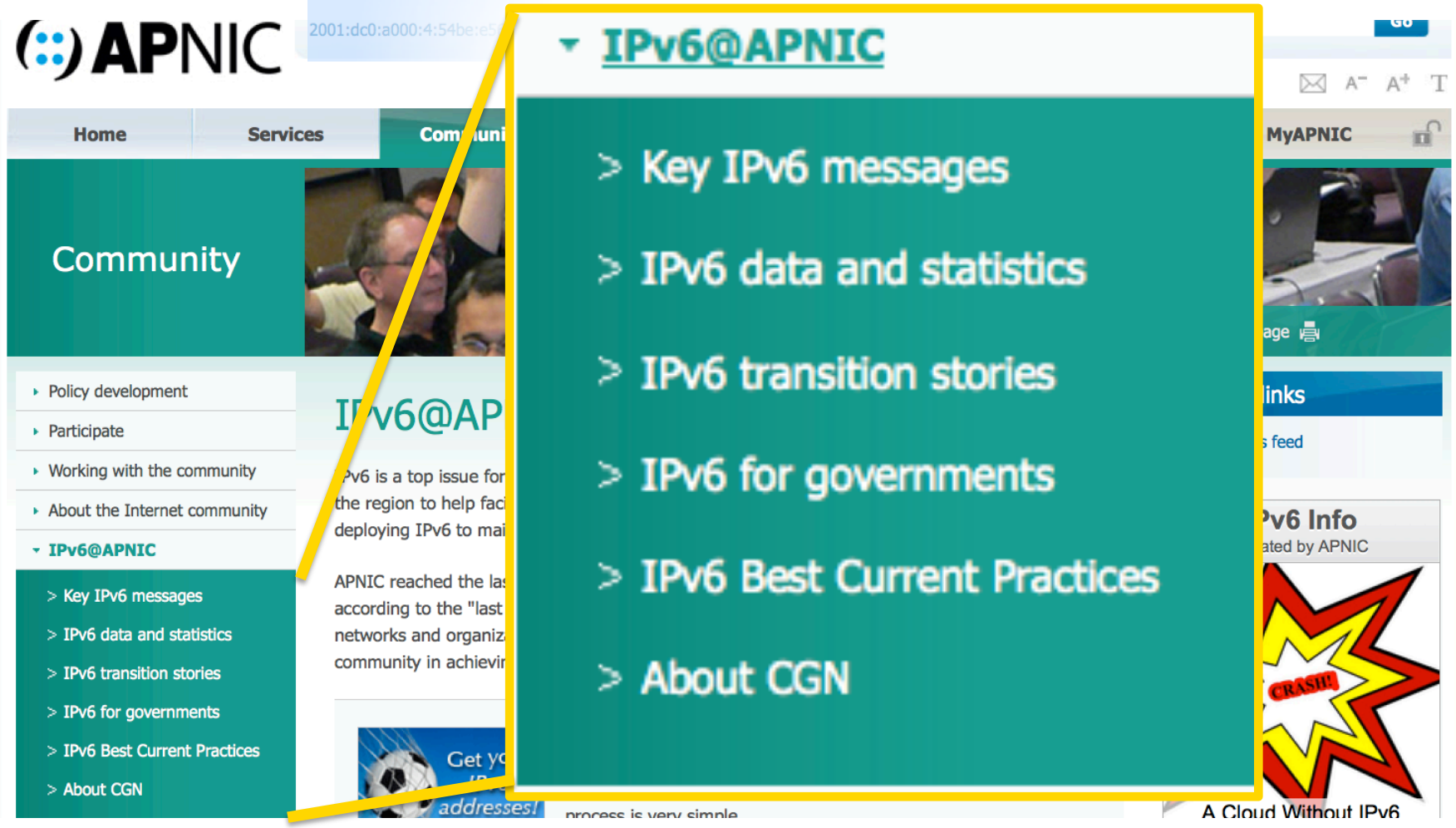
http://statistics.apec.org/index.php/key_indicator/index

Support the current and future growth

- The end-to-end Internet principle allows many stakeholders to interact directly, and provide foundation for innovation
  - The Internet is a highly diverse and flexible amalgam of many components
  - The speed of innovation is rapid
- Internet industry is at a critical turning point
  - Some may be left behind if their organisation does not learn how to provide both IPv4 and IPv6 services.
  - Choosing technologies that support the current business model, while establishing a foundation for a future business model is no simple task – there is no one strategy that fits all.

www.apnic.net/ipv6

www.apnic.net/ipv6



Thank you!