APNIC Update

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Liaison Officer/Internet Resource Analyst, APNIC

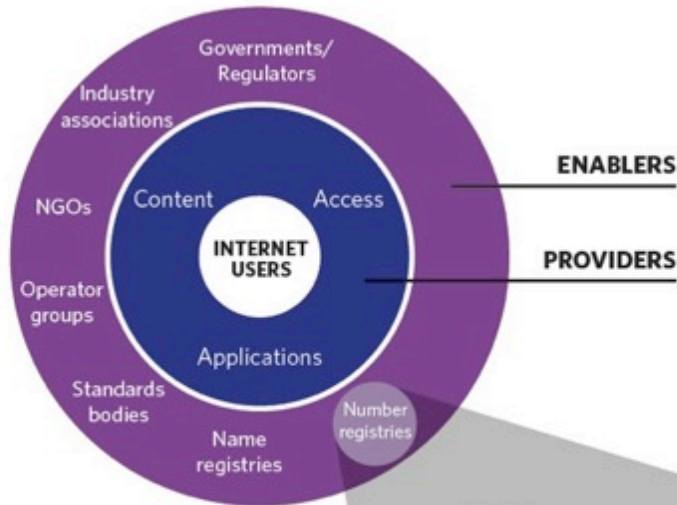SGNOG 2   June 25 2013

APNIC

Overview

APNIC's vision:

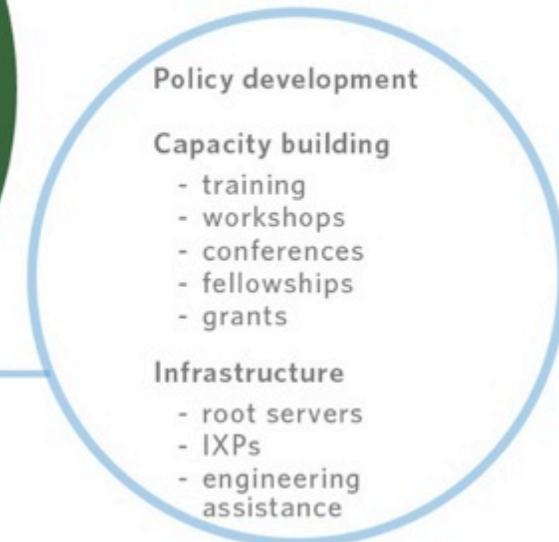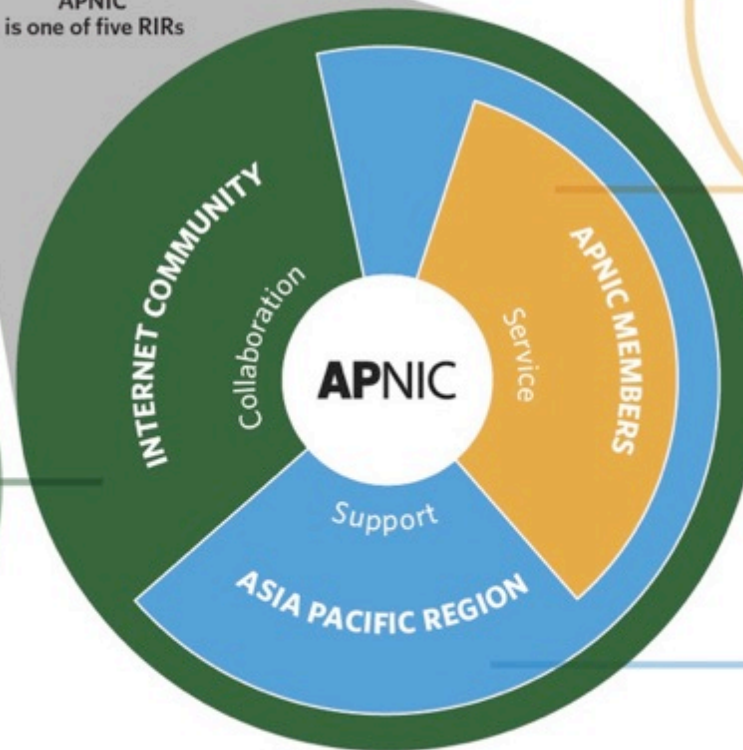A global, open, stable, and secure Internet that serves the entire Asia Pacific community.

How we achieve this:

- Serving Members

- Supporting the Asia Pacific Region

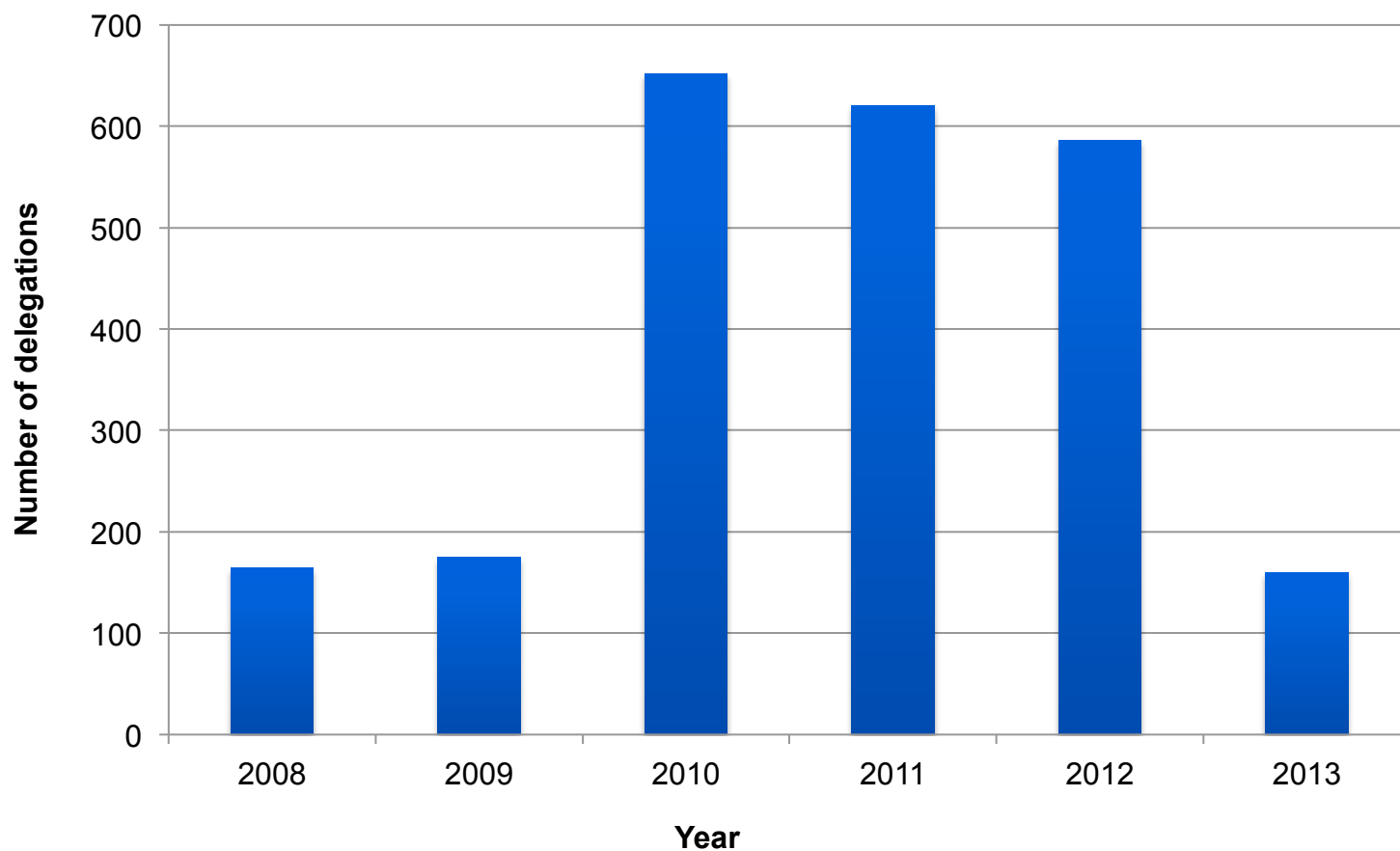- Collaborating with the Internet Community

(::) APNIC

addressing the Internet in the Asia Pacific

ENABLERS

PROVIDERS

Governments/Regulators
Industry associations
NGOs
Operator groups
Standards bodies
Name registries
Number registries

Content
Access
INTERNET USERS
Applications

APNIC is one of five RIRs

INTERNET COMMUNITY

Collaboration
Service
Support

APNIC

APNIC MEMBERS

ASIA PACIFIC REGION

Resource distribution
- IP addresses
- AS numbers

Registration services
- reverse DNS
- Internet routing registry
- resource certification
- whois registry

Original research

Data collection and measurements

Publications

Local/regional/global events

Internet governance

Internet security

Policy development

Capacity building
- training
- workshops
- conferences
- fellowships
- grants

Infrastructure
- root servers
- IXPs
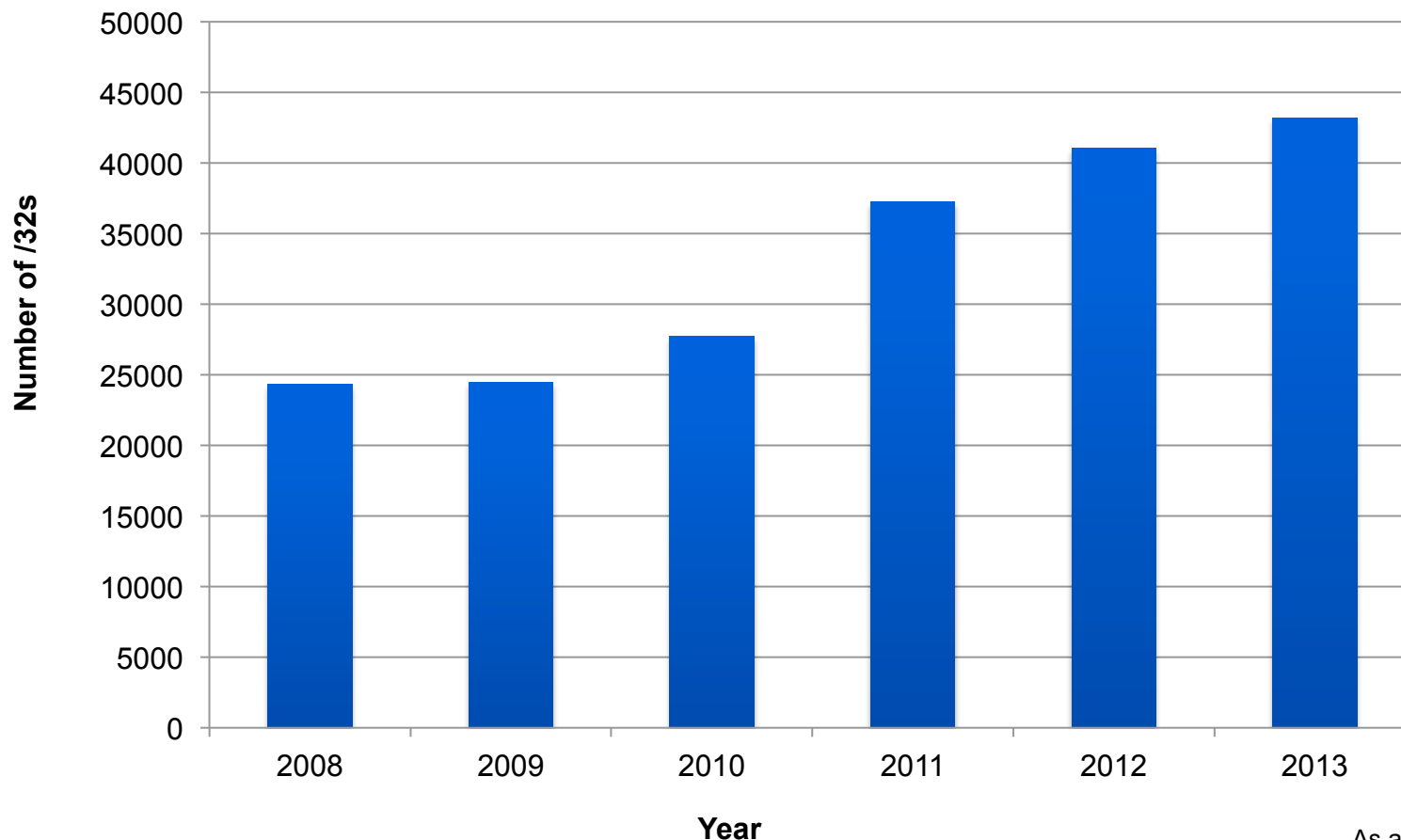- engineering assistance

IPv6 Delegations by Year

As at 30 April 2013
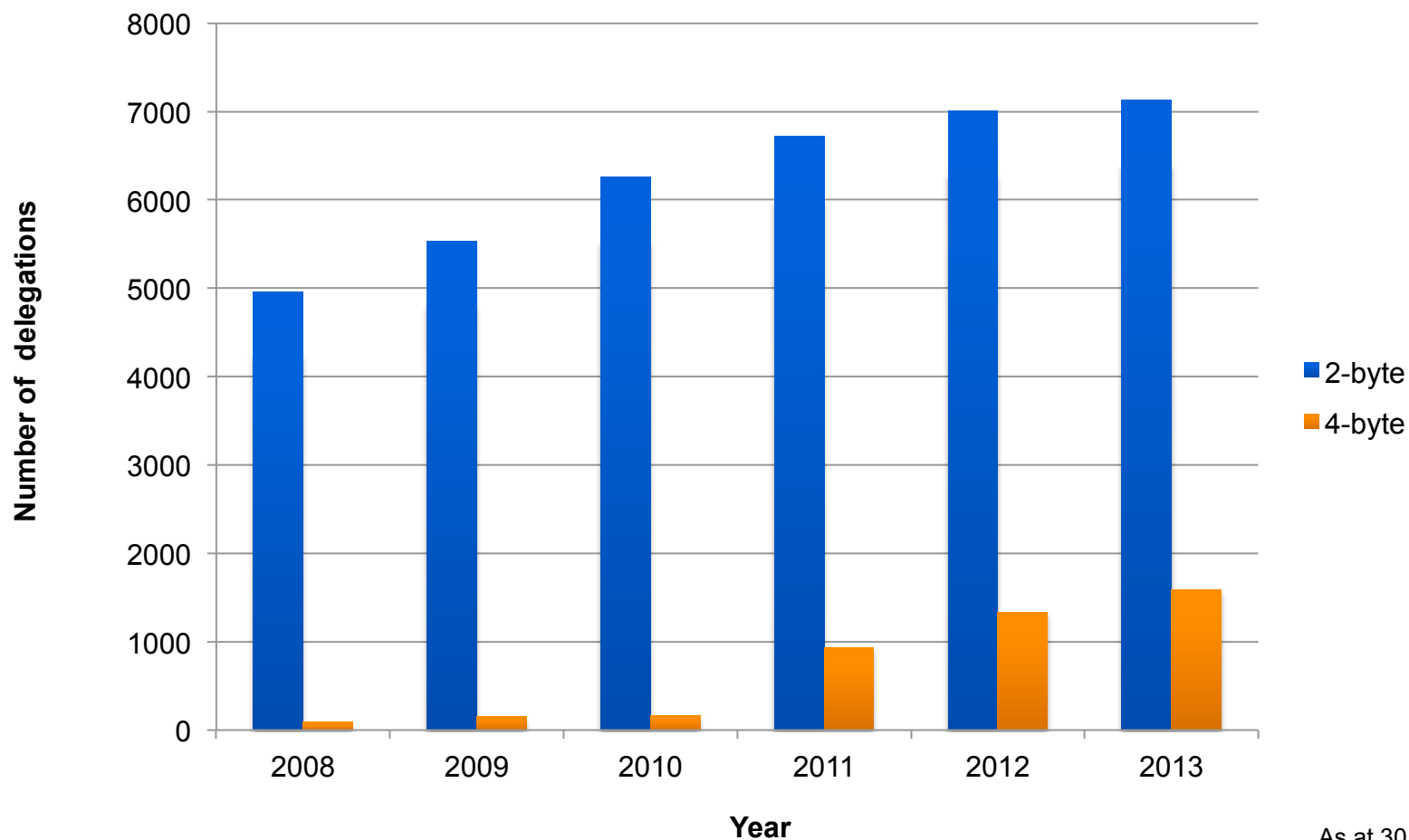
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Cumulative IPv6 Delegations (/32s)

As at 30 April 2013

Cumulative ASN Delegations

As at 30 April 2013

4-byte announced in SG

Total of 68 4-bytes assigned in SG, 38 are visible in the global routing table!

```
131165   GAX-SG Global Axcess Pte. Ltd.
131217   INFINEON-SG 8 Kallang Sector
131475   SIT-AS-AP Singapore Institute of Technology
131790   SANOFI-SG 6 Raffles Quay #18-00
132016   IRESS-NET-AU IRESS Market Technology Ltd
132047   MYREPUBLIC-SG MyRepublic Ltd.
132053   QUALCOMM-SG-AS-AP Qualcomm Inc
132078   HP-KPMG Hewlett-Packard Singapore
132081   IDA-SG 10 Pasir Panjang Road
132082   IVISIONSGLOBAL-SG Block 9008, Tampines Street 93 #01-27
132132   REPUBLICTELECOM-SG MyRepublic Ltd.
132142   ZONETEL-AS-AP ZONE Telecom Pte Ltd
132200   EXABYTES-AS-AP Exabytes Network (Singapore) Pte. Ltd.
132236   NEC-STEE-CS-SG 22 Cross Street #03-54/61
132237   IDA-AS-WDA Infocomm Development Authority of Singapore
132242   HOGARTHWW-SG Hogarth Worldwide Pte
132247   NTTS-ISD-NET-SG NTT Singapore - Integration Services
132253   CPFBOARD-SG 79 Robinson Road
132265   SIANET-AS-AP Singapore Airlines Limited
132277   XTRA-COMMUNICATION-SG 105 Tampines Road #03-06/07
132293   IDA-AS-EMA Infocomm Development Authority of Singapore
132337   NETRONEXT-AS-AP NetroNext Pte Ltd
132356   CAG-IT-SG 60 Airport Boulevard
132398   AGLOWALICOM-SG 50 Playfair Road #05-03
132399   ATICLOUD-AP 26, rue de joinville
132402   BJN-AP 516 Clyde Ave US
132406   LINKEDIN-AS 8 Shenton Way
132425   APC-HOSTING-SG APC Hosting Pte Ltd
132439   CSCACLOUD-SG 221 Henderson Road #07-01
132472   AUCTORIZIUM-SG 70 Bendemeer Road
132500   UCFAID-AS-AP University Corporation for Advanced Internet
Development
132526   CSPL-AS-AP Cybersite Services Pte Ltd
132696   SGIX-AS Singapore Internet Exchange Limited
132699   SIEMENSPTELTD-AS-AP Siemens Pte Ltd.
132731   CYBERSITE-NET-AS-AP Cybersite Pte Ltd
132734   SCHNEIDER-AS-AP Schneider Electric (SINGAPORE) Pty Ltd
132739   SCAFFNETPTELTD-AS-AP Scaffnet Pte Ltd
132804   SINGTEL-AS-SCSGBDK3 Singapore Telecommunications Limited
```

IPv4 Address Transfer Services

- Support for intra and inter-RIR transfers

- Pre-approval service, with opt-in anonymous listing

- Broker listing; four registered so far

    www.apnic.net/transfer-brokers

- Mailing list to enable the source and recipients of IPv4 address transfers and IPv4 brokers to discuss topics relevant to transfers

    apnic-transfers@apnic.net

- Public transfer log

    ftp://ftp.apnic.net/public/transfers/apnic

- Transfer fees applied
    - 20% of the transferred block's annual fee (other holdings not included in the calculation)
    - Payable by the recipient, or by the source if transferred out of the APNIC region
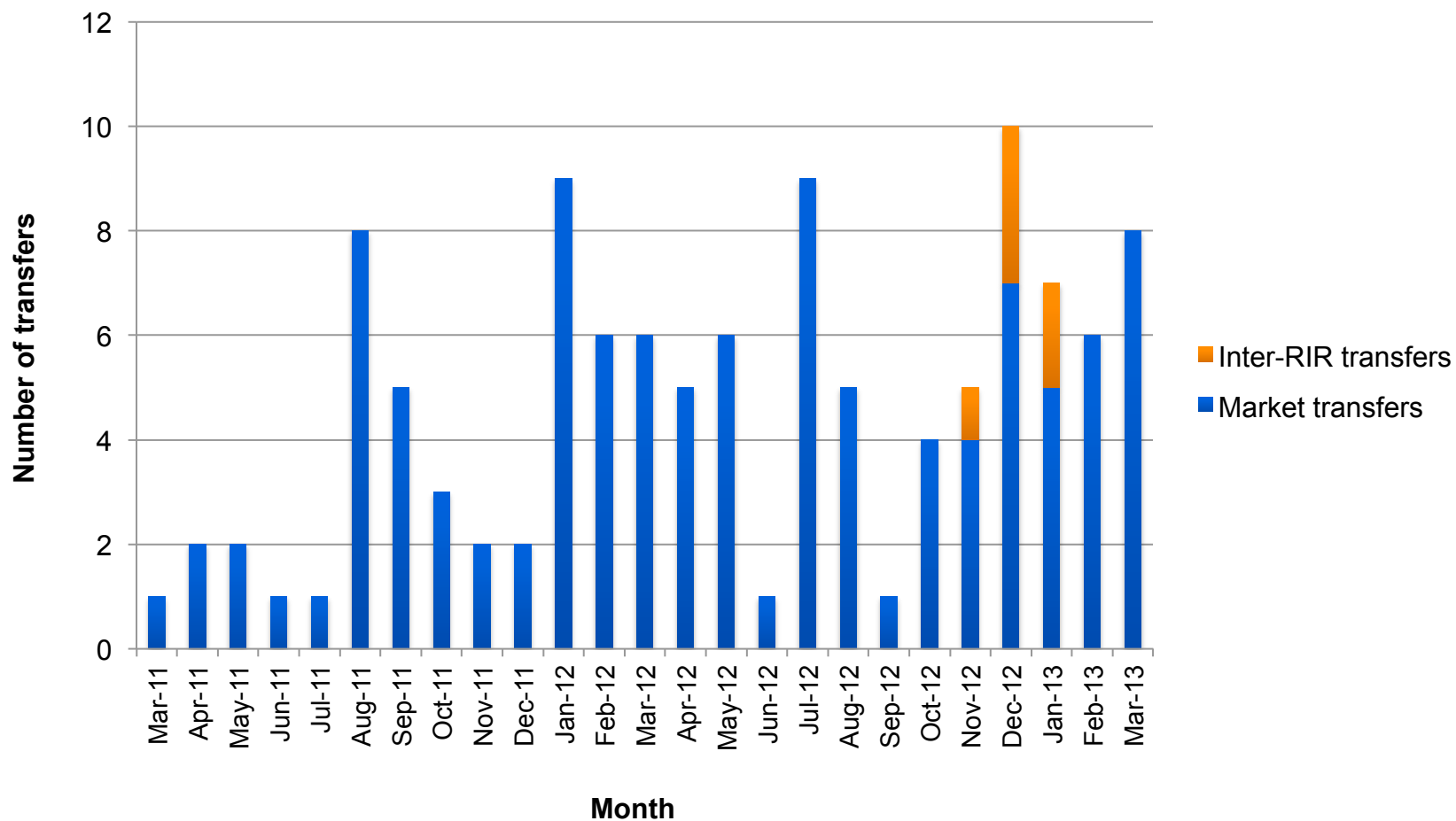
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8

Prop-50 transfers in SG

- Total of 9 transfers

```
| 2011-08-29 03:34:24 | 2011-08-31 16:34:26 | Telekomunikasi Indonesia (PT)            | TELEKOMUNIKASI INDONESIA INTERNATIONAL, PTE.LTD | TELIN-NET-SG       |
| 2012-01-16 01:19:17 | 2012-01-23 14:55:46 | Enterprise IT (AUST) Pty Limited         | Godaddy.com                                     | GODADDY-NET-AP     |
| 2012-03-19 02:19:35 | 2012-03-22 15:27:57 | OSINet International Pte Ltd              | OSINet Communications Pte Ltd                   | OSINET-COMMS-AS-AP |
| 2012-11-12 15:54:59 | 2012-11-19 15:30:06 | Avonsys                                  | Linkedin Singapore Pte. Ltd                     | LINKEDIN-SG        |
| 2012-12-19 01:06:56 | 2012-12-21 15:42:03 | Beyond Excellent Technology Ltd          | SingNet Pte Ltd                                 | SINGNET-SG         |
| 2013-01-29 04:06:37 | 2013-01-29 04:06:37 | American Registry for Internet Numbers   | Viewqwest Pte Ltd                               | ESDUN              |
| 2013-02-21 05:42:54 | 2013-02-26 00:21:40 | Outstanding Telecommunication Pte Ltd    | Tibanne Co. Ltd.                                | TIBANNENET         |
| 2013-03-25 01:47:01 | 2013-03-26 07:08:45 | Beyond Excellent Technology Ltd          | SingNet Pte Ltd                                 | SINGNET-SG         |
| 2013-05-03 08:49:45 | 2013-05-17 01:07:55 | Cloud-Sense Technology Corporation Ltd.  | M1 Connect Pte Ltd                              | QALA               |
+---------------------+---------------------+------------------------------------------+-------------------------------------------------+--------------------+
```

Inter-RIR Transfers

- Completed transfers: eight from ARIN to APNIC (Nov 2012 – April 2013)

- Transfer time (including evaluation): one – two weeks

- Successfully transferred live network
  - ARIN-managed resources transferred into the AP region, to be managed by APNIC

- ARIN and APNIC stats overlap one day after the transfer due to the time zone difference
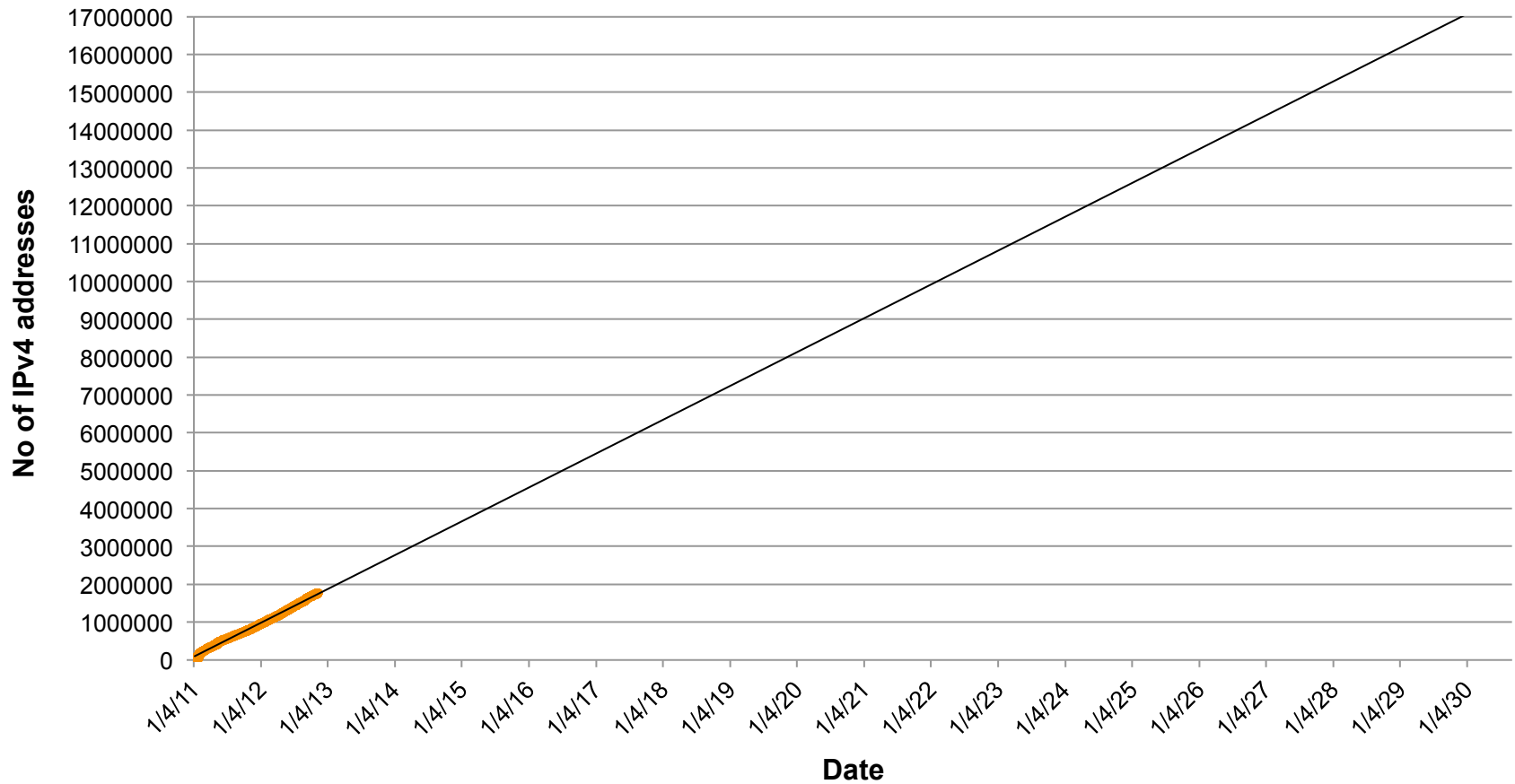
IPv4 Market Transfers

As at 30 April 2013

APNIC

IPv4 Market Transfer Size
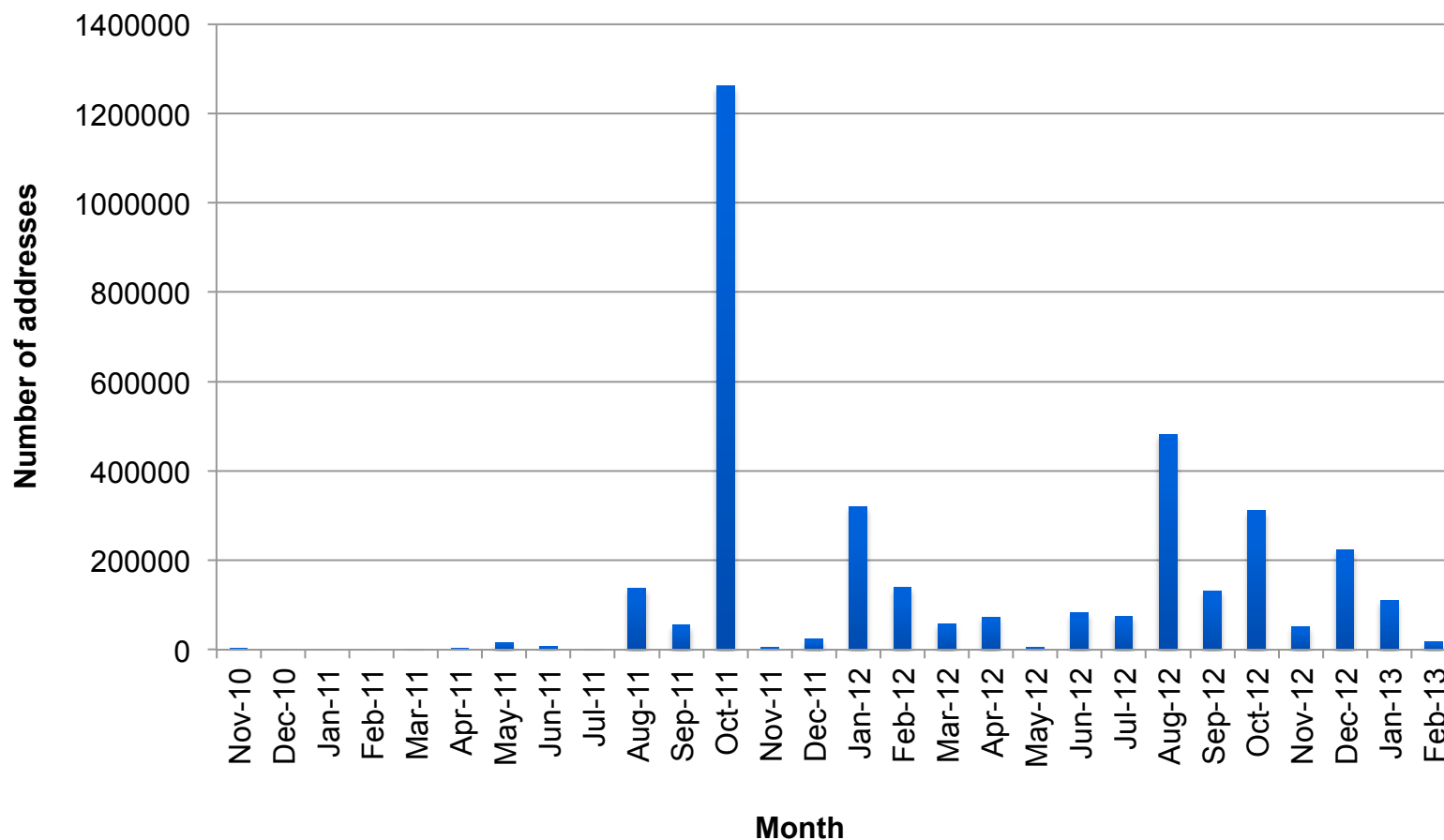
As at 30 April 2013

IPv4 Last /8 Delegation Trend

APNIC Policies in 2013

- Implemented:
  - prop-104: Clarifying demonstrated needs requirement in IPv4 transfer policy (Feb 2013)
  - prop-101: Removing multihoming requirement for IPv6 portable assignments (Feb 2013)

- Did not reach consensus at APNIC 35:
  - prop-105: Distribution of returned IPv4 address (modification of prop-088)
    - Returned to author for further development
  - prop-106: Restricting excessive IPv4 address transfers under the final /8 block
    - Abandoned

Training

- Continuing focus on IPv6 deployment
  - Comprehensive face-to-face and eLearning sessions
  - IPv6 eLearning day (first Wednesday of every month)

- eLearning
  - Every Wednesday in three time zones
  - 24 modules (1-hour duration per module)
  - Enhanced schedule for 2013

- Face-to-Face
  - Extensive hand-on exercises
  - Physical and Virtual Training Labs to enable participants to build and configure networks

- New training website

training.apnic.net

Training Delivered in 2013 (Jan to Apr)

- Face-to-face training
  - 30 courses in 12 locations
  - 614 participants

- eLearning
  - 39 courses
  - 326 participants

Map labels: Ulaanbaatar, Cox's Bazar, Baguio, Hyderabad, Phnom Penh, Bangalore, Cyberjaya, Palembang, Singapore, Port Vila, Brisbane, Wellington

TRAINING ACTIVITIES

As at 30 April 2013

IPv6 in the Community

- IPv6@APNIC
  - IPv6 Plenary at APNIC 35 in Singapore, Feb 2013 focused on mobile network deployment in cellular networks
  - Workshop at ICANN 46, Beijing

- Asia Pacific IPv6 Task Force (APIPv6TF)
  - Established to encourage IPv6 deployment and serve as a platform for knowledge exchange
  - APNIC continues to provide Secretariat services
  - Met at APNIC 34 and 35

Upcoming Conferences

- APNIC 36: Xi-an, China
  - 20 to 30 August 2013
  - Celebrating APNIC's 20th anniversary

conference.apnic.net/36/home

- APRICOT 2014 Bangkok, Thailand
  - 18 to 28 February 2014 (includes APNIC 37)

Following Conferences

- APNIC 38, TBD
  - Call for Proposals

    www.apnic.net/events/host-an-event

- APRICOT 2015: Fukuoka, Japan
  - 24 February to 6 March 2015 (includes APNIC 39 and APAN 39)

APNIC Labs: IPv6 Measurement

- Labs publishes comprehensive reports on IPv6 uptake measurements
  - Reports contain aggregate information on a global scale, by economy, and by individual network

- IPv6 Capability Tracker
  - Google Analytics tracking tool to enable website operators to measure client IPv6 capabilities

- Measuring IPv6
  - Measuring the end-to-end capability of IPv6 clients per economy
  - Readiness data at end user level for various intergovernmental organizations and economies

APNIC Labs: IPv6 Measurement

- IPv6 preference by AS Number
  - Measures IPv6 client capability per autonomous system

- IPv4 address report
  - Measuring IPv4 free pool address exhaustion

www.labs.apnic.net

Measuring IPv6

Percent of users using IPv6
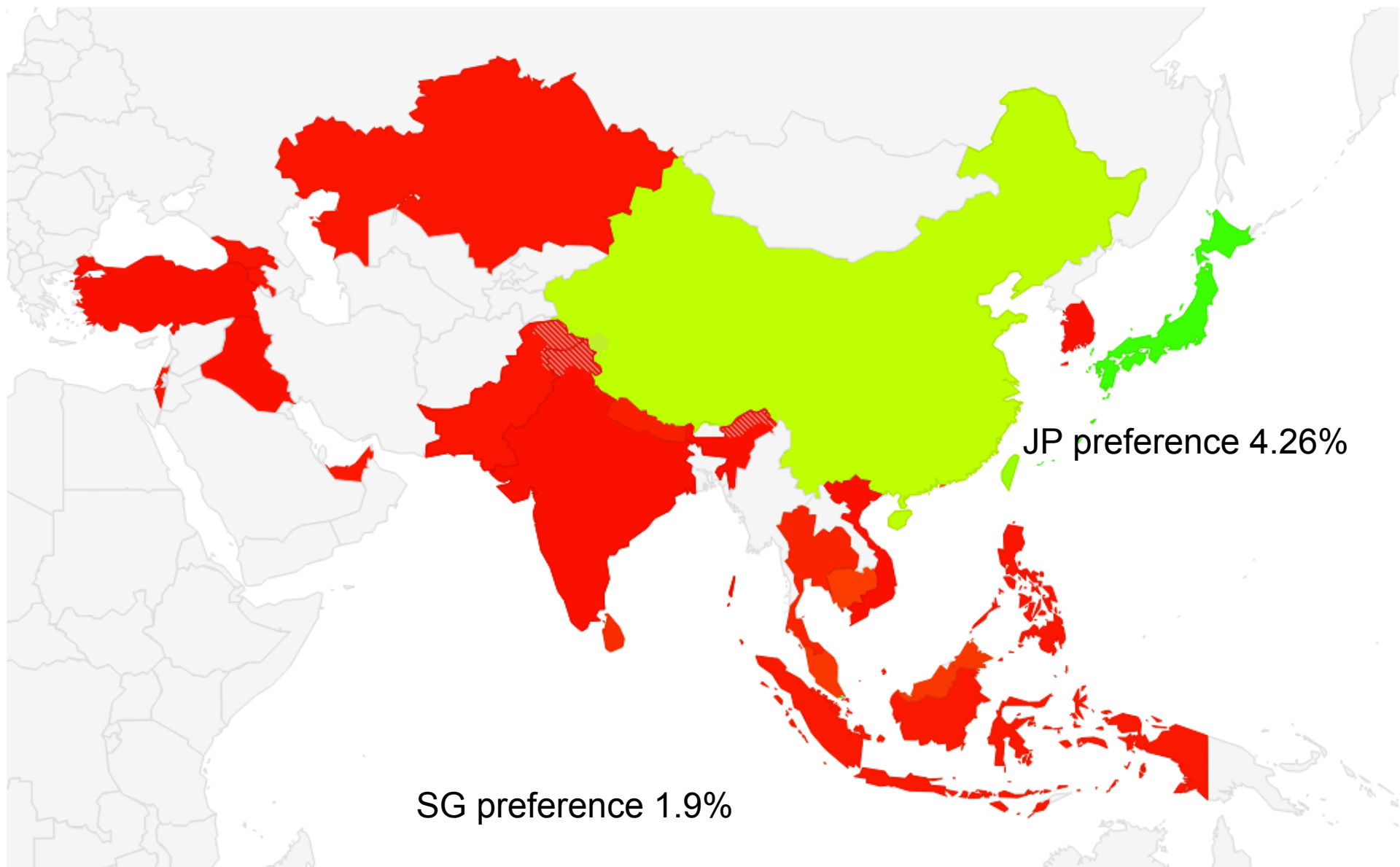http://labs.apnic.net/ipv6

0 ——— 0.6
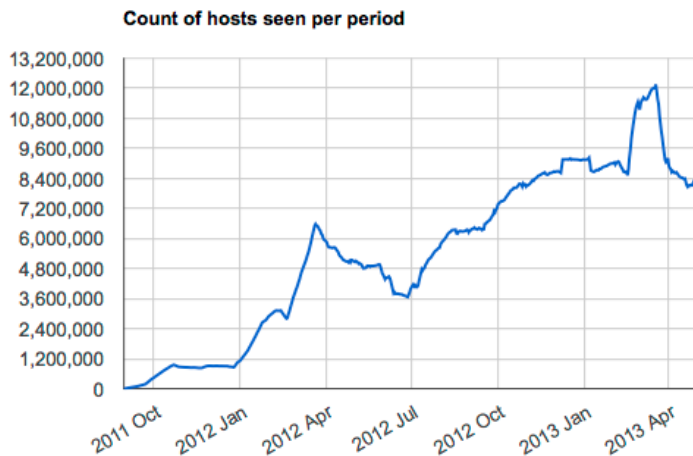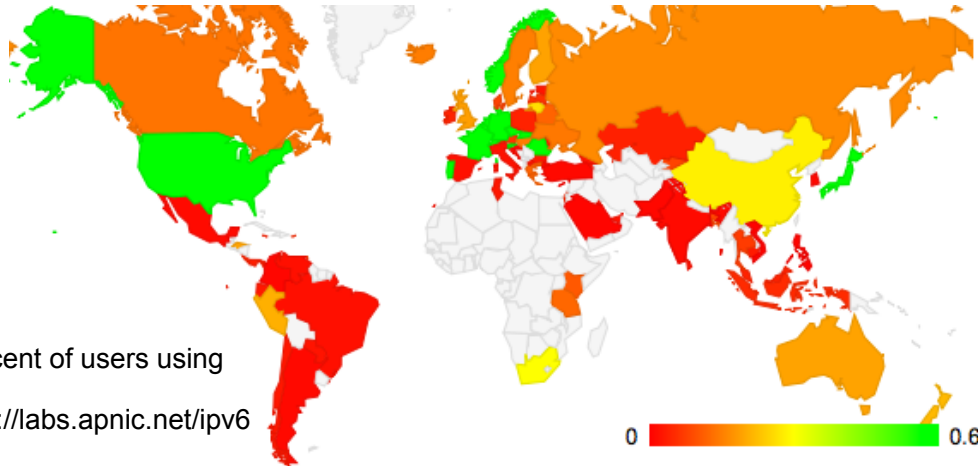
We've been conducting a large-scale IPv6 measurement across the Internet to provide baseline data about the rate of deployment of IPv6 across countries and individual networks
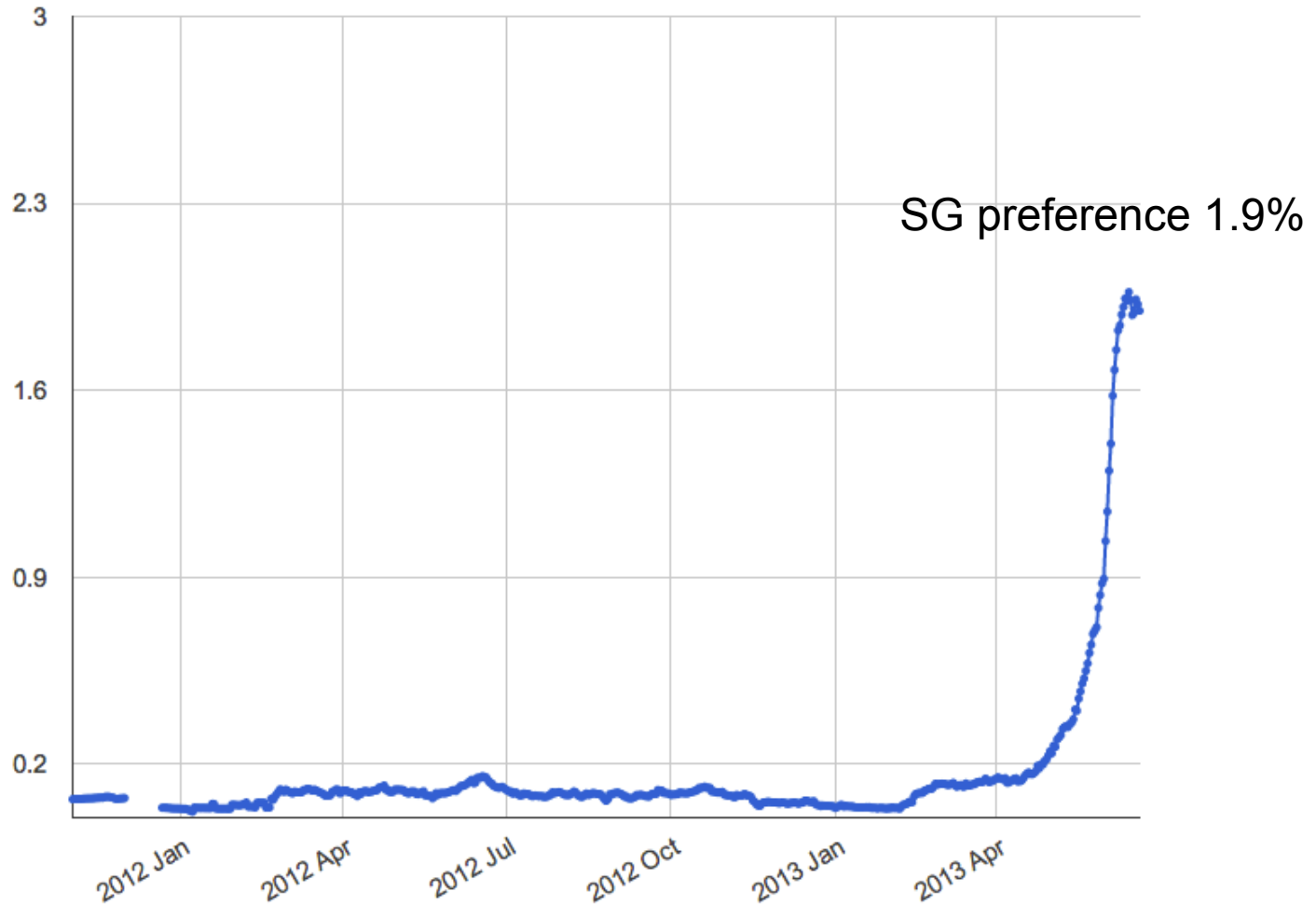
Count of hosts seen per period

Economy	ASN	AS Name	# samples	v6 capable	v6 preferred
US	AS19782	INDIANAGIGAPOP - Indiana University	1566	100	100
CN	AS37944	CNNIC-CSTNET-AP CHINA SCIENCE AND TECHNOLOGY NETWORK	1364	100	100
CN	AS23910	CNGI-CERNET2-AS-AP China Next Generation Internet CERNET2	7060	100	100
JP	AS9607	BBTOWER BroadBand Tower; Inc.	255	96.0784	96.0784
NZ	AS24226	CATALYST-IT-AS-AP Catalyst IT	830	94.3373	93.9759
JP	AS55394	GREE-NET GREE; Inc.	519	93.6416	71.0983
AU	AS38083	CURTIN-UNI-AS-AP Curtin University	715	89.6503	88.951
US	AS3598	MICROSOFT-CORP-AS - Microsoft Corp	1113	74.9326	72.4169
ID	AS17553	IPBNET-AS-AP Bogor Agricultural University	251	74.9004	60.9562
AU	AS4608	APNIC-AP Asia Pacific Network Information Centre	629	73.6089	70.9062
NZ	AS58666	NASL-AS-AP Network Access Services Limited	206	69.4175	61.165
US	AS5661	USF - UNIVERSITY OF SOUTH FLORIDA	295	69.1525	65.4237
US	AS1312	VA-TECH-AS - Virginia Polytechnic Institute and State Univ.	480	67.7083	62.7083
CZ	AS197451	VUTBR-AS Brno University of Technology	416	64.6635	59.375
GB	AS786	JANET The JNT Association	223135	63.1044	52.4337
US	AS15169	GOOGLE - Google Inc.	12414	60.9312	18.9866
NO	AS57963	LYNET-INTERNETT-AS Lynet Internett AS	326	58.8957	55.2147
US	AS2055	LSU-1 - Louisiana State University	266	58.2707	55.2632
NZ	AS17649	DMZGLOBAL-AP DMZGlobal Ltd	239	58.159	54.3933
US	AS6621	HNS-DIRECPC - Hughes Network Systems	2041	56.8349	56.1979
US	AS6263	NDIN - State of North Dakota; ISD	249	56.6265	54.6185
CN	AS17672	CHINATELECOM-HE-AS-AP asn for Hebei Provincial Net of CT	2706	54.139	51.2565
NZ	AS18119	ACSDATA-NZ ACSData	931	53.4909	52.3093
US	AS1351	UVM-EDU-AS - University of Vermont	242	53.3058	45.8678
CN	AS4538	ERX-CERNET-BKB China Education and Research Network Center	4868	50.4314	47.6787
JP	AS2500	WIDE-BB WIDE Project	208	50	49.0385
HK	AS4528	HKU-AS-HK The University of Hong Kong	635	48.6614	44.5669

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What about Singapore?

- Can we "drill down" inside an individual economy?
  - Get the "per AS" view of the IPv6 capability

- You bet we can!
  - 746,140 measurements ran against Singaporean Internet Users in the last 30 days

JP preference 4.26%

SG preference 1.9%

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0 1

Rapid recent uptake!

SG preference 1.9%

x-axis labels: 2012 Jan, 2012 Apr, 2012 Jul, 2012 Oct, 2013 Jan, 2013 Apr

y-axis labels: 0.2, 0.9, 1.6, 2.3, 3

SG in the top 20

World rankings by IPv6 Preference

Economy	v6pref ▾	3month avg hits/month	notes
CH	11.30%	7513	
RO	10.99%	297474	
EU	10.12%	316	
LU	6.92%	1803	
FR	5.34%	280269	
BE	4.33%	50781	
JP	4.26%	295560	
DE	3.34%	55013	
US	2.94%	408135	
PE	2.72%	142574	
CZ	2.15%	55079	
SG	1.90%	11824	
NO	1.33%	8809	
GR	0.89%	109148	
SI	0.85%	13619	
NL	0.79%	58173	
PT	0.78%	27253	
TW	0.71%	81363	
SE	0.63%	13754	
CN	0.63%	104490	

Singapore by ASN

Number of ASN in Singapore	Number of Singaporean ASN seen in globally routable BGP
301	195

Singapore by ASN

Number of ASN in Singapore	Number of Singaporean ASN seen in globally routable BGP
301	195

Around 65% of the ASN allocated to Singaporean entities are visible in the global BGP view.

Singapore by ASN

Number of Singaporean ASN seen in globally routable BGP	Number of Singaporean ASN seen in this experiment
195	166

Singapore by ASN

Number of Singaporean ASN seen in globally routable BGP	Number of Singaporean ASN seen in this experiment
195	166

Over ¾ of the BGP active ASN in Singapore have been seen in the experiment. (85%)

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Singapore by ASN

Number of Singaporean ASN seen in this experiment	Number of Singaporean ASN with globally routable IPv6 in BGP
166	77

40% of BGP active ASN seen in Singapore have at least one globally routable IPv6 prefix.

Singapore by ASN

Number of Singaporean ASN with globally routable IPv6 in BGP	Number of Singaporean ASN seen with globally routable IPv6
77	21

27% of IPv6 BGP active Singaporean ASN seen, appear <u>end-user</u> active in IPv6, using global-unicast.

Others are using tunnels outside of Singapore

The Singaporean Leaderboard

ASN	AutNum	Network Name	count	%capable	%preferred
24482	SGGS-AS-AP	SG.GS	213	28.2407	25.463
7472	NUS-AS-AP	Computer Centre	343	18.5714	17.4286
55430	STARHUBINTERNET-AS-NGNBN	Starhub Internet Pte Ltd	7526	15.6201	13.5184
4773	MOBILEONELTD-AS-AP	MobileOne Ltd. Mobile/Internet Service Provider Singapore	37415	10.2471	9.20672
18106	VIEWQWEST-SG-AP	Viewqwest Pte Ltd	832	1.4068	0.820633
10091	SCV-AS-AP	StarHub Cable Vision Ltd	17526	1.08992	0.397366
9506	MAGIX-SG-AP	Magix Broadband Network	151312	0.396424	0.378137
132047	MYREPUBLIC-SG	MyRepublic Ltd.	2588	0.191424	0.191424
17547	QALA-SG-AP	M1 CONNECT PTE. LTD.	2718	0.144718	0.108538
4657	STARHUBINTERNET-AS	StarHub Internet Exchange	3862	0.301432	0.100477
3758	ERX-SINGNET	SingNet	9300	0.0837872	0.0628404
45143	SINGTELMOBILE-AS-AP	SINGTEL MOBILE INTERNET SERVICE PROVIDER Singapore	7465	0.0929738	0.0531279

Error bars

- We can't directly measure iOS in the google flash mechanism (because flash isn't being run on iOS devices)

- We can't directly measure anyone with adblock enabled in the flash measurement (because .. Its an _advert_!)

- We can't directly measure end users who have ACLs blocking youtube (the predominant ad placement website) in the flash measurement.
  - These are 'low side' effects: we undercount in flash

- The javascript measurement is prone to distortions from repeat visits. We try to account for this.
  - This is a 'high side' effect: we can over count in javascript

APNIC Blabs

- APNIC Chief Scientist Geoff Huston's blog on what's new at Labs or what the team finds currently interesting

www.blabs.apnic.net

Questions?

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