IPv6 Deployment: Where are we now?

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Agenda

• Status update of IPv4 address exhaustion
• A quick overview of IPv6 readiness among in the AP region
  – Review of several statistics
  – Transit providers and Content Providers
  – IPv6 ready end users
• Review of IPv6 readiness statistics by economy
  – Partnership between public and private sectors
• Growth path of the Internet
• Conclusion
Status update of IPv4 address exhaustion

Review of several statistics
Available IPv4 /8s in each RIR

- AFRINIC: 3.52
- APNIC: 0.81
- ARIN: 1.5
- LACNIC: 1.35
- RIPE NCC: 0.93

December 2013
IPv4 address exhaustion
Projection

Projection of consumption of Remaining RIR Address Pools

Projected RIR Address Pool Exhaustion Dates:
- RIR:   Projected Exhaustion Date
  - APNIC: 19-Apr-2011 (actual)
  - RIPE NCC: 14-Sep-2012 (actual)
  - LACNIC: 09-Nov-2014
  - ARIN: 04-Mar-2015
  - AFRINIC: 22-Dec-2020

IPv6 readiness in the world

Review of several statistics
IPv6 adoption in Internet core networks

http://6lab.cisco.com/stats/cible.php?country=world
## World ranking

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Sample</th>
<th>Green</th>
<th>Orange</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vanuatu</td>
<td>42</td>
<td>40.5%</td>
<td>0.0%</td>
</tr>
<tr>
<td>2</td>
<td>Maldives</td>
<td>13</td>
<td>30.8%</td>
<td>0.0%</td>
</tr>
<tr>
<td>3</td>
<td>Slovenia</td>
<td>50</td>
<td>30.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>4</td>
<td>Czech Republic</td>
<td>50</td>
<td>30.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>5</td>
<td>Brazil</td>
<td>50</td>
<td>28.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>6</td>
<td>United States of America</td>
<td>50</td>
<td>22.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>7</td>
<td>Singapore</td>
<td>50</td>
<td>22.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>8</td>
<td>Netherlands</td>
<td>50</td>
<td>18.0%</td>
<td>4.0%</td>
</tr>
<tr>
<td>9</td>
<td>India</td>
<td>50</td>
<td>16.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>10</td>
<td>Switzerland</td>
<td>50</td>
<td>16.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

[http://www.vyncke.org/ipv6status/ 07/03/2014](http://www.vyncke.org/ipv6status/ 07/03/2014)
IPv6 enabled web sites among Alexa top-50

http://www.vyncke.org/ipv6status/plotsite.php?metric=w&global=legacy&pct=y07/03/2014
IPv6 measurement
End user readiness: World

Data source from “flash” and “JavaScript” and including viewers from mobile devices.

http://labs.apnic.net/ipv6-measurement/Regions/001%20World/ as of 6/2/2014
# IPv6 deployment leaderboard in the World (commercial operators)

<table>
<thead>
<tr>
<th>ASN</th>
<th>Entity</th>
<th>Economy</th>
<th>IPv6 preferred rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>22394</td>
<td>Cellco Verizon Wireless</td>
<td>US</td>
<td>55.60</td>
</tr>
<tr>
<td>18126</td>
<td>CTCX Chubu Telecommunications Company; Inc.</td>
<td>JP</td>
<td>37.59</td>
</tr>
<tr>
<td>55430</td>
<td>STARHUBINTERNET-AS-NGNBN Starhub Internet Pte Ltd</td>
<td>SG</td>
<td>36.55</td>
</tr>
<tr>
<td>2516</td>
<td>KDDI CORPORATION</td>
<td>JP</td>
<td>30.06</td>
</tr>
<tr>
<td>3303</td>
<td>Swisscom (Switzerland)</td>
<td>CH</td>
<td>27.43</td>
</tr>
<tr>
<td>8708</td>
<td>RSC &amp; RDS SA</td>
<td>RO</td>
<td>24.38</td>
</tr>
<tr>
<td>12322</td>
<td>PROXAD Free SAS</td>
<td>FR</td>
<td>22.89</td>
</tr>
<tr>
<td>20825</td>
<td>Unitymedia NRW GmbH</td>
<td>DE</td>
<td>22.19</td>
</tr>
<tr>
<td>6389</td>
<td>Bellsouth net Inc.</td>
<td>US</td>
<td>20.26</td>
</tr>
<tr>
<td>7018</td>
<td>AT&amp;T Services Inc.</td>
<td>US</td>
<td>18.41</td>
</tr>
<tr>
<td>4739</td>
<td>INTERNODE-AS Internode Pty Ltd</td>
<td>AU</td>
<td>17.76</td>
</tr>
<tr>
<td>7922</td>
<td>Comcast Cable Communications</td>
<td>US</td>
<td>16.90</td>
</tr>
<tr>
<td>23655</td>
<td>Snap Internet Limited</td>
<td>NZ</td>
<td>15.87</td>
</tr>
<tr>
<td>21928</td>
<td>T-Mobile USA</td>
<td>US</td>
<td>12.26</td>
</tr>
<tr>
<td>4773</td>
<td>MobileOne Ltd Mobile/Internet Service Provider</td>
<td>SG</td>
<td>10.49</td>
</tr>
</tbody>
</table>

http://labs.apnic.net/ipv6-measurement/AS/ March 2014
IPv6 in ICANN 2013 RAA

• ICANN has updated their “Registrar Accreditation Agreement (RAA)” in June 2013
  – All ICANN accredited registrars must sign to continue their affiliation with ICANN
  – “3.19 Additional Technical Specifications to implement IPv6, DNNSEC and IDNs. Registrar shall comply with the Additional Registrar Operations Specification attached hereto.”
• Registrar shall provide an interactive web page and a port 43 Whois service via both IPv4 and IPv6

Observation

- IPv6 deployment status is varied among regions, economies and individual ASN (network operators)
  - IPv6 deployment is not happening all at once
  - Some economies have been very active in terms of IPv6 deployment
  - Some ASNs have been very active in terms of IPv6

- Let’s look into some statistics and anecdotal evidences of some economies in the AP region
IPv6 deployment status in the AP region
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 roadmap 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

- 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.
China: Stats

IPv6 Preference by Month

10 Mar 14
flash IPv6 preferred: 0.742286

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

- Series of initiative provided by Hong Kong OGCIO
  - Supported academic research on IPv6 since 2003
  - Government backbone network was enabled with IPv6 in 2008
  - Government Internet Gateway systems was enabled with IPv6 in 2009
    - Public facing government services (200 website) are on IPv6
  - Supported the ISOC Hong Kong to organize the “IPv6 in Action!” project in 2012
    - APNIC provided our expertise for this project

Hong Kong: Stats

IPv6 Preference by Month

03 Mar 14
flash IPv6 preferred: 0.288966

http://labs.apnic.net/ipv6-measurement/Economies/Hong Kong/
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
      - Some providers are experiencing positive result
    - Discussion on IPv6 services in mobile networks
    - Discussion on developing IPv6 security guidelines

Japan: Stats

IPv6 Preference by Month

09 Mar 14
flash IPv6 preferred: 5.07504

http://labs.apnic.net/ipv6-measurement/Economies/JP/
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 infocomm ecosystem to IPv6
  - To promote IPv6 adoption in the local industry

Singapore: Stats

IPv6 Preference by Month

09 Mar 14
flash IPv6 preferred: 8.75484

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

• “IPv6 Upgrade Promotion Program” lead by Ministry of Transportation and Communications

• Objectives
  – Seamless transfer from IPv4 to IPv6 network environments in Chinese Taipei
  – National Information and Communication’s Initiative to actively promote the gradual upgrade to IPv6
    • By 2013: Enable dual stack among 50% of public network services (Web, DNS, email)
    • By 2015: Enable dual stack the remaining public network services
    • Around 2016: All governments related network services to be IPv6 enabled around 2016
  – Monitoring IPv6 deployment status
  – Active engagement among multi stakeholders

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

IPv6 Preference by Month

http://labs.apnic.net/ipv6-measurement/Economies/TW/
Growth path of the Internet
Mobile cellular subscription (per 100 inhabitants)

- Hong Kong, 227.93
- Singapore, 153.40
- Viet Nam, 149.41
- Malaysia, 140.94
- Taiwan, 126.46
- Thailand, 120.29
- Indonesia, 115.20
- Brunei Darussalam, 113.77
- Japan, 109.43
- Korea, 110.36
- New Zealand, 110.33
- The Philippines, 106.77
- Australia, 106.19
- China, 81.26
- Papua New Guinea, 37.78

Source: http://statistics.apec.org/index.php/key_indicator/index
Mobile cellular subscription (per 100 inhabitants)

- More than one subscription per person
- Hong Kong: 225, Singapore: 150, Vietnam: 150, Malaysia: 140, Taiwan: 125, Thailand: 120, Indonesia: 115
- We can conclude that aspiring economies are moving straight to Mobile networks.
Global LTE growth focus

Global LTE Subscriptions will surpass 1 billion by 2018.

Source: Informa Telecoms & Media, Subscription Forecast, February 2013
LTE user devices 2011 - 2013

Mobile networks

• The business competency of mobile network operators:
  – Shifting from being a traditional voice and messaging provider to a mobile broadband service provider
  – Services on voice, messaging and data are converging on IP based services
  – Rapidly increasing LTE deployment in the region

• Decision makers’ (mobile network operators) view
  – Ready to move to Voice over LTE?
  – Mobile cloud computing on top of the LTE network?
  – What are key building blocks of all-IP strategy?
Case Study
T-Mobile USA IPv6 on LTE Story

• Lack of IPv4 address space combined with rapid growth in “always-on” devices prompted a re-think on IP addressing strategy in late 2009
  – IPv4 does not fit the business need
  – IPv6 deployment in 3GPP is easy

• Feasibility study and impact assessment on IPv6 deployment took about 9 months

• T-Mobile USA started IPv6 friendly user trial in 2010 on their 2G/3G/HSPA network
  – Currently settled with IPv6-Only + 464XLAT transition technology to make everything work with IPv6-Only

• T-Mobile USA did not spent any CAPEX to deploy IPv6

• Introduction feature to handsets is a slow and careful process

Conclusion
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
  – 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
  – Key success factor: Information sharing and continuous collaboration among multi-stakeholders of the Internet
IPv6 in the Asia Pacific Internet community

IPv6 is a top issue for the Asia Pacific Internet community. APNIC engages in activities throughout the region to help facilitate a smooth transition. The greater goal is to support the Asia Pacific in deploying IPv6 to maintain a scalable Internet for everyone.

APNIC reached the last /8 of IPv4 addresses in April 2011, and now delegates IPv4 resources according to the "last /8 policy". The scarcity of IPv4 makes IPv6 deployment critical for all networks and organizations in the Asia Pacific. Here's what APNIC is doing to support the community in achieving real and tangible IPv6 deployment:

**Distributing IPv6 addresses**

Getting an IPv6 block is the first step in your transition, and the process is very simple.

**Kickstart IPv6 - one click to IPv6**
www.apnic.net/ipv6
IPv6 for CTOs

http://www.apnic.net/community/ipv6-program/ipv6-cto

A quick glance of the options currently available:

IPv6 transition while extending IPv4 address life time:
Thank you!

This presentation file is available at:
<www.apnic.net/presentations>