Asia-Pacific
Economic Cooperation

2016/TEL53/DSG/007a
Agenda Item: 2.3

IPv6 Readiness Among APEC TEL Member Economies – APNIC Presentation

Purpose: Information
Submitted by: APNIC

APEC PERU 2016

ICT Development Steering Group Meeting
Tacna, Peru
16 June 2016

IPv6 readiness among APEC TEL member economies

APEC TEL53 – Tacna, Peru

Kevon Swift
kevon@lacnic.net

Agenda

- **APNIC & LACNIC**
- **IPv6 End User Readiness**
- **IPv6 in Latin America**
  - LACNIC/CAF IPv6 KPI – ***ICAv6***
  - Results across LACNIC economies
  - Case Studies
  - Economic Model
- **Lessons Learnt**
  - Recommendations

- LACNIC is APNIC's sister organization based in Montevideo, Uruguay
- LACNIC is the Regional Internet Registry (RIR) counterpart covering Latin America and the Carribbean
- LACNIC's area of responsibility includes Chile, Mexico, and Peru.

IPv6 measurement
End user readiness: World

http://stats.labs.apnic.net/ipv6/XA as of 12/06/2016

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The IPv6 economy league table

CC	Country	IPv6 capable (%)
BE	Belgium	53.21
CH	Switzerland	29.24
US	United States of America	29.10
PT	Portugal	28.34
DE	Germany	27.93
GR	Greece	26.64
EC	Ecuador	20.33
EE	Estonia	19.26
PE	Peru	18.91
LU	Luxembourg	17.24
JP	Japan	16.72
FI	Finland	16.67
MY	Malaysia	13.84

http://stats.labs.apnic.net/ipv6/ as of 12/06/2016

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IPv6 in Latin America

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Various ways to measure IPv6 adoption

Opendata Project by LACNIC: http://stats.labs.lacnic.net/CAF-LACNIC ICAv6 Index and Partial Indicators: http://portalipv6.lacnic.net/caf-lacnic/

Google IPv6 Statistics: global and by country

APNIC Capability Measurements by country and estimated population using IPv6 per ASN

Akamai IPv6 Adoption Visualization: https://www.akamai.com/es/es/our-thinking/state-of-the-internet-report/state-of-the-internet-ipv6-adoption-visualization.jsp

Various Measurements on the World IPv6 Launch Website: http://www.worldipv6launch.org/measurements/

Cisco 6lab Project (very comprehensive information): http://6lab.cisco.com/index.php

RIPE Statistics: http://v6asns.ripe.net/v/6?s=_ALL

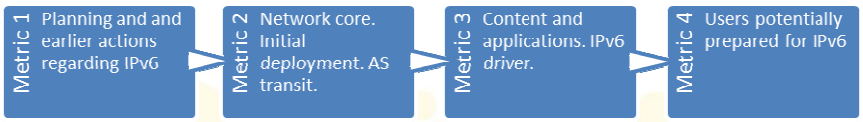
Special Report: IPv6 Deployment for Social and Economic Development in Latin America and the Caribbean

- LACNIC teamed up with CAF – Development Bank of Latin America to examine IPv6 deployment in Latin America and the Caribbean
- Results aim to clarify:
  - Why IPv6 adoption is still low in Latin America and the Caribbean compared to other regions
  - What can be done to improve deployment
- Conducted over 10-month period in 2015
- Results published at http://portalipv6.lacnic.net

Research included

- Surveys among LACNIC Members addressing deployment (or not) of IPv6
- LACNIC IPv6 KPI (ICAv6) based on Cisco's methodology for evaluating various stages of the Internet value chain
- 10-country sample comprising face-to-face interviews with ISPs, public entities and academic institutions
- Dynamic model to assist ISPs with the financial implications of various deployment strategies
- Successful cases, guidelines, recommendations

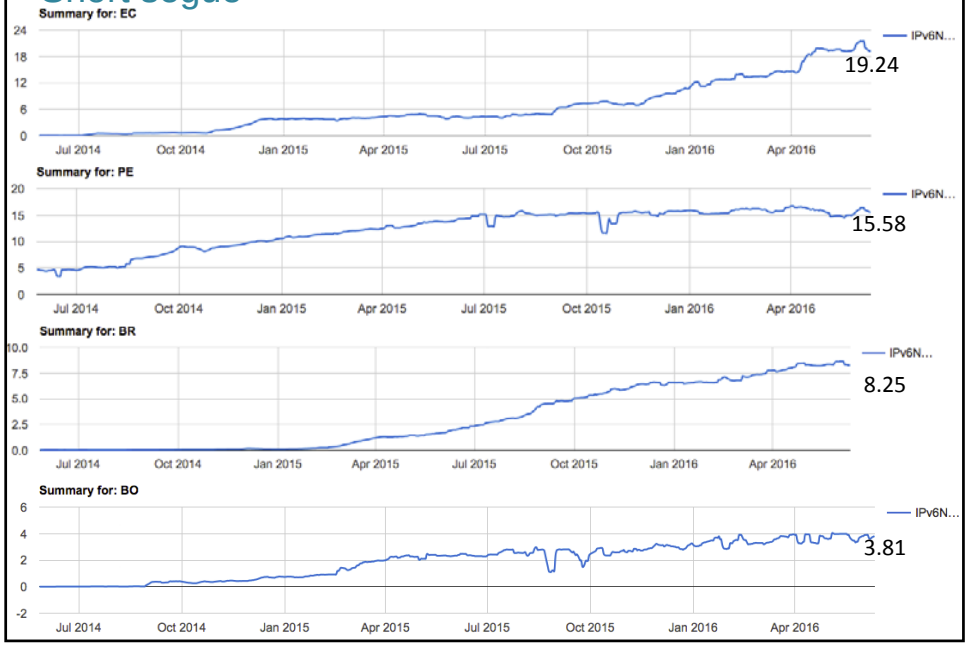
LACNIC ICAv6



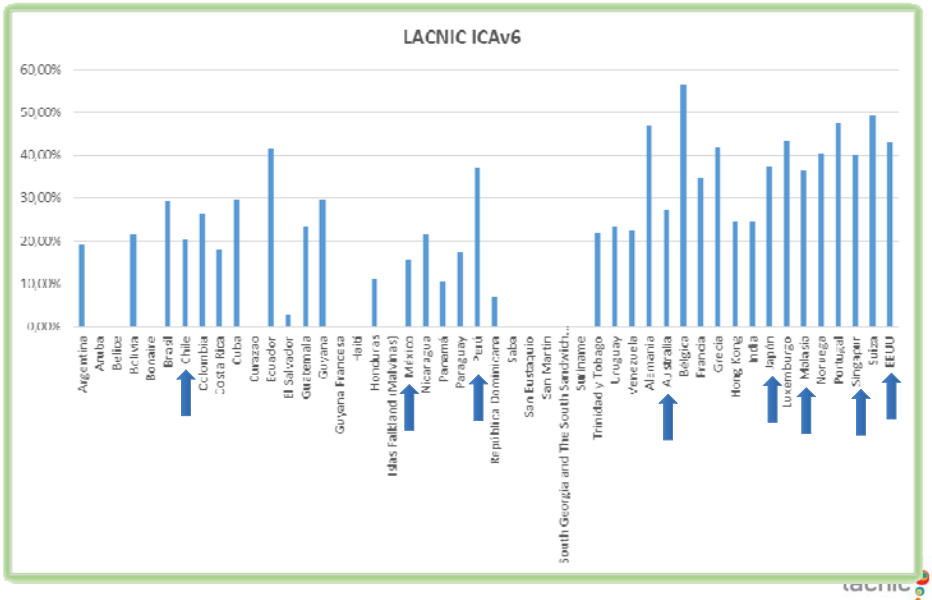
1. PACTO (Planning): % of IPv6 allocated prefixes with observed traffic wrt total allocations.
2. ASTRAN (AS with IPv6 transit): AS transit with observed IPv6 traffic. Average of AS's providing IPv6 transit and IPv4 transit AS's that have an IPv6 assignment.
3. CONT (Content): Sum of the weighted % of IPv6 accessible sites plus the weighted % of IPv6 proof/test domains ("IPv6" embryos according to LACNIC).
4. USUARIOS (Users): percentage of IPv6-capable end-users

$$LACNIC\ ICAv6\ \% = 0{,}3 * (0{,}1 * PACTO + 0{,}9 * ASTRAN) + 0{,}7 * \sqrt{CONT * USUARIOS}$$

Short segue



Results



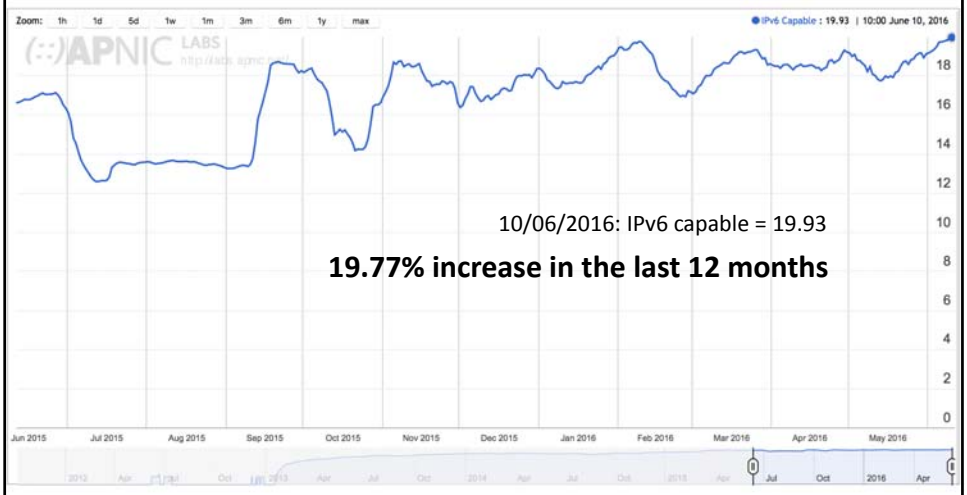
Field Work: Summary of findings

- Roughly only four (4) countries have more than 1% of users ready for IPv6 (Bolivia, Brazil, Ecuador and Peru). Most ISPs are still not offering IPv6 to end users (residential, mobile) but most have IPv6 deployed in their network core;
- 30% of organisations in the region are thinking about deploying IPv6 in 2016;
- Most commonly, the transition strategy adopted is Dual Stack with native IPv6 & private IPv4 + CGN44;
- Countries with large Internet penetration are the most delayed in IPv6 uptake (lower growth rate, IPv4 stock still enough for their *needs*)

Field Work: Summary of Findings con't

- ISPs:
  - So called "IPv6-ready" CPEs not so IPv6-ready
  - Provisioning systems & internal BSS software
  - Operations / help-desk training (but not a big issue)
- NRENs / Universities: IPv6 deployed in CPEs but some campus problems: Wi-Fi & firewalls generally not supporting IPv6 (or not configured)
- Governments: e-Gov systems, Government portals, community Wi-Fi networks not supporting IPv6

Perú



10/06/2016: IPv6 capable = 19.93

19.77% increase in the last 12 months

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Peru IPv6 leaderboard

ASN	Organization	IPv6 capable (%)
6147	Telefonica del Peru	24.61
262253	Econocable Media	0.19
27843	Optical Technologies	0.17
262235	Netline Peru	0.14
21575	Entel Peru	0.06
262210	Viettel Peru	0.06
12252	America Movil	0.02
19180	Americatel Peru	0.02

http://stats.labs.apnic.net/ipv6/PE 12/06/2016

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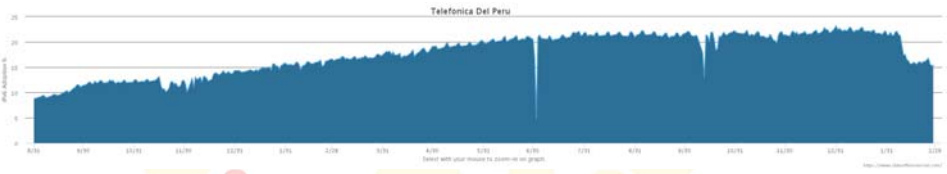
Telefónica – Perú

- **2008:** address shortage identified due to high growth rate of DSL customers
  - Internal planning involving all areas of the company
- **2010:** equipment and software testing
- **2012:** started ADSL IPv6 service
- IPv6 in HFC network is expected by 2016 and mobile in 2017

Telefónica – Perú



- CGN deployed due to IPv4 shortage (2012)
  - Corporate users and some DSL users get public IPs
  - Mobile uses CGN
  - IPv6: dual stack, CGN for IPv4 address sharing
- No problems identified in BSS
- Provisioning systems were part of the initial plan
- Help Desk: IP technology is irrelevant

Economic Model

Control Panel

I.1 NLV of the Costs of Each Alternative

	Net Present Value
Alternative 1, transition with dual-stack and CGNAT with CPE	$4.910.952,82
Alternative 1, transition with dual-stack and CGNAT without CPE	$2.312.338,22
Alternative 2, using CGNAT without implementing IPv6	$6.192.207,28
Alternative 3, purchasing IPv4 addresses without NAT or IPv6	$4.077.689,49

I.2 Main Parameters

Rate of opportunity cost of capital.	12%
Service life of dual-stack CPEs or timeframe for replacement of IPv4-only CPEs with dual-stack CPEs	5,0
Service life of IPv4-only CPEs. Alternative 2.	5,0
Total number of current residential customers	100.000
Idem but already served with IPv4 addresses (CGNAT or individual IPv4 addresses)	50.000
Annual customer base growth rate	15%
CGNAT operational capacity – simultaneous sessions – calculation module	10.000.000
Maximum average number of sessions per user without dual-stack	1.000
Minimum design number of sessions with CGNAT per user without dual-stack, by quality	1.000
% of IPv4 sessions per user with dual-stack (CONT indicator)	4,92%
Minimum design number of sessions with CGNAT per use with dual-stack, by quality	492
% of users connected simultaneously	30%
Average number of users per client	3
Annual drop in IPv4-only CPE prices	10%
Reduction of the price difference between dual-stack vs. IPv4-only CPEs = 0 in 5 years	20%
Annual ARPU per customer assumed to be constant	$240,00

Lessons Learnt

General recommendations

- Adjustments to regulatory frameworks and policies so that they will facilitate IPv6 deployment (telecoms, ICT, public procurement)
- Support for academic networks and universities (agents for innovation)
- Develop road map to encourage a timely transition to IPv6, including training plans

APEC TEL IPv6 Guidelines 2010

- Scope of the document
  - **Lead the industry by example in adopting IPv6**
    - Ensuring governments' online presence via IPv4+IPv6
    - **New procurement requirements** with IPv6
      - Be ready with transition – do not buy legacy equipment!
  - **Partnership between governments and industry**
    - Periodic information exchange and collaboration
  - **Human capacity development**
    - Enhance IPv6 skills of technical staff
    - IPv6 training programs to be shared
  - **International and cross-agency cooperation**
    - Sharing information on IPv6 Best Current Practice
    - Avoid duplicating efforts IPv6 implementation

APEC TEL
Strategic Action Plan 2016 - 2020

- Item 3 Promote Regional Economic Integration
  - Objective 3. 4 Enhance online connectivity
    a) Promote open data in APEC region
    b) Promote development of cross-border e-commerce
    c) Promote the **Internet of Things (IoT)** and application-to-application connectivity
    d) Promotion of digital content within the APEC region
    e) Promote greater adoption of **IPv6**

http://www.apec.org/~/media/Files/Groups/TEL/20150331_APEC%20TEL%20Strategic%20Action%20Plan%202016-2020.pdf

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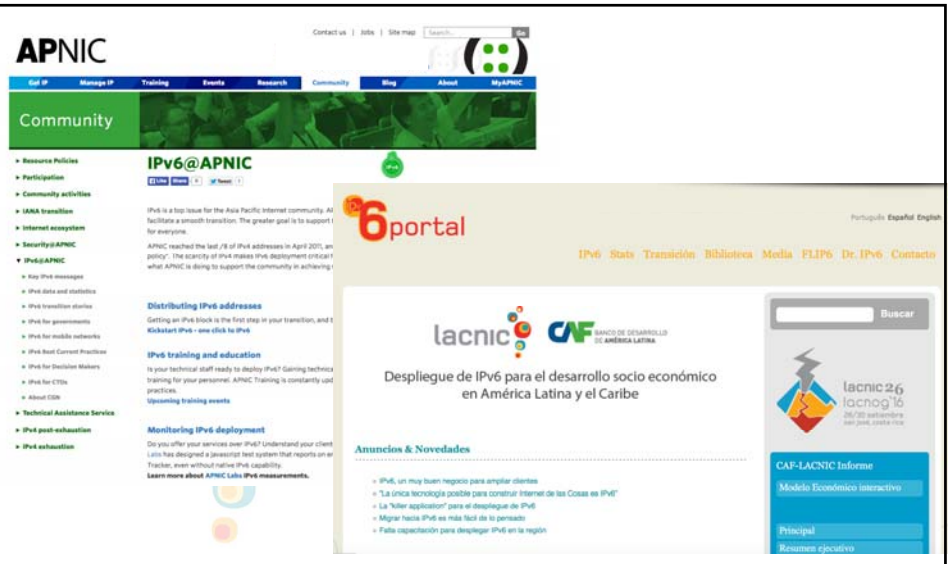

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Questions?

Thank You