Putting IPv6 to work

North American IPv6 Summit
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Impacts of IPv6

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Agenda

1. Introduction.
2. Impacts of IPv4 and IPv6
   - Environmental
   - Operational (Costs)
   - Social
3. Recent documents and news.
4. References.
IP Addresses numbers

- IPv6 - 340,282,366,920,938,463,463,374,607,431,768,211,456 ~ $10^{38}$
- IPv4 - 4,294,967,296 ~ $10^{9}$

- World Population (2014) 7,183,849,000
- # Lacking IPv4 Addresses 2,888,881,704
- Population in the US (2014) 318,892,103
- Population in Colorado (2013) 5,268,367
- Population in Denver (2013) 649,495
- Tourists in the City thousands +100
- Attendants this Summit +100

*Source: www.census.gov in August 2014*
IPv4 Facts: (Today)

IANA Unallocated Address Pool Exhaustion:
03-Feb-2011
Exhausted: Apr - 2011 APNIC
Sep - 2012 RIPE
Jun - 2014 LACNIC
Projecte...
IP Supply

*Source: Google – December 2013*
Impacts of IPv4 and IPv6

- Environmental
- Operational (Costs)
- Social
IPv6 Footprint

Reduction in the energy consumption of mobile devices (batteries)
(No NAT-keep-Alive / Yes “long-live”)

Topic of IETF list (January 2014):
“Reducing the battery impact of ND”

Possible solution:
“respond to router solicitations with Unicast RAs sent to the sender”
+ IPv6 Footprint

• The no fragmentation and the fixed size of the main header could have a positive impact by making more efficient the sending of packets.
• + If it is achieved a reduction in the use of extension headers.
• IPv6 can be faster.
• Monitoring of more devices and environmental variables by sensor networks.
IPv6 and the Environment

*Source: Presentation of Bii in the IPv6 Google event*
IPv6 and the Environment

* Buildings control (sensors & devices).
* Remote control of devices.
* Integration and interconnection of heterogeneous subsystems (RFID tags, Bluetooth, ZigBee, KNX and DLNA).

*Source: Smartipv6building.org
- “Standards-based IPv6 network”.
- Smart Grids.
- Street light monitoring system based on IPv6.

*Source: Silverspringnet*
Environmental impact of IPv6

- It is an enabler of innovation.
- Facility and savings in the networks management (20%).

*Source: Presentation of Japan*
- IPv6 Footprint

- It can have a negative impact by producing “consumerism” and necessities no present before, with more devices on-line (Internet connection).
- Internet uses 10-13% of the energy consumption*.
- If no green energy sources are used.
- More traffic => More energy consumption.

*Source: Google event “Green Internet” June 2013
- and + social impacts of IPv6

• **Negative** by producing “consumerism” and necessities no present before.
• More access devices even in the clothes “Wearable Internet”.

*Source: Wikipedia / Apple*
IPv6 in smart glasses?

Glass of Google™

SmartGlass of David Alonso Quiroz

*Source: Nosotros / CNN Expansion (August 2013)
IPv6 in traffic signals?

NTCIP (National Transportation Communications for ITS Protocol)  Only IPv4?

ITS (Intelligent Transportation Systems)

*Source: NEMA / phys.org / ntcip.org / CNN Expansion (August 2013)*
IPv6 necessary for IoT

*Source: Infographic of Postscapes (March 2014)
IPv6 and IoT

IoT6 is a 3 years FP7 European research project on the future Internet of Things.

October 2011 until September 2014

*Source: www.iot6.eu
Internet Of Things Consortium

*Source: WebPages of ISOC and Blogthinkbig*
Operational Impacts of IPv6

• With the lack of IPv4 addresses, continue using NAT can complicate the connectivity and the management of devices that require an IP.
• The NAT use has or could have a high impact in the economy.
• IPv6 has been faster (in some sceneries with no tunnels).
IPv6 Enabler Ecosystems

*Source: 6lowpan.net*
Interoperability of and with IPv6

*Source: Silverspringnet*
Operational Impacts of IPv6

• The latter you start to enable and test IPv6, greater will be the costs to invest in areas such as updates in Humanware, Software and Hardware.

• With a good planning, involved costs are part of regular updates of computers and networks.

*Source: P
There are only this many IPv6 addresses left:

340,282,366,920,938,463,463,374,607,431,574,528,660

Projected IPv6 Exhaustion Date

5,395,000,000,000,000,000,000,000,000,000,000 AD

Alternative Method: /48 Prefix Allocations

There are only this many /48 prefixes left:

281,474,976,430,960.0498

Projected IPv6 Exhaustion Date

70,370,000,000 AD

*Source: Webpage Sam Bowne*
Recent documents

• RFC 7346 IPv6 Multicast Address Scopes
• RFC 7341 DHCPv4-over-DHCPv6 (DHCP 4o6) Transport
• RFC 7283 Handling Unknown DHCPv6 Messages
• RFC 7278 Extending an IPv6 /64 Prefix from a Third Generation Partnership Project (3GPP) Mobile Interface to a LAN Link
• RFC 7287 Mobile Multicast Sender Support in Proxy Mobile IPv6 (PMIPv6) Domains
• RFC 7269 NAT64 Deployment Options and Experience
• RFC 7222 Quality-of-Service Option for Proxy Mobile IPv6
• RFC 7225 Discovering NAT64 IPv6 Prefixes Using the Port Control Protocol (PCP)

*Source: IETF*
Recent Forecast

- IPv6-capable devices in 2018:
  - 80% smartphones and tablets (3.9 Billion)
  - 94% laptops (797 million)
  - 34% M2M connections (2.4 Billion)

*Source: Cisco Blog (VNI Forecast) – September 2014*
Recent News

• “Yea! LinkedIn Joins Facebook And Google In Permanently Enabling IPv6” Sep. 08th/2014
• linkedin.com “shows up on IPv6 internet! August 13th/2014
• Comcast reaches key Milestone in launch of IPv6 Broadband Network. July 22nd/2014
• OpenWRT gets native IPv6 stroking in major refresh. July 14th/2014
• CKLN (Caribbean Knowledge and Learning Network) Implements IPv6. June 26th/2014

*Source: Internet*
Recent News

• Need to move to IPv6 highlighted as Microsoft runs out of US address space (Azure cloud service). June 24th/2014

• No more IPv4 addresses in Latin America and the Caribbean. LACNIC. June 10th/2014

• Campaign: Turn Off IPv4 on 6 June 2014 for One Day. June 06th/2014

• Happy World IPv6 Launchiversary #2 – What Will YOU Do Today To Help Get More IPv6 Deployed? June 06th/2014

*Source: Internet*
Is IPv4 dead?

*Source: Technologyreview*
IPv6 ≈ VCR?

IPvcr4 vs. “IPDVx6”

*Source: Networkingnerd.net / gettyimages.com
IPv6 – The Sky Really is Falling!

*Source: Twitter de @ARIN _ July 30th 2014*
What if the ipv6 pushmi-pullyu doesn’t exist? - Ian Farrer

Reasons for IPv6 – Push or Pull?
The ‘Usual’ Justifications

- We’re out of v4 addresses!
- So’s RIPE/ARIN/APNIC....

- Customers are demanding v6!
- Look at the new services we can build!

Image source: http://bodybalance4you.wordpress.com
03/08/2014

*Source: ION Belfast - IPv6 Success Stories _ Sep. 2014
IPv6 already on the road?

*Courtesy: Karen Wucher*
IPv6 has been standard since it was designed in September 1991, and it has proven to be a simple and scalable protocol, although not even obsolete, is becoming soon.

In the early 1990s, the IETF began to design the new version of the IP, called IPv6, that became a standard in December 1995.

IPv6 has new and important features, the most important are a design that allows it to overcome the IPv4 limits: a practically infinite addressing space, the possibility to auto-configure hosts, an efficacious support for security and mobility of nodes, a design more suitable to transport real-time traffic, and the possibility to implement a gradual transition from IPv4 to IPv6.

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Successful Participation!
Wednesday June 6th 2011

World IPv6 Launch
June 6th 2012

Two workshops were coordinated during the CUDI Meeting Spring 2013 Queretaro, Mexico, April, 2013

It was given Module #8: IPv6, in the "Diplomado Integral de Telecomunicaciones" of DGCTIC, Mexico City, Mexico, January, 2013
El Nuevo Internet: Internet para Todos 
Calidad, Movilidad y Seguridad

Bienvenido al Capítulo Mexicano del Foro IPv6

El Grupo de Trabajo Mexicano de IPv6 es un esfuerzo conjunto para impulsar el conocimiento de esta tecnología, identificar oportunidades de la arquitectura, promover su despliegue, así como construir una comunidad de instituciones y personas activas en el campo de IPv6 en México.

Evento:

Lanzamiento Mundial de IPv6
6 de junio 2012

Eventos Próximos y Pasados:
Presentaciones y Documentos

Noticias y Artículos IPv6:

Artículos y Documentos:
Comunicado de prensa conjunto de ISOC México, NIC México, IPv6 Task Force México y Capítulo Mexicano del Foro IPv6, sobre el Lanzamiento Mundial de IPv6. Versión PDF [Descargar]

IPv6 Forum Rockies. Avances 2010

RMIPv6 Task Force
Thank you
Gracias

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