

Putting
IPv6
to work



North American IPv6 Summit

Grand Hyatt, Denver, Colorado

September 23-25, 2014

Rocky Mountain IPv6 Task Force



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

Projected Exhaustion Date:

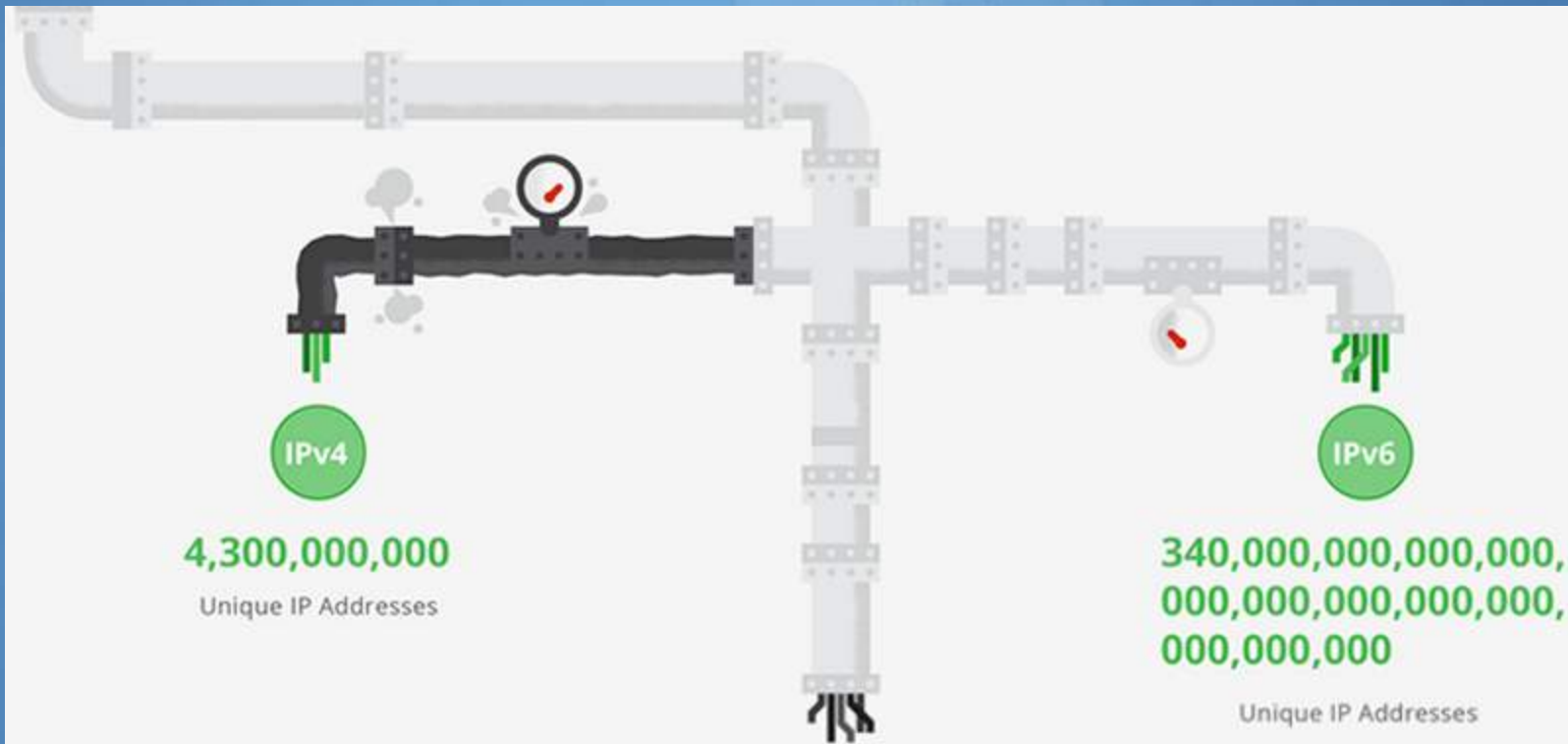
ARIN: 25-Feb-2015

AFRINIC: 22-Jul-2019





IP Supply



*Source: Google – December 2013

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Impacts of IPv4 and IPv6



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+ IPv6 Footprint

Reduction in the **energy** consumption of mobile devices (**batteries**)

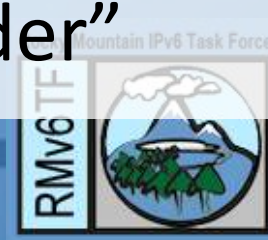
(No NAT-keep-Alive / Yes “long-live”)

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”



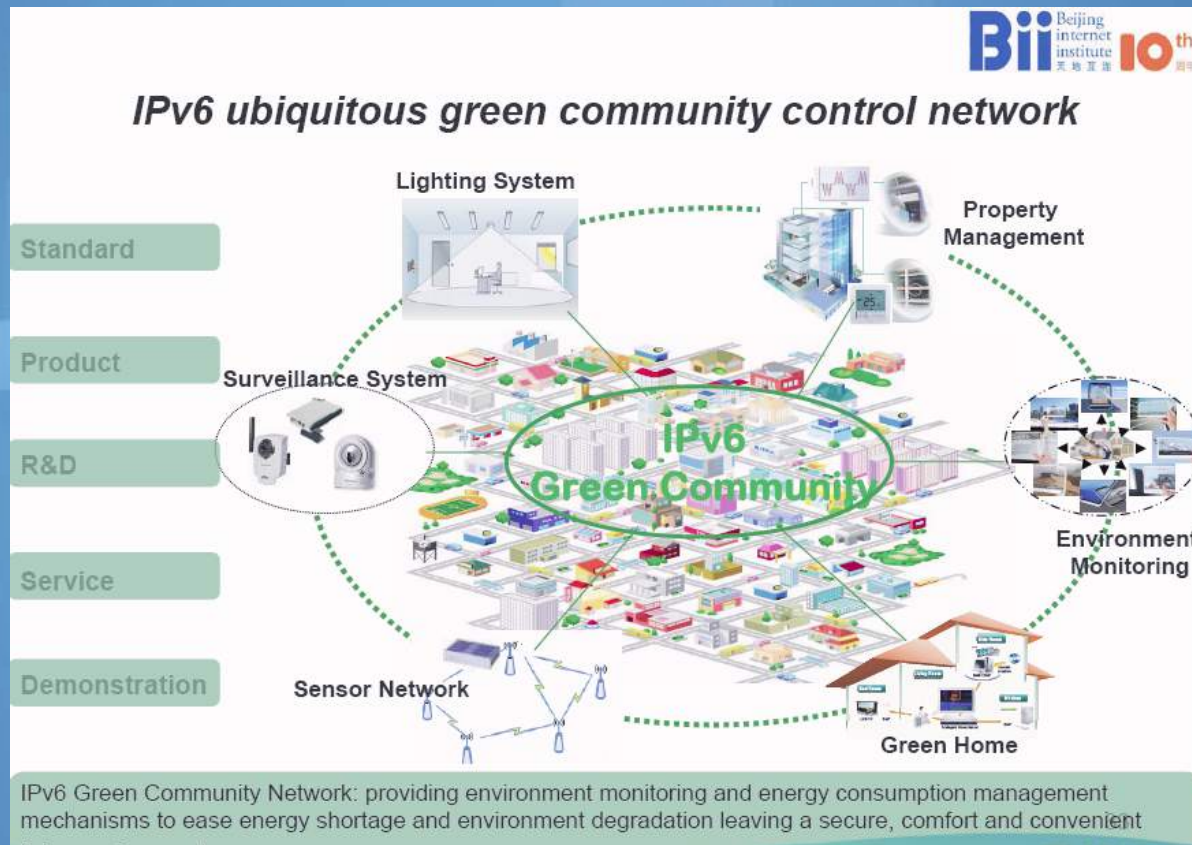


+ IPv6 Footprint

- 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



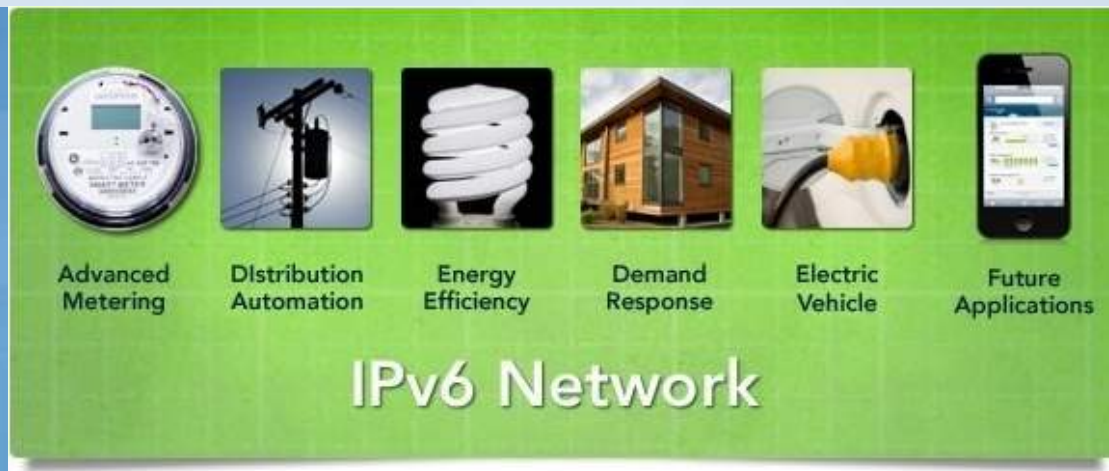
- * Buildings control (sensors y devices).
- * Remote control of devices.
- * Integration and interconnection of heterogeneous subsystems (RFID tags, Bluetooth, ZigBee, KNX and DLNA).

*Source: Smartipv6building.org





IPv6 and the Environment



- “Standards-based IPv6 network”.
- Smart Grids.
- Street light monitoring system based on IPv6.

*Source: Silverspringnet

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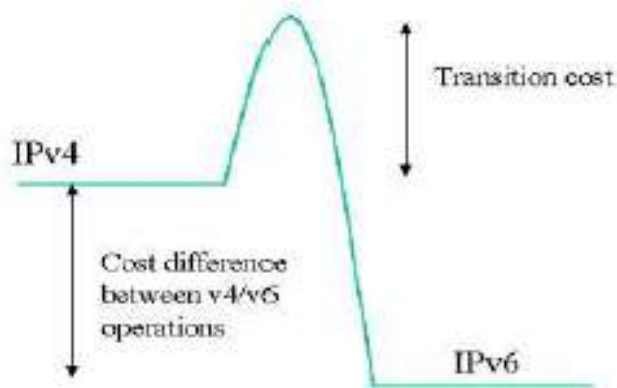




Environmental impact of IPv6

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

IPv4-IPv6 Migration costs (Phase 3)



*Source: Presentation of Japan





- IPv6 Footprint

- It can have a negative impact by producing “consumerism” and necessities not 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”.



Zypad of Arcom Control Systems



*Source: Wikipedia / Apple



IPv6 in smart glasses ?



Glass of Google™



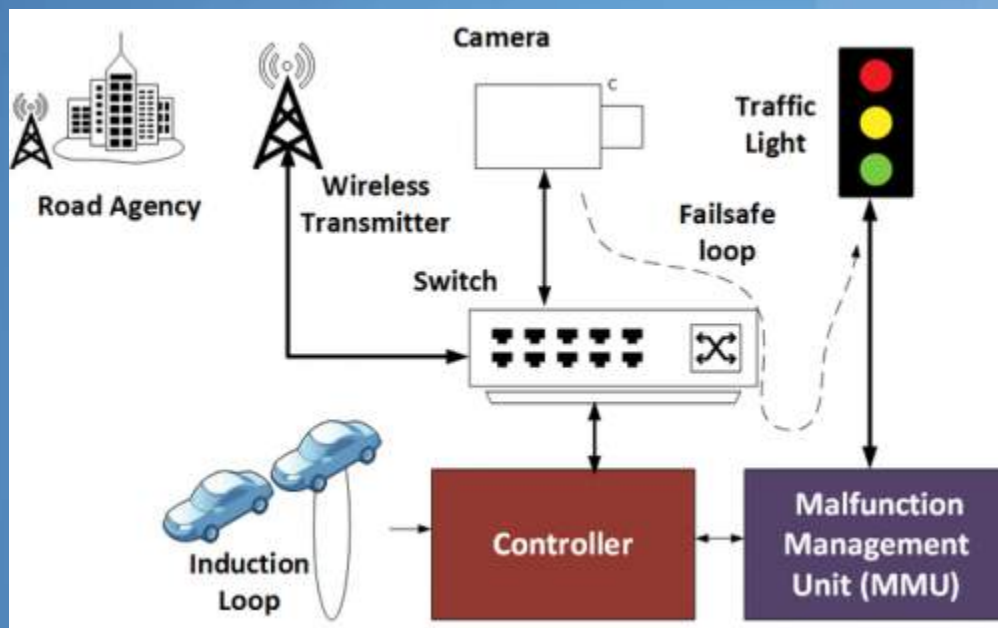
SmartGlass of David Alonso Quiroz



*Source: Nosotros / CNN Expansion (August 2013)



IPv6 in traffic signals ?



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

ITS (Intelligent Transportation Systems)

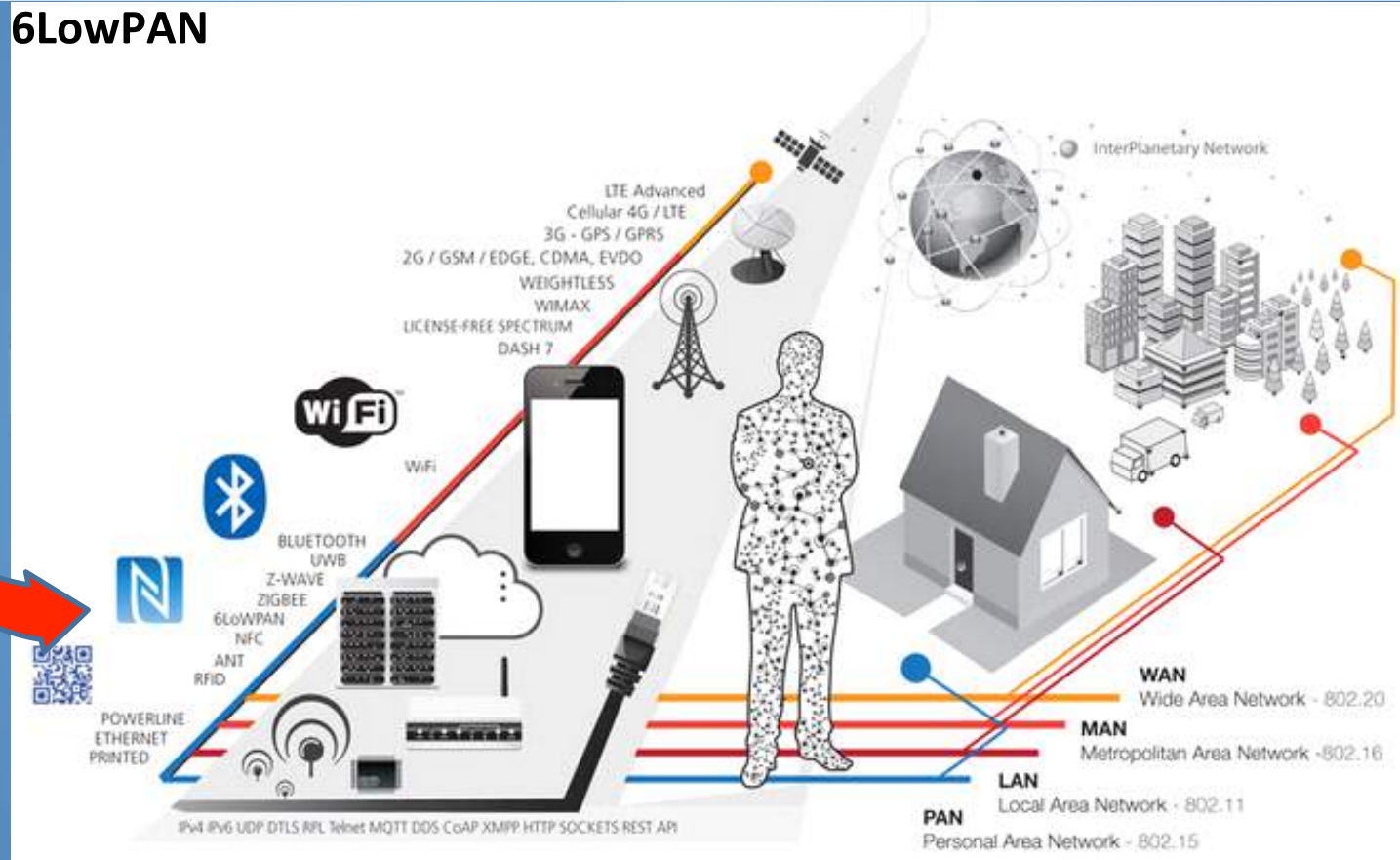
***Source:** NEMA / phys.org / ntcip.org / CNN
Expansion (August 2013)





IPv6 necessary for IoT

6LowPAN



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*Source: Infographic of Postscapes (March 2014)





IPv6 and IoT



IoT6 - Universal Integration of the Internet of Things
through an IPv6-based Service Oriented Architecture enabling heterogeneous components interoperability

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





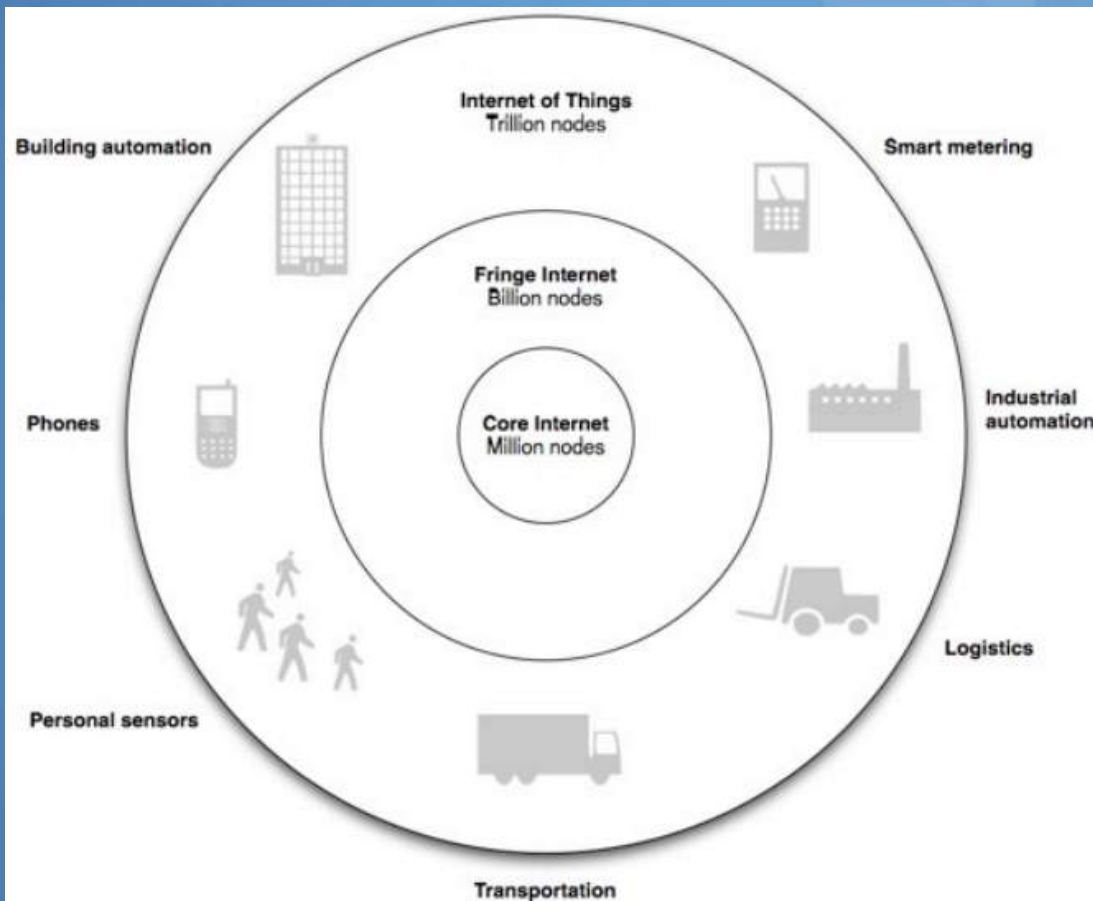
Operational Impacts of IPv6

- 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

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Interoperability of and with IPv6

SEP 1.x	REST Web Services CIM IEC 61968	C12.18/ C12.19	DLMS/ COSEM IEC 62056	PANA RFC 5193	SNMP RFC 1157	NTP RFC 5905	SSH RFC 4251	DNS RFC 1085	DNP3 IEEE 1815	SunSpec
ZigBee Cluster Libraries	EXI CoAP/ HTTP RFC2616	TLS/ RFC3246 DTLS RFC6347								
ZigBee Pro	TCP RFC 793/UDP RFC 768						RPL RFC 6553	ICMP RFC 4443		
	IPsec RFC 2401	IPv6 RFC 2460, IPv6 Addressing 4291 IPv4 RFC 791				DSCP RFC 2474				
	6LoWPAN RFC 4944	PPP RFC 1661								MODBUS
802.15.4 MACs	IEEE L2R	GPRS	Satellite	4G LTE 3GPP TF25.913	IEEE 802.3	IEEE 802.11				
802.15.4 DSSS	802.15.4g FHSS	2G GPRS	3G	WIMAX - IEEE 802.16						

*Source: Silverspringnet

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+ 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



IPv6 Exhaustion Counter Calculation

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 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

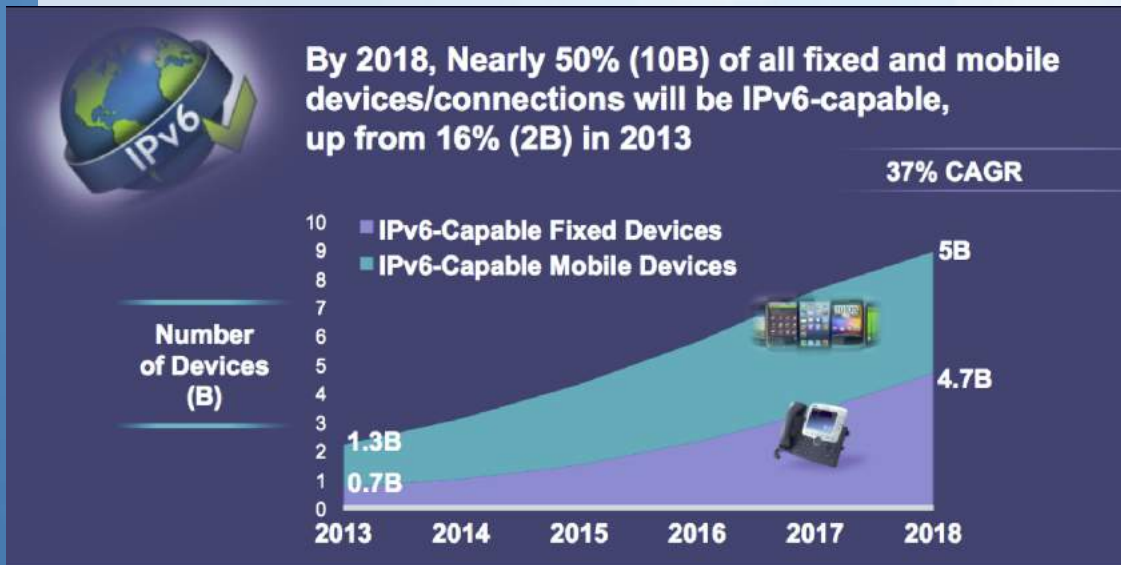
- **RFC 7346** IPv6 Multicast Address Scopes
- **RFC 7341** DHCPv4-over-DHCPv6 (DHCP 4o6) Transport
- **RFC 7283** Handling Unknown DHCPv6 Messages
- **RFC 7278** Extending an IPv6 /64 Prefix from a Third Generation Partnership Project (3GPP) Mobile Interface to a LAN Link
- **RFC 7287** Mobile Multicast 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!



**SIMPLE. GET
IPv6
RUNNING!**



Image source: <http://bodybalance4you.wordpress.com>
05/09/2014 2

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IPv6 already on the road ?



*Courtesy: Karen Wucher



www.ipv6.unam.mx/site



México



Versión en Español

This page is also accessible via IPv6

IPv4 has been standard since it was designed in September 1981, 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.



!!! Successful Participation !!!
Wednesday June 8th 2011



World IPv6 Launch
!!! June 6th 2012 !!!

NEWS

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

- Home
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- Our IPv6 Networks
- Papers
- Presentations
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- IPv6 International Networks
- Other sites

Internet2-MX and IPv6

IPv6 in Latin America



Status: Service-In
Last: 2013-06-27
URL: www.ipv6.unam.mx
ACCESSING VIA IPv6

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www.ipv6forum.com.mx

FORUM México

English Version

Under Construction

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[Solo Miembros](#)

[Prueba IPv6](#)

[Twitter: foroipv6mx](#)

Agotamiento IPv6

Situación actual (RIR)

RIR	Plazo y tiempo de bloques	Reserva de bloques
AfriNIC	20.07.2019	3.11
APNIC	19.04.2011	0.84
ARIN	20.02.2016	0.82
LACNIC	10.05.2014	0.26
RIPENIC	14.09.2012	1.08

NetCore via IPv6

semana IPv6

El Nuevo Internet: Internet para Todos Calidad, Movilidad y Seguridad

Bienvenido al Capítulo Mexicano del Foro IPv6 Miércoles 30 de Julio del 2014

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

Eventos

[Foro Latinoamericano de IPv6](#)



[Lanzamiento Mundial de IPv6](#)
!!! Hace YA 2 años
6 de junio 2012 !!!



[Cumbre Norteamericana de IPv6](#)
Información en [Español](#)

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 (06/junio/2012)

[IPv6 Forum Roadmap & Vision 2010](#)

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**Thank you
Gracias**

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