

IPv6 in Real Life

Deployment of Popular Servers in IPv6 Version 5.0

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(ESNOG/GORE-4 special blend edition)



Version 5.0

- version 1.0: RIPE 53
- version 2.0: RIPE 54
- version 3.0: RIPE 55
- version 4.0: RIPE 56

The objective?

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For newcomers:

The objective?

For newcomers:

- If my wife would have a computer with only IPv6 connectivity, what would she see?

The objective?

For newcomers:

- If my wife would have a computer with only IPv6 connectivity, what would she see?
- N.B. My wife is a lawyer with no computer literacy

The objective?

For newcomers:

- If my wife would have a computer with only IPv6 connectivity, what would she see?
- N.B. My wife is a lawyer with no computer literacy
- N.B.2. Don't try to use your children as guinea pigs. They're more dangerous than wives

Why?



Why?

- IPv4 space is running out (24-Dic-2012 10.30 AM)

Why?

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- Everybody is telling that we must migrate to IPv6 (from years on)

Why?

- IPv4 space is running out (24-Dic-2012 10.30 AM)
- Everybody is telling that we must migrate to IPv6 (from years on)
- But... is there life in IPv6?

Investigation method

- No rocket science here
- Just some easy lookups in DNS space and some easy to do test
- And some web digging
- Regular updates through RIPE meetings

Investigation method (2)

- Get the most visited webs per country
 - Source: <http://www.alexacom/>
- Check for:
 - Ask to the DNS of that domain for...
 - An AAAA DNS entry for the web service and the email

Investigation method (3)

- If there is a DNS entry, verify that it works
 - Open the web page with a IPv6 navigator
 - Telnet to port 25 and do some basic SMTP dialog
 - Dig to the IPv6 DNS server

Investigation method (4)

- Making the easier, difficult
- Though you can associate A and AAAA records to www.example.com, many domains do it differently:
 - www.ipv6.example.com
 - `www6.example.com`
 - `ipv6.example.com`

Investigation method (5)

- We also verify the DNS hierarchy
- Root servers with AAAA addressing
- TLD (gTLD and ccTLD) with AAAA addressing
- TLD that accept AAAA entries for subdomain DNS servers

Some changes

- April 2009
 - Alexa changed
 - Now they provide the 1 million top sites
 - This alters the measurements
 - More quantity
 - We use only the first 15.000

Iconography

- ✱ Correct, DNS entry and server answers
- # Incorrect, No DNS entry
- ? Liar, DNS entry but no answer

And now, the results



The big numbers on web servers

Countries

Unique domains

Unique web
servers on ipv6

Proportion (per
thousands)

The big numbers on web servers

	RIPE 53
Countries	75
Unique domains	4315
Unique web servers on ipv6	12
Proportion (per thousands)	2.78

The big numbers on web servers

	RIPE 53	RIPE 54
Countries	75	102
Unique domains	4315	4937
Unique web servers on ipv6	12	10
Proportion (per thousands)	2.78	2.02

The big numbers on web servers

	RIPE 53	RIPE 54	RIPE 55
Countries	75	102	103
Unique domains	4315	4937	4572
Unique web servers on ipv6	12	10	15
Proportion (per thousands)	2.78	2.02	3.28

The big numbers on web servers

	RIPE 53	RIPE 54	RIPE 55	RIPE 56
Countries	75	102	103	109
Unique domains	4315	4937	4572	5415
Unique web servers on ipv6	12	10	15	34
Proportion (per thousands)	2.78	2.02	3.28	6.27

The big numbers on web servers

	RIPE 53	RIPE 54	RIPE 55	RIPE 56	RIPE 59
Countries	75	102	103	109	102
Unique domains	4315	4937	4572	5415	15000
Unique web servers on ipv6	12	10	15	34	129
Proportion (per thousands)	2.78	2.02	3.28	6.27	8.6

Some samples

- Most of the countries gave same results
- We will show some average results and some distinguished cases

Australia

	*	#	?
www.example.com	0		0
www.ipv6.example.com	0		1
www6.example.com	0		0
ipv6.example.com	1		0
Web Totals	1	398	1
SMTP IPv6	0	400	0
DNS	0	400	0

Indonesia

	*	#	?
www.example.com	0		0
www.ipv6.example.com	0		1
www6.example.com	5		0
ipv6.example.com	1		0
Web Totals	6	393	1
SMTP IPv6	5	395	0
DNS	5	395	0

Portugal

	*	#	?
www.example.com	1		0
www.ipv6.example.com	0		1
www6.example.com	1		0
ipv6.example.com	1		0
Web Totals	3	396	1
SMTP IPv6	1	399	0
DNS	1	399	0

China

	*	#	?
<u>www.example.com</u>	0		0
<u>www.ipv6.example.com</u>	0		1
www6.example.com	0		0
ipv6.example.com	1		1
Web Totals	1	397	2
SMTP IPv6	0	400	0
DNS	0	400	0

The big numbers on web servers

- 15000 domains examined
- 129 have web servers

Incorrect web servers

Incorrect web servers

- www6.doctissimo.fr

Incorrect web servers

- `www6.doctissimo.fr`
 - `fe80::222:19ff:feaa:9d9f`

Incorrect web servers

- www6.doctissimo.fr
- fe80::222:19ff:feaa:9d9f
- www.putalocura.com

Incorrect web servers

- `www6.doctissimo.fr`
 - `fe80::222:19ff:feaa:9d9f`
- `www.putalocura.com`
 - `::ffff:217.13.124.45`

Incorrect web servers

- www6.doctissimo.fr
 - `fe80::222:19ff:feaa:9d9f`
- www.putalocura.com
 - `::ffff:217.13.124.45`
- www.desidump.com

Incorrect web servers

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 - `fe80::222:19ff:feaa:9d9f`
- www.putalocura.com
 - `::ffff:217.13.124.45`
- www.desidump.com
 - `::1`

Incorrect web servers

- www6.doctissimo.fr
 - `fe80::222:19ff:feaa:9d9f`
- www.putalocura.com
 - `::ffff:217.13.124.45`
- www.desidump.com
 - `::1`
- www.online.fr

Incorrect web servers

- www6.doctissimo.fr
 - fe80::222:19ff:feaa:9d9f
- www.putalocura.com
 - ::ffff:217.13.124.45
- www.desidump.com
 - ::1
- www.online.fr
 - 696e:6502:6672:0:1c00:12e:2800:0

Incorrect web servers

- www6.doctissimo.fr
 - `fe80::222:19ff:feaa:9d9f`
- www.putalocura.com
 - `::ffff:217.13.124.45`
- www.desidump.com
 - `::1`
- www.online.fr
 - `696e:6502:6672:0:1c00:12e:2800:0`
- ipv6.unm.edu

Incorrect web servers

- www6.doctissimo.fr
 - fe80::222:19ff:feaa:9d9f
- www.putalocura.com
 - ::ffff:217.13.124.45
- www.desidump.com
 - ::1
- www.online.fr
 - 696e:6502:6672:0:1c00:12e:2800:0
- ipv6.unm.edu
 - 3ffe:2900:11:10::1

SMTP & DNS servers

SMTP & DNS servers

- Mail servers

SMTP & DNS servers

- Mail servers
 - 28 detected

SMTP & DNS servers

- Mail servers
 - 28 detected
 - 20 answered

SMTP & DNS servers

- Mail servers
 - 28 detected
 - 20 answered
- DNS servers

SMTP & DNS servers

- Mail servers
 - 28 detected
 - 20 answered
- DNS servers
 - 44 detected

SMTP & DNS servers

- Mail servers
 - 28 detected
 - 20 answered
- DNS servers
 - 44 detected
 - 42 answered

Finally, some good old friends

	Web	MX	NS
--	-----	----	----

Finally, some good old friends

	Web	MX	NS
ripe.net	*	*	*

Finally, some good old friends

	Web	MX	NS
ripe.net	*	*	*
arin.net	*	*	#

Finally, some good old friends

	Web	MX	NS
ripe.net	*	*	*
arin.net	*	*	#
apnic.net	*	*	*

Finally, some good old friends

	Web	MX	NS
ripe.net	*	*	*
arin.net	*	*	#
apnic.net	*	*	*
lacnic.net	*	*	*

Finally, some good old friends

	Web	MX	NS
ripe.net	*	*	*
arin.net	*	*	#
apnic.net	*	*	*
lacnic.net	*	*	*
afrinic.net	*	*	*

More good ole friends...

	Web	MX	NS
--	-----	----	----

More good ole friends...

	Web	MX	NS
iana.org	*	*	*

More good ole friends...

	Web	MX	NS
iana.org	*	*	*
icann.org	*	*	*

More good ole friends...

	Web	MX	NS
iana.org	*	*	*
icann.org	*	*	*
ietf.org	*	*	*

...and some more good ole friends

	Web	MX	NS
--	-----	----	----

	Web	MX	NS
telefonica.es	#	#	#
ono.es	#	#	#
upm.es	#	#	#
uc3m.es	#	#	#
consulintel.es	*	#	*
tecnocom.es	#	#	#
bondis.org	#	#	#



...and some more good ole friends

	Web	MX	NS
red.es	#	#	*

	Web	MX	NS
telefonica.es	#	#	#
ono.es	#	#	#
upm.es	#	#	#
uc3m.es	#	#	#
consulintel.es	*	#	*
tecnocom.es	#	#	#
bondis.org	#	#	#

...and some more good ole friends

	Web	MX	NS
red.es	#	#	*
rediris.es	#	#	*

	Web	MX	NS
telefonica.es	#	#	#
ono.es	#	#	#
upm.es	#	#	#
uc3m.es	#	#	#
consulintel.es	*	#	*
tecnocom.es	#	#	#
bondis.org	#	#	#



...and some more good ole friends

	Web	MX	NS
red.es	#	#	*
rediris.es	#	#	*
<u>mcyt.es</u>	#	?	#

	Web	MX	NS
telefonica.es	#	#	#
ono.es	#	#	#
upm.es	#	#	#
uc3m.es	#	#	#
consulintel.es	*	#	*
tecnocom.es	#	#	#
bondis.org	#	#	#

...and some more good ole friends

	Web	MX	NS
red.es	#	#	*
rediris.es	#	#	*
<u>mcyt.es</u>	#	?	#
cesca.es	#	#	#

	Web	MX	NS
telefonica.es	#	#	#
ono.es	#	#	#
upm.es	#	#	#
uc3m.es	#	#	#
consulintel.es	*	#	*
tecnocom.es	#	#	#
bondis.org	#	#	#

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red.es	#	#	*
rediris.es	#	#	*
<u>mcyt.es</u>	#	?	#
cesca.es	#	#	#
catnix.net	#	#	#

	Web	MX	NS
telefonica.es	#	#	#
ono.es	#	#	#
upm.es	#	#	#
uc3m.es	#	#	#
consulintel.es	*	#	*
tecnocom.es	#	#	#
bondis.org	#	#	#

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cesca.es	#	#	#
catnix.net	#	#	#
espanix.net	#	#	#

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telefonica.es	#	#	#
ono.es	#	#	#
upm.es	#	#	#
uc3m.es	#	#	#
consulintel.es	*	#	*
tecnocom.es	#	#	#
bondis.org	#	#	#

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catnix.net	#	#	#
espanix.net	#	#	#
uam.es	#	#	#

	Web	MX	NS
telefonica.es	#	#	#
ono.es	#	#	#
upm.es	#	#	#
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consulintel.es	*	#	*
tecnocom.es	#	#	#
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...and some more good ole friends

	Web	MX	NS
red.es	#	#	*
rediris.es	#	#	*
<u>mcyt.es</u>	#	?	#
cesca.es	#	#	#
catnix.net	#	#	#
espanix.net	#	#	#
uam.es	#	#	#

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telefonica.es	#	#	#
ono.es	#	#	#
upm.es	#	#	#
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...and some more good ole friends

	Web	MX	NS
red.es	#	#	*
rediris.es	#	#	*
<u>mcyt.es</u>	#	?	#
cesca.es	#	#	#
catnix.net	#	#	#
espanix.net	#	#	#
uam.es	#	#	#

	Web	MX	NS
telefonica.es	#	#	#
ono.es	#	#	#
upm.es	#	#	#
uc3m.es	#	#	#
consulintel.es	*	#	*

...and some more good ole friends

	Web	MX	NS
red.es	#	#	*
rediris.es	#	#	*
<u>mcyt.es</u>	#	?	#
cesca.es	#	#	#
catnix.net	#	#	#
espanix.net	#	#	#
uam.es	#	#	#

	Web	MX	NS
telefonica.es	#	#	#
ono.es	#	#	#
upm.es	#	#	#
uc3m.es	#	#	#
consulintel.es	*	#	*
tecnocom.es	#	#	#

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	Web	MX	NS
red.es	#	#	*
rediris.es	#	#	*
<u>mcyt.es</u>	#	?	#
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catnix.net	#	#	#
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uam.es	#	#	#

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telefonica.es	#	#	#
ono.es	#	#	#
upm.es	#	#	#
uc3m.es	#	#	#
consulintel.es	*	#	*
tecnocom.es	#	#	#
bondis.org	#	#	#



DNS Hierarchy

Root servers

- 7 root servers operating in IPv6
- They're in the hints file distributed by internic (finally!!!)
- <http://www.internic.net/zones/named.root>

TLD DNS servers



TLD DNS servers

of DNS servers
No IPv6 DNS servers
1 IPv6 DNS servers
2 IPv6 DNS servers
3 IPv6 DNS servers
4 IPv6 DNS servers
5 IPv6 DNS servers
6 IPv6 DNS servers
7 IPv6 DNS servers
8 IPv6 DNS servers

Tecnocom



TLD DNS servers

# of DNS servers	RIPE 53
No IPv6 DNS servers	97
1 IPv6 DNS servers	72
2 IPv6 DNS servers	51
3 IPv6 DNS servers	27
4 IPv6 DNS servers	17
5 IPv6 DNS servers	-
6 IPv6 DNS servers	-
7 IPv6 DNS servers	-
8 IPv6 DNS servers	-

TLD DNS servers

# of DNS servers	RIPE 53	RIPE 54
No IPv6 DNS servers	97	96
1 IPv6 DNS servers	72	75
2 IPv6 DNS servers	51	51
3 IPv6 DNS servers	27	31
4 IPv6 DNS servers	17	16
5 IPv6 DNS servers	-	-
6 IPv6 DNS servers	-	-
7 IPv6 DNS servers	-	-
8 IPv6 DNS servers	-	-

TLD DNS servers

# of DNS servers	RIPE 53	RIPE 54	RIPE 55
No IPv6 DNS servers	97	96	109
1 IPv6 DNS servers	72	75	69
2 IPv6 DNS servers	51	51	55
3 IPv6 DNS servers	27	31	30
4 IPv6 DNS servers	17	16	16
5 IPv6 DNS servers	-	-	2
6 IPv6 DNS servers	-	-	-
7 IPv6 DNS servers	-	-	-
8 IPv6 DNS servers	-	-	-

TLD DNS servers

# of DNS servers	RIPE 53	RIPE 54	RIPE 55	RIPE 56
No IPv6 DNS servers	97	96	109	92
1 IPv6 DNS servers	72	75	69	61
2 IPv6 DNS servers	51	51	55	64
3 IPv6 DNS servers	27	31	30	42
4 IPv6 DNS servers	17	16	16	10
5 IPv6 DNS servers	-	-	2	6
6 IPv6 DNS servers	-	-	-	6
7 IPv6 DNS servers	-	-	-	-
8 IPv6 DNS servers	-	-	-	-

TLD DNS servers

# of DNS servers	RIPE 53	RIPE 54	RIPE 55	RIPE 56	RIPE 59
No IPv6 DNS servers	97	96	109	92	64
1 IPv6 DNS servers	72	75	69	61	54
2 IPv6 DNS servers	51	51	55	64	65
3 IPv6 DNS servers	27	31	30	42	37
4 IPv6 DNS servers	17	16	16	10	22
5 IPv6 DNS servers	-	-	2	6	6
6 IPv6 DNS servers	-	-	-	6	17
7 IPv6 DNS servers	-	-	-	-	8
8 IPv6 DNS servers	-	-	-	-	1



gTLD DNS Servers



gTLD DNS Servers

.int
.biz
.com
.info
.mobi
.org
.aero
.edu
.gov
.mil

gTLD DNS Servers

	RIPE 53
.int	2
.biz	2
.com	2
.info	2
.mobi	2
.org	3
.aero	1
.edu	0
.gov	0
.mil	0

gTLD DNS Servers

	RIPE 53	RIPE 54
.int	2	2
.biz	2	2
.com	2	2
.info	2	2
.mobi	2	2
.org	3	3
.aero	1	1
.edu	0	0
.gov	0	0
.mil	0	0

gTLD DNS Servers

	RIPE 53	RIPE 54	RIPE 55
.int	2	2	2
.biz	2	2	2
.com	2	2	2
.info	2	2	2
.mobi	2	2	2
.org	3	3	5
.aero	1	1	1
.edu	0	0	0
.gov	0	0	0
.mil	0	0	0

gTLD DNS Servers

	RIPE 53	RIPE 54	RIPE 55	RIPE 56
.int	2	2	2	2
.biz	2	2	2	2
.com	2	2	2	2
.info	2	2	2	6
.mobi	2	2	2	2
.org	3	3	5	5
.aero	1	1	1	1
.edu	0	0	0	0
.gov	0	0	0	0
.mil	0	0	0	0

gTLD DNS Servers

	RIPE 53	RIPE 54	RIPE 55	RIPE 56	RIPE 59
.int	2	2	2	2	2
.biz	2	2	2	2	2
.com	2	2	2	2	2
.info	2	2	2	6	6
.mobi	2	2	2	2	6
.org	3	3	5	5	6
.aero	1	1	1	1	8
.edu	0	0	0	0	1
.gov	0	0	0	0	0
.mil	0	0	0	0	0

RIPE support of DNS

- Many TLD use RIPE IPv6 DNS servers as secondary
 - 72 TLD have one

Popular DNS servers

Popular DNS servers

- a0.cctld.afiliast.info: 9 TLDs

Popular DNS servers

- a0.cctld.afiliast-nst.info: 9 TLDs
- ns3.nic.fr: 7 TLDs

Popular DNS servers

- a0.cctld.afiliast.net: 9 TLDs
- ns3.nic.fr: 7 TLDs
- phloem.uoregon.edu: 8 TLDs

Popular DNS servers

- a0.cctld.afiliast.info: 9 TLDs
- ns3.nic.fr: 7 TLDs
- phloem.uoregon.edu: 8 TLDs
- ns-ext.isc.org: 17 TLDs

Popular DNS servers

- a0.cctld.afiliast-nst.info: 9 TLDs
- ns3.nic.fr: 7 TLDs
- phloem.uoregon.edu: 8 TLDs
- ns-ext.isc.org: 17 TLDs
- ns-ext.vix.com: 9 TLDs

Popular DNS servers

- a0.cctld.afiliast-nst.info: 9 TLDs
- ns3.nic.fr: 7 TLDs
- phloem.uoregon.edu: 8 TLDs
- ns-ext.isc.org: 17 TLDs
- ns-ext.vix.com: 9 TLDs
- sec3.apnic.net: 9 TLDs

Popular DNS servers

- a0.cctld.afiliast-nst.info: 9 TLDs
- ns3.nic.fr: 7 TLDs
- phloem.uoregon.edu: 8 TLDs
- ns-ext.isc.org: 17 TLDs
- ns-ext.vix.com: 9 TLDs
- sec3.apnic.net: 9 TLDs
- sns-pb.isc.org: 8 TLDs

Popular DNS servers

- a0.cctld.afiliast-nst.info: 9 TLDs
- ns3.nic.fr: 7 TLDs
- phloem.uoregon.edu: 8 TLDs
- ns-ext.isc.org: 17 TLDs
- ns-ext.vix.com: 9 TLDs
- sec3.apnic.net: 9 TLDs
- sns-pb.isc.org: 8 TLDs
- a&f&h&j&k&l&m.root-servers.net: 6 TLDs

Popular DNS servers

- a0.cctld.afiliast-nst.info: 9 TLDs
- ns3.nic.fr: 7 TLDs
- phloem.uoregon.edu: 8 TLDs
- ns-ext.isc.org: 17 TLDs
- ns-ext.vix.com: 9 TLDs
- sec3.apnic.net: 9 TLDs
- sns-pb.isc.org: 8 TLDs
- a&f&h&j&k&l&m.root-servers.net: 6 TLDs
- rip.psg.com: 14 TLDs

Popular DNS servers

- a0.cctld.afiliast-nst.info: 9 TLDs
- ns3.nic.fr: 7 TLDs
- phloem.uoregon.edu: 8 TLDs
- ns-ext.isc.org: 17 TLDs
- ns-ext.vix.com: 9 TLDs
- sec3.apnic.net: 9 TLDs
- sns-pb.isc.org: 8 TLDs
- a&f&h&j&k&l&m.root-servers.net: 6 TLDs
- rip.psg.com: 14 TLDs
- sunic.sunet.se: 20 TLDs

RIPE secondaries

- Curious case:

AD ns-ad.ripe.net. 172800 IN AAAA 2001:610:240::53:cc:12:6

AE ns-ae.ripe.net. 172800 IN AAAA 2001:610:240::53:cc:12:233

AF ns-af.ripe.net. 171953 IN AAAA 2001:610:240::53:cc:12:1

AL ns-al.ripe.net. 172800 IN AAAA 2001:610:240::53:cc:12:3

AM ns-am.ripe.net. 172800 IN AAAA 2001:610:240::53:cc:12:12

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AR ns-ar.ripe.NET. 172800 IN AAAA 2001:610:240::53:cc:12:11

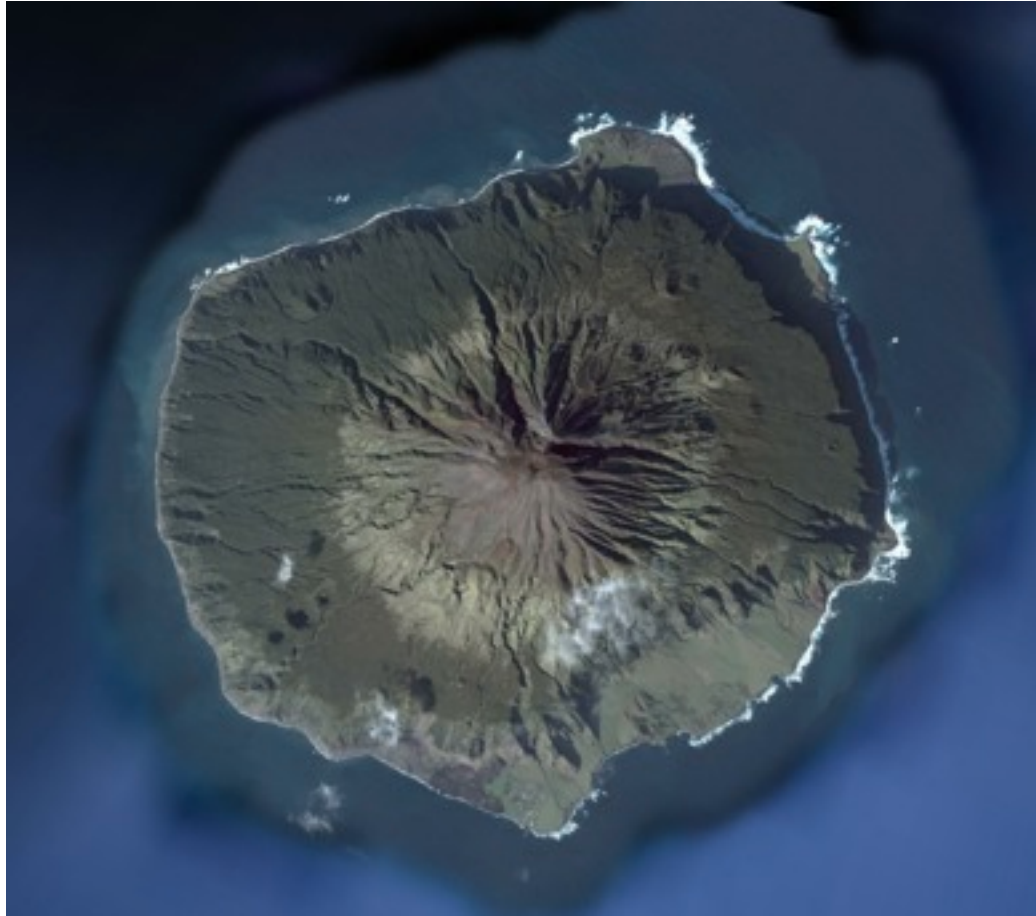
BA ns-ba.ripe.net. 172800 IN AAAA 2001:610:240::53:cc:12:28

What would be Internet Powered by IPv6 for my wife?

What would be Internet
Powered by IPv6 for my
wife?

Spanish?

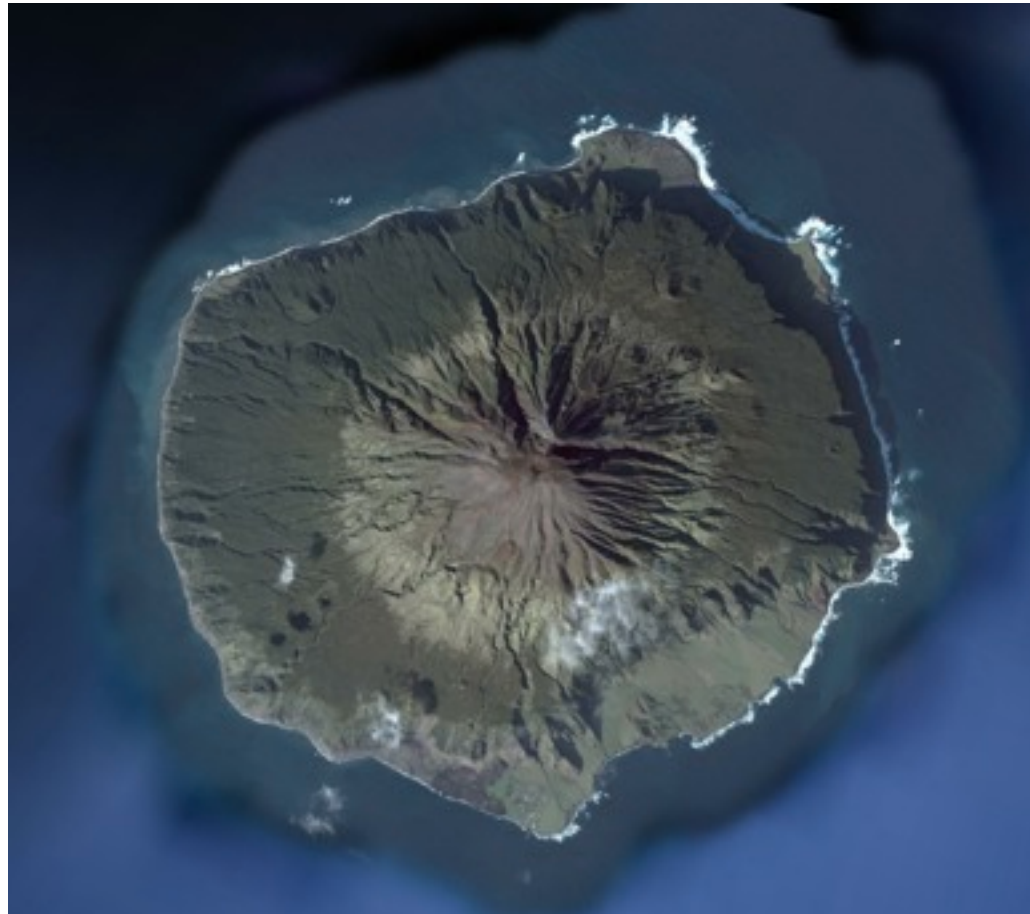
What would be Internet
Powered by IPv6 for my
wife?



Tecnocom



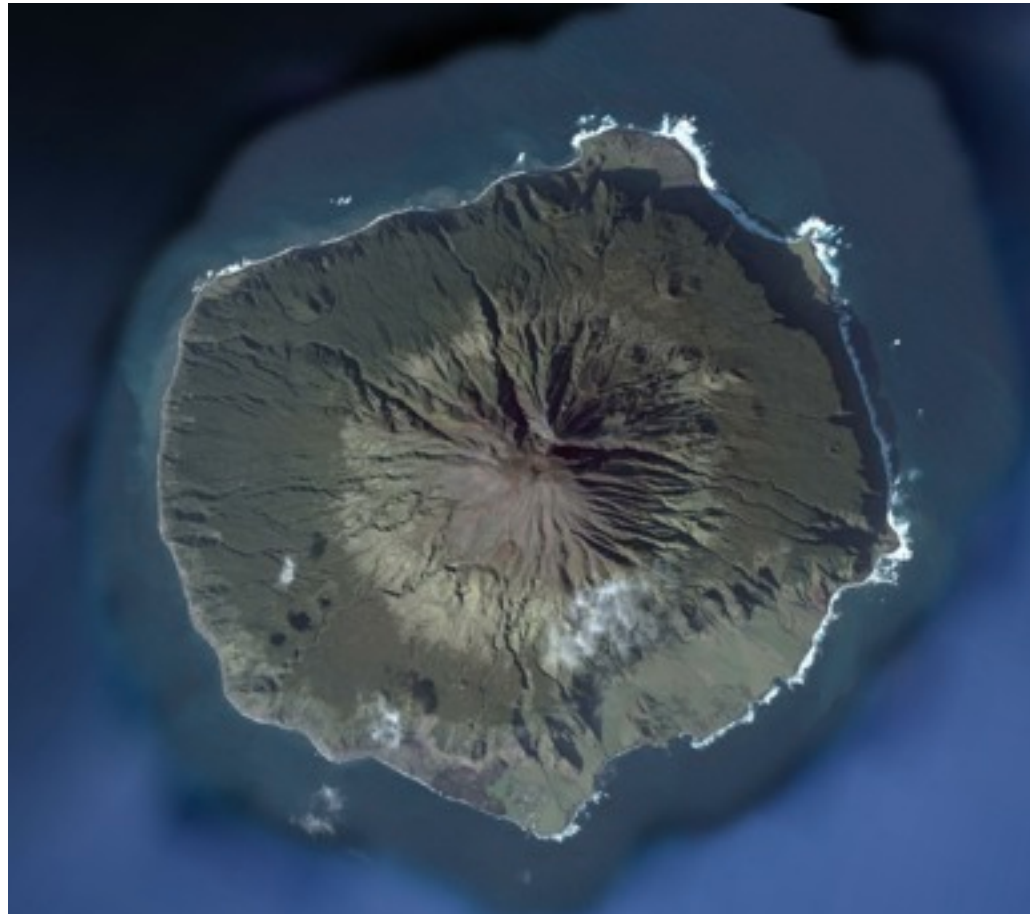
- Tristan da Cunha



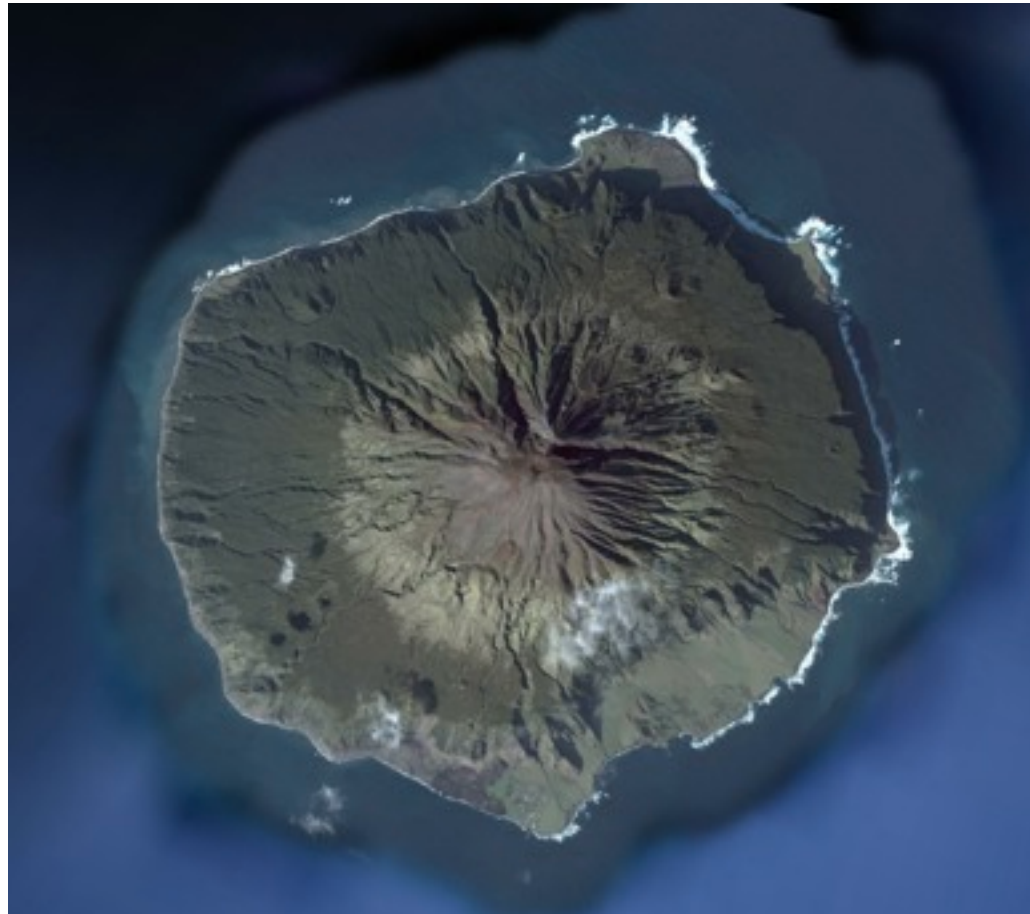
Tecnocom



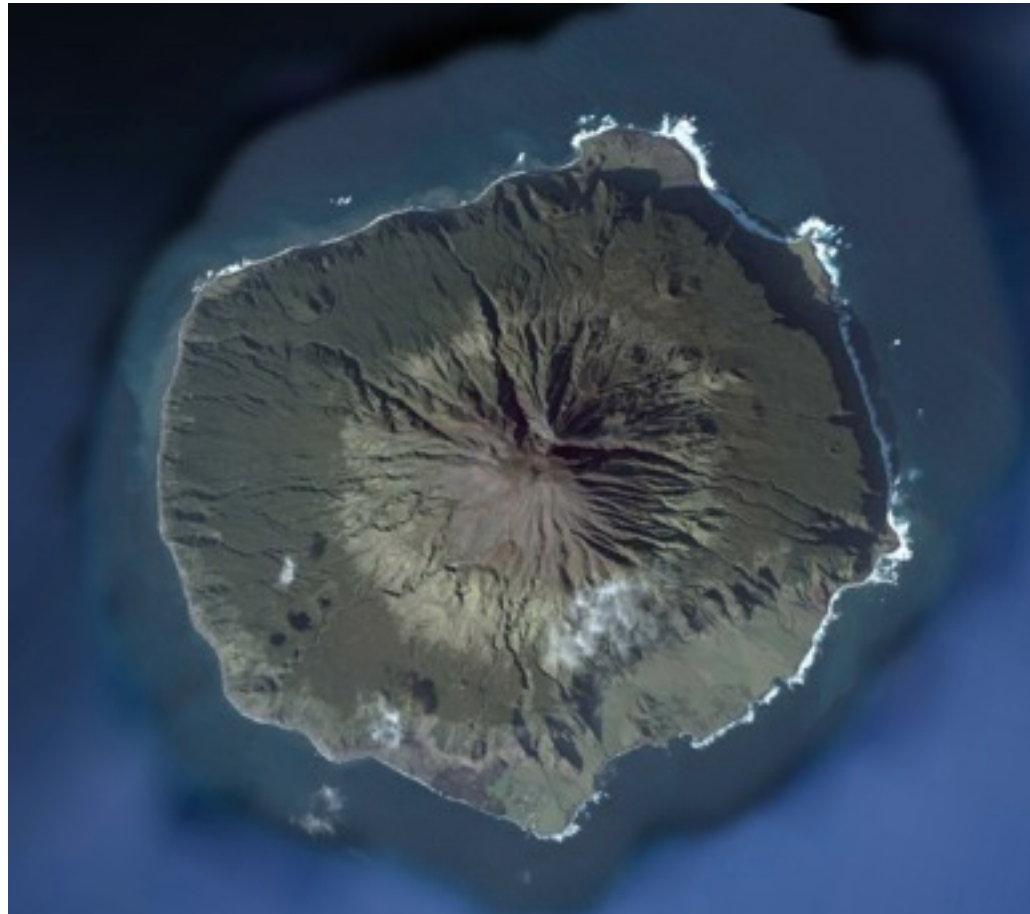
- Tristan da Cunha
- the most remote inhabited archipelago in the world



- Tristan da Cunha
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 - Population: 271



- Tristan da Cunha
 - the most remote inhabited archipelago in the world
 - Population: 271
 - Nearest civilization: 2.430 km

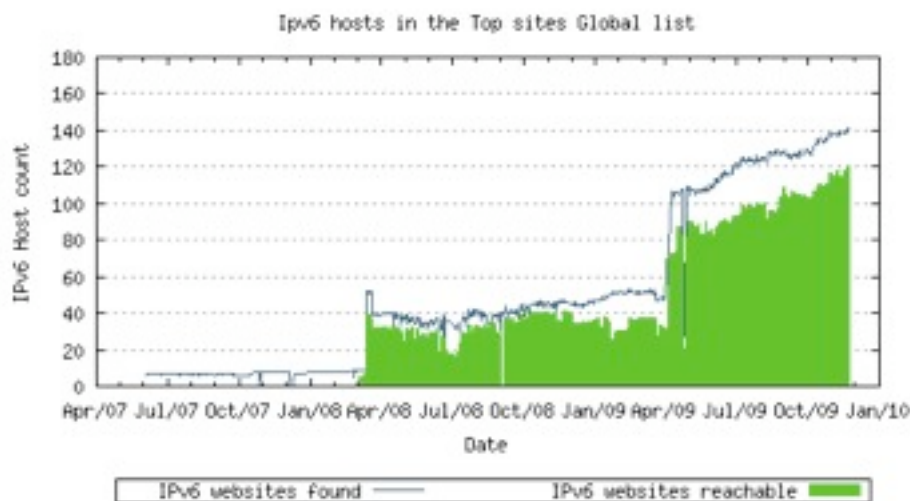


All this and many more in...

- Global data: http://plutarco.lab.bt.es/ipv6/global_results.html
- Country data: http://plutarco.lab.bt.es/html/ipv6/country_select.html

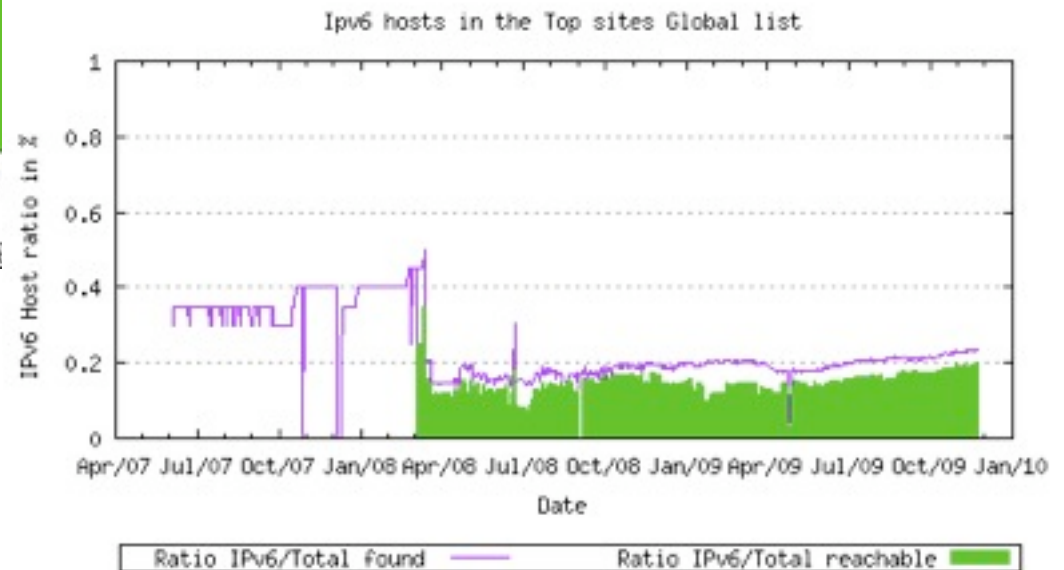
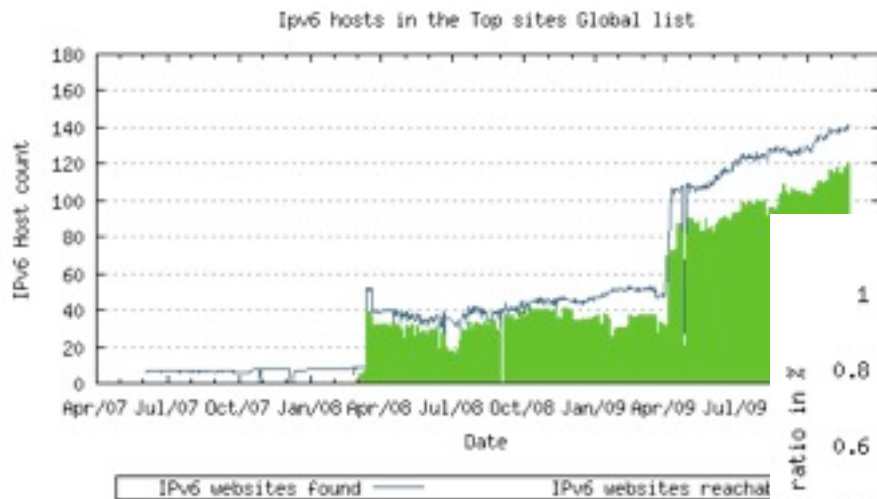
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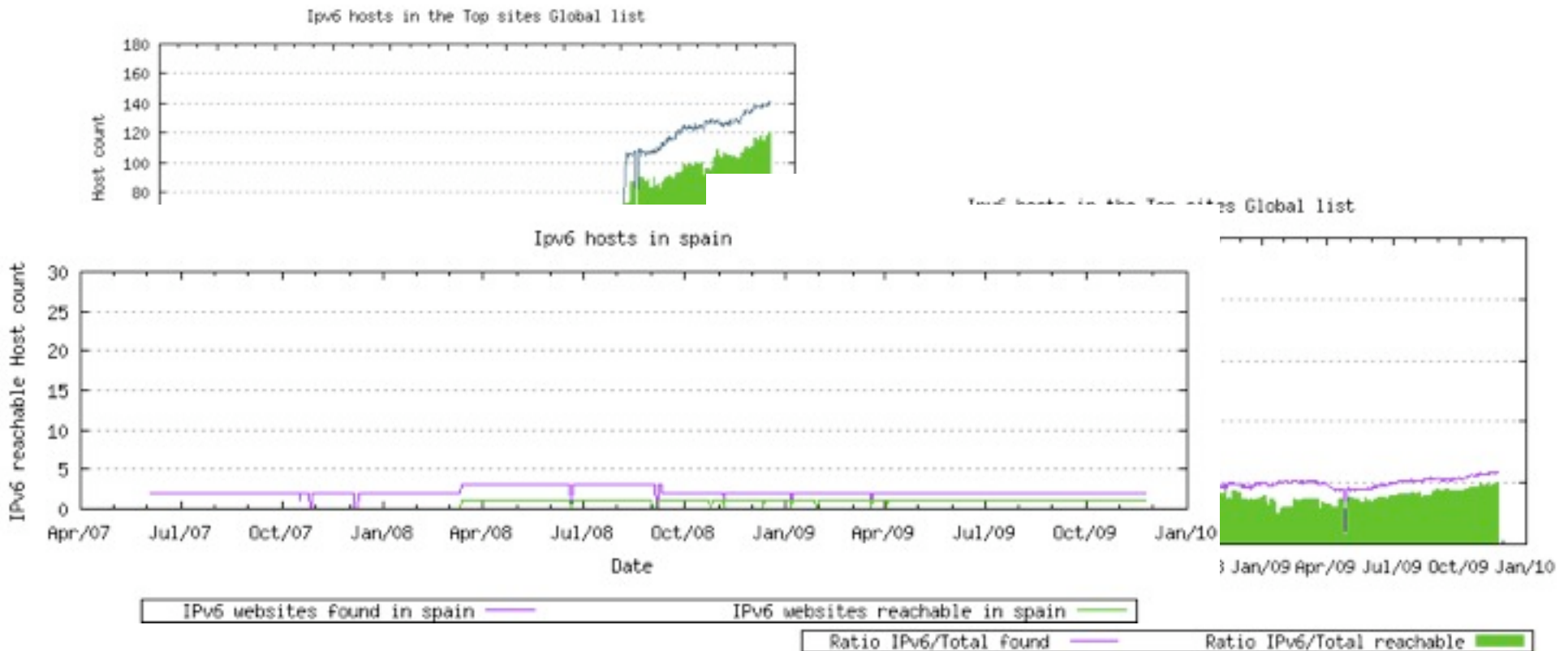
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Questions?

Suggestions & Corrections are welcome

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