



Cisco IPv6 Deployment Statics

Shishio Tsuchiya

shtsuchi@cisco.com

Measuring IPv6 adoption life cycle

<http://6lab.cisco.com/stats/>



- Measurement and Analysis are important for people who is considering deployment IPv6 in the network.
- What kind of information provide on Cisco IPv6 stat?

<http://6lab.cisco.com/stats/>



Home
World-scale data
Information

Select data type :
All
IPv6 Prefixes
Transit AS
Web Content
Users

いいね!

g+1

Tweet

Connecting through :




6lab.cisco.com @cisco6lab

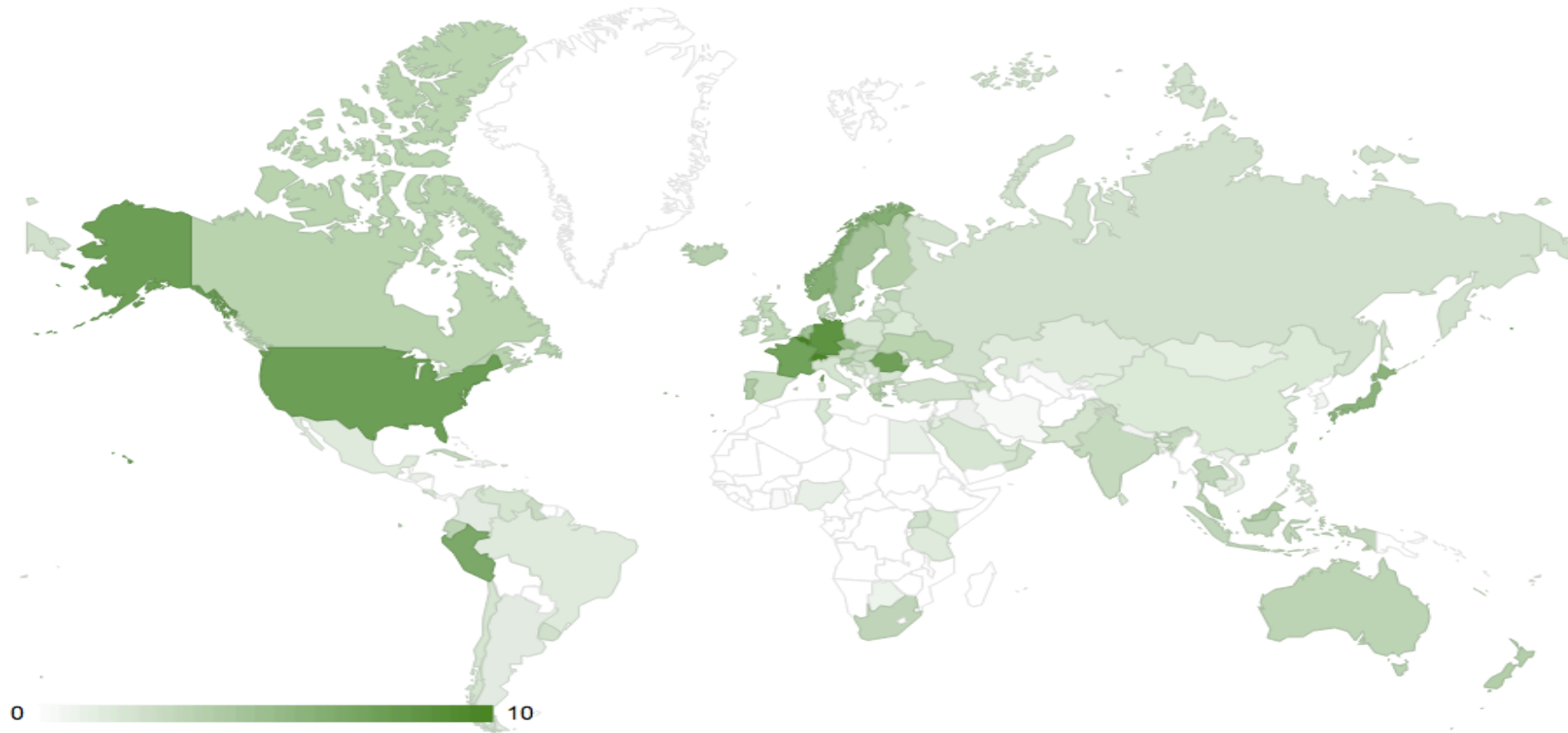
18 Feb

Expect a significant increase in global #IPv6 users over next weeks.

China is back from new year's vacation. see pic

pic.twitter.com/HPkchcEcvZ

Show Photo



[World](#) | [Africa](#) | [Asia](#) | [America](#) | [Europe](#) | [Oceania](#)

IPv6 adoption statics

- This web site presents metric of IPv6 adoption in country and global level.
- We used public existing data: *Whois DB of RIR, APNC Lab, Routeview, Alexa, Google, ITU and so on.*
- The overall map presents two IPv6 metric: deployment ratio and the relative deployment index.
- Color indicates relative deployment index of each of countries.
- Overall IPv6 ratio depends on IPv6 Transit AS/contents/user

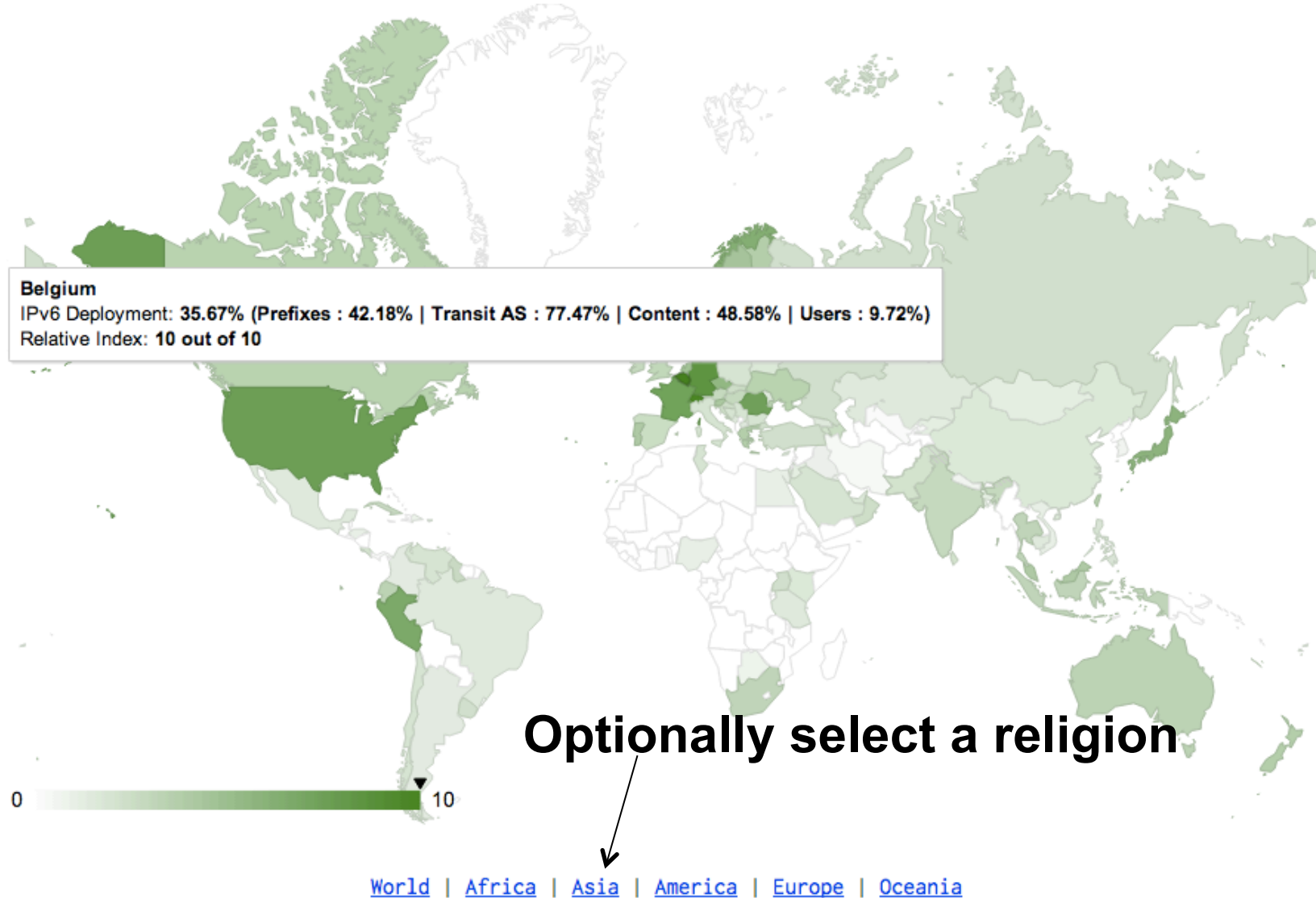
$$DeploymentRatio = \frac{\%TransitAS + 3 \times \sqrt{\%content \times \%user}}{4}$$

$$RelativeMean = \frac{1}{4} \frac{\%TransitAS}{\max_{world}(\%TransitAS)} + \frac{3}{4} \frac{\sqrt{\%content \times \%user}}{\max_{world}(\sqrt{\%content \times \%user})}$$

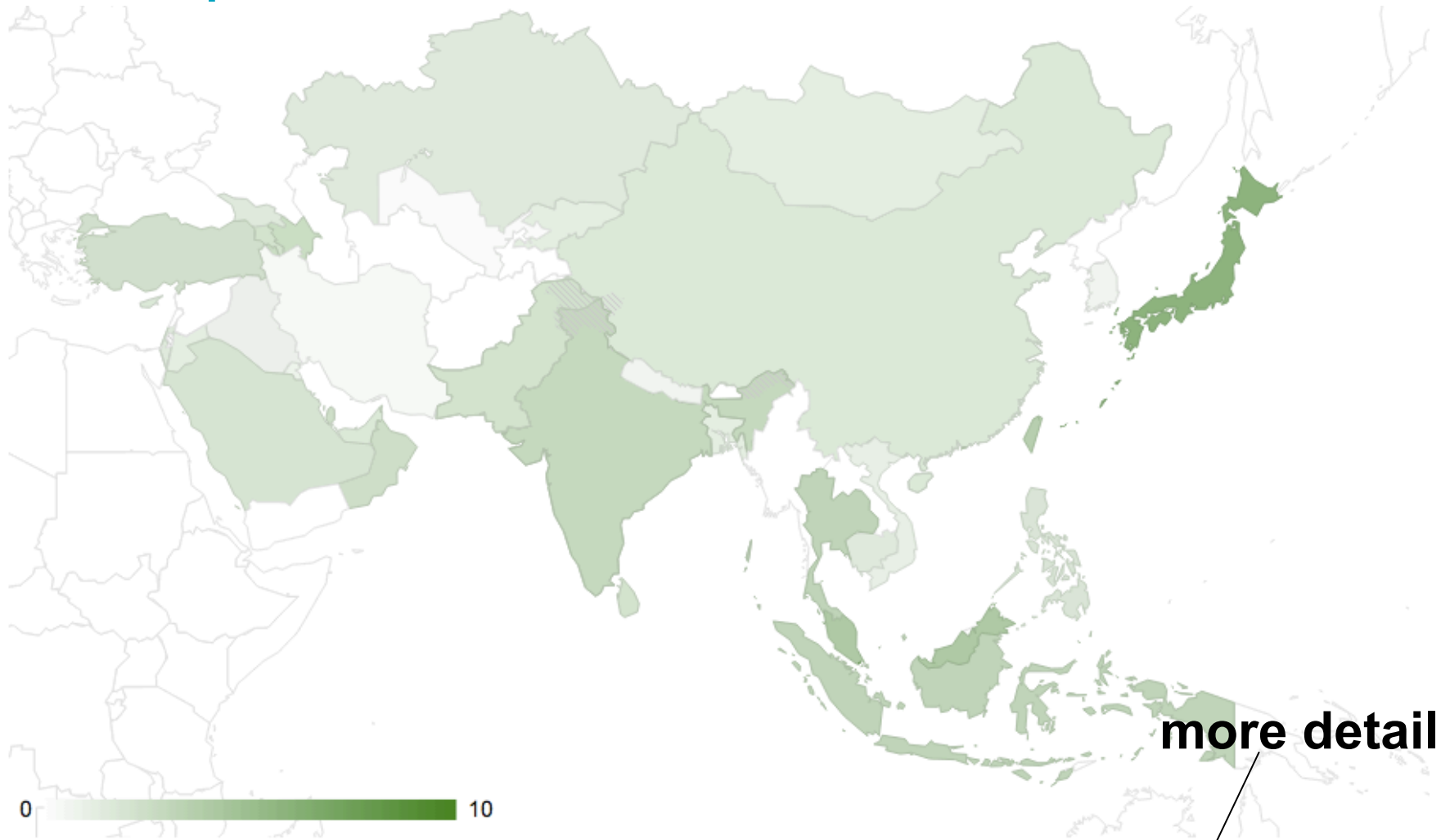
$$RelativeIndex = 10 \times \frac{RelativeMean}{\max_{world}(RelativeMean)}$$



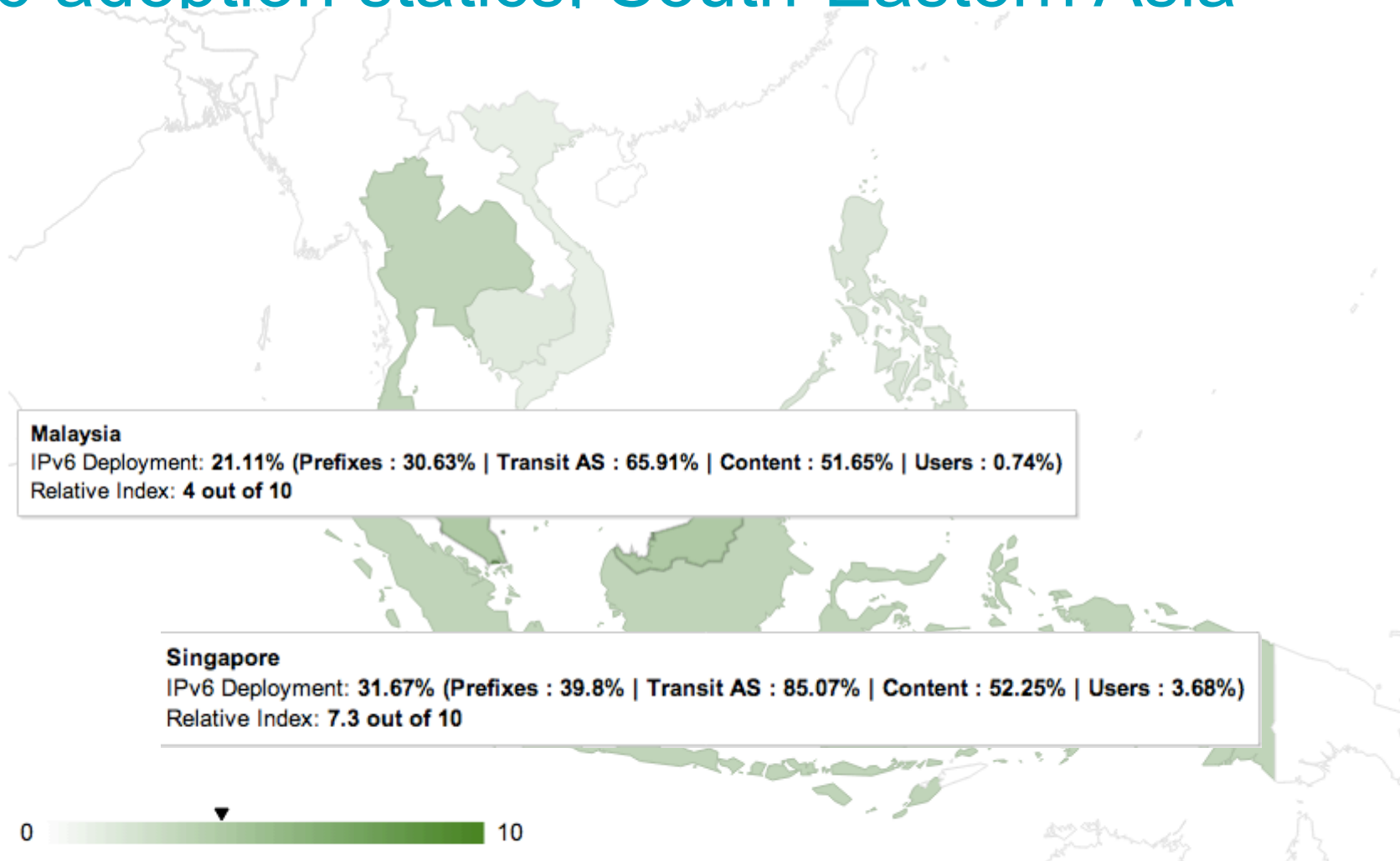
IPv6 adoption statics,at a glance



IPv6 adoption statics,Asia



IPv6 adoption statics. South-Eastern Asia



[World](#) | [Africa](#) | [Asia](#) | [America](#) | [Europe](#) | [Oceania](#)
[Western Asia](#) | [Central Asia](#) | [Eastern Asia](#) | [Southern Asia](#) | [South-Eastern Asia](#)

IPv6 adoption statics,all

United States of America

IPv6 Deployment: **27.28%** (Prefixes : 40.43% | Transit AS : 60.11% | Content : 44.85% | Users : 5.95%)
Relative Index: **7.6 out of 10**

Germany

IPv6 Deployment: **33.11%** (Prefixes : 53.54% | Transit AS : 80.72% | Content : 47.4% | Users : 6.27%)
Relative Index: **8.4 out of 10**

Belgium

IPv6 Deployment: **35.67%** (Prefixes : 42.18% | Transit AS : 77.47% | Content : 48.58% | Users : 9.72%)
Relative Index: **10 out of 10**

Japan

IPv6 Deployment: **27.37%** (Prefixes : 46.85% | Transit AS : 79.6% | Content : 28.31% | Users : 3.5%)
Relative Index: **5.7 out of 10**

Peru

IPv6 Deployment: **24.74%** (Prefixes : 21.43% | Transit AS : 55.19% | Content : 47.83% | Users : 4.45%)
Relative Index: **6.8 out of 10**

0 10

IPv6 adoption statics,home

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

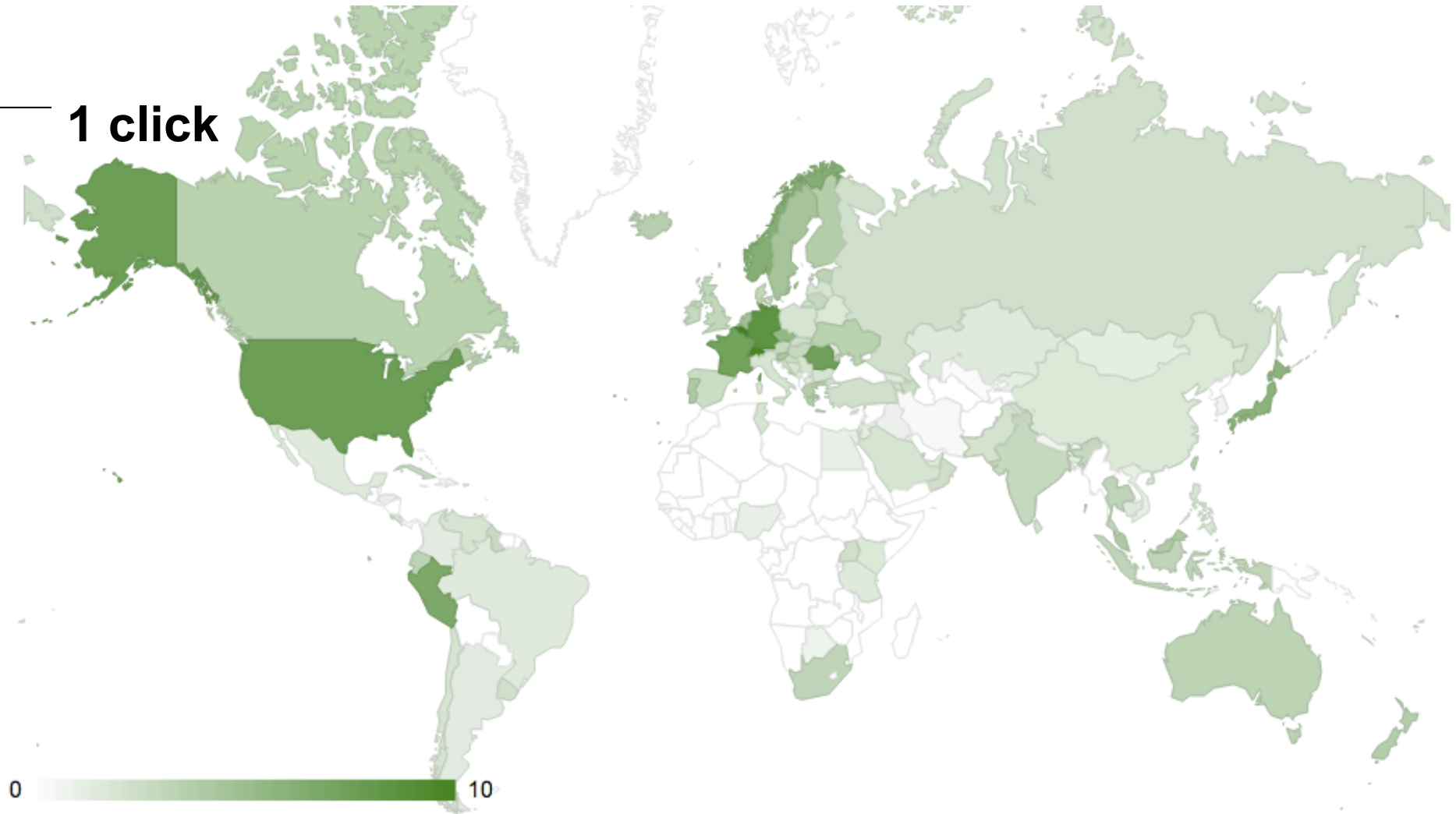
Users

✓ いいね! 1

g+1

Tweet

Connecting through :



IPv6 adoption statics,IPv6 prefixes

Information

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

Users

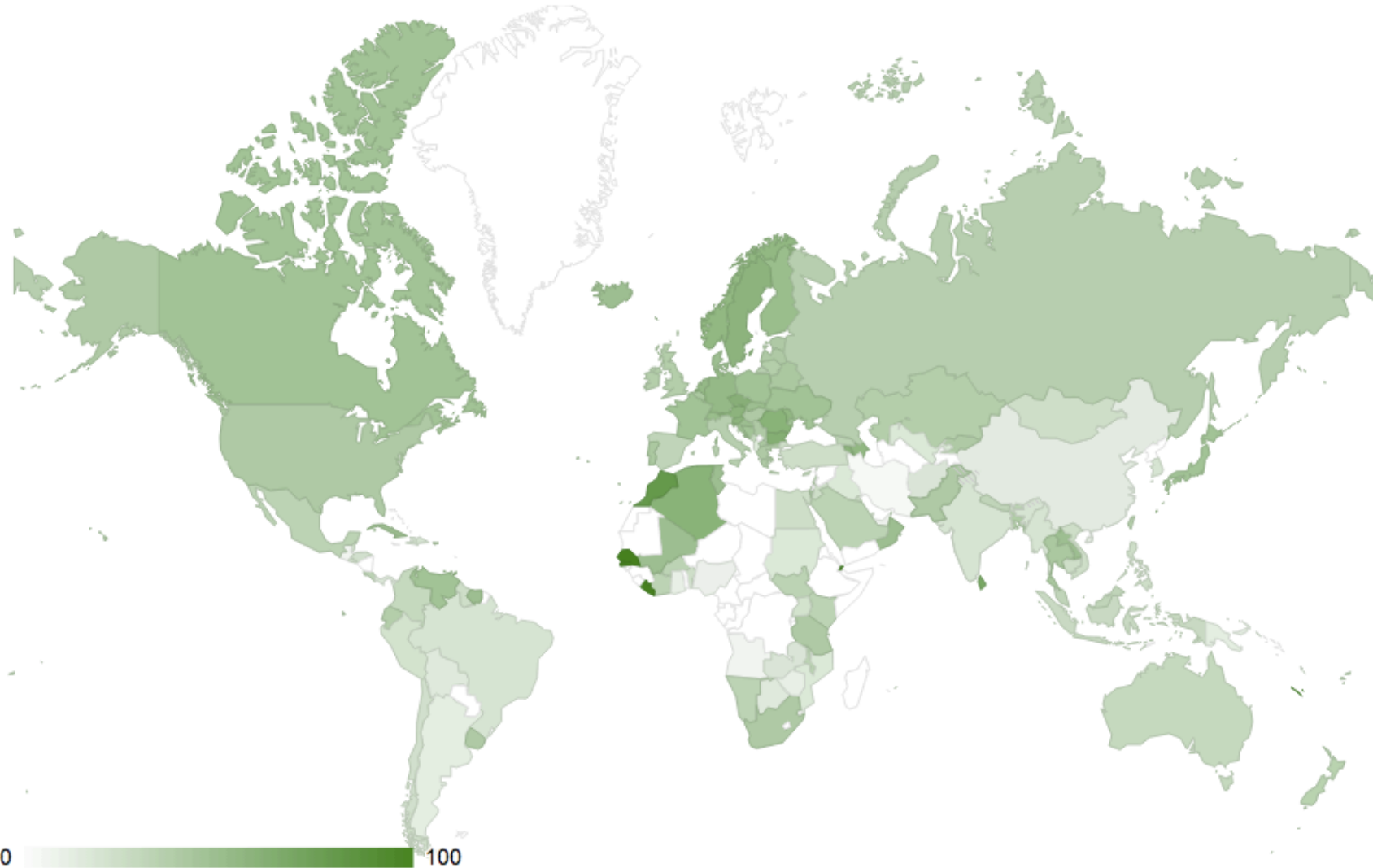
✓ いいね! 1

g+1

Tweet

Connecting through :

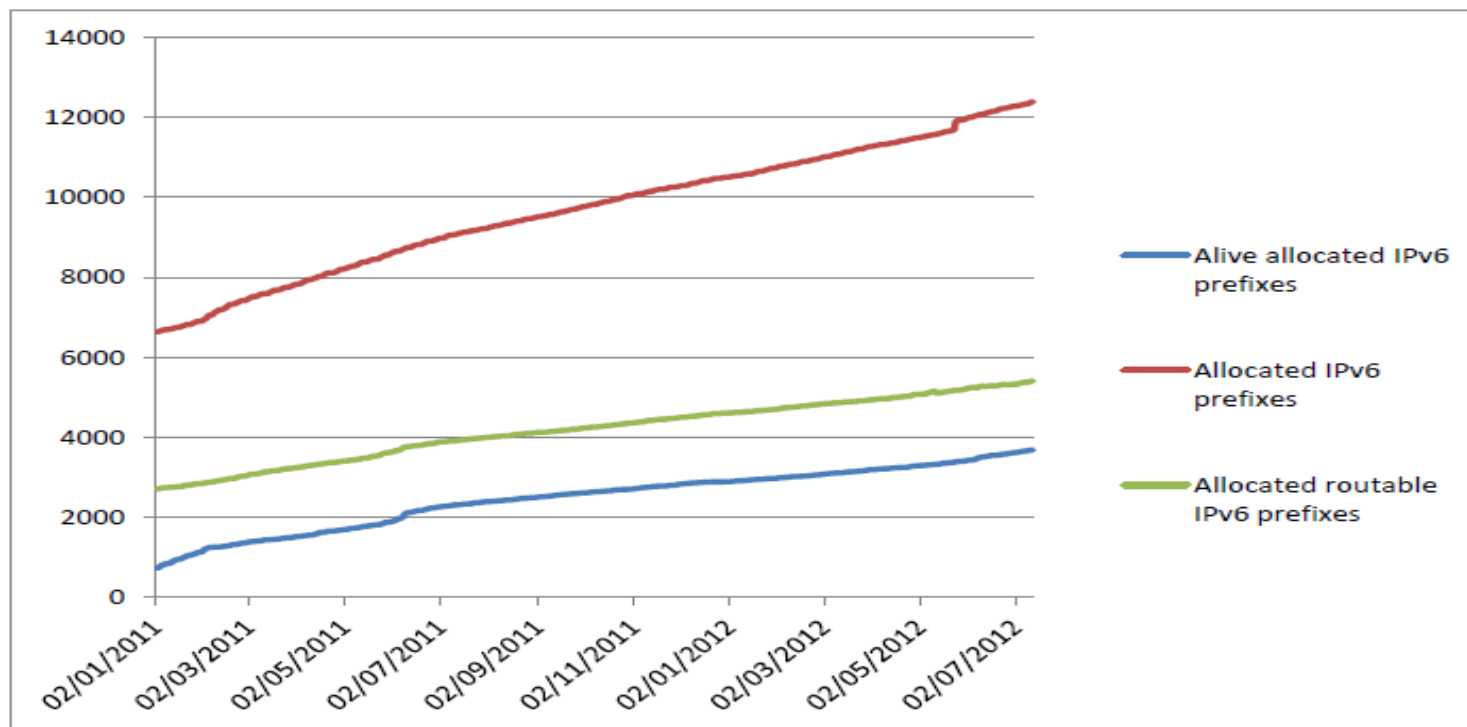
IPv6



IPv6 adoption statics,IPv6 prefixes

- When an entity plans to enable IPv6 on its network, the first step is to ask the **RIR** for an IPv6 prefix.
- The second step is to make this prefix reachable on the network, which means make an entry in **BGP** tables for this prefix: the prefix is then routable.
- If we've seen traffic from one of [APNIC labs](#), [Eric Vyncke](#) then we assume that the prefix is alive.
 - Color : Ratio of allocated v6 prefixes that are routable to all allocated v6 prefixes
 - Indication : Ratio of allocated v6 prefixes to allocated v4 prefixes
 - Ratio of allocated IPv6 prefixes from which traffic has been seen to all allocated v6 prefixes

IPv6 adoption statics,IPv6 prefixes



Source: Eric Vyncke & Hugo Kaczmarek

- “Allocated” prefix from whois database of RIR
- “Routable” prefix from [route-views project](#)
- “Alive” prefix get by [Geoff Huston script](#)

IPv6 adoption statics,IPv6 prefixes

Information

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

Users

いいね! 1

g+1

Tweet

Connecting through :

IPv6

Germany
Ratio of routable IPv6 prefixes: **53.54%**
Ratio of allocated IPv6 prefixes / ratio of alive allocated IPv6 prefixes: **17.9% / 24.72%**

Belgium
Ratio of routable IPv6 prefixes: **42.18%**
Ratio of allocated IPv6 prefixes / ratio of alive allocated IPv6 prefixes: **22.04% / 29.93%**

United States of America
Ratio of routable IPv6 prefixes: **40.43%**
Ratio of allocated IPv6 prefixes / ratio of alive allocated IPv6 prefixes: **7.74% / 36.64%**

Japan
Ratio of routable IPv6 prefixes: **46.85%**
Ratio of allocated IPv6 prefixes / ratio of alive allocated IPv6 prefixes: **15.19% / 30.37%**

Peru
Ratio of routable IPv6 prefixes: **21.43%**
Ratio of allocated IPv6 prefixes / ratio of alive allocated IPv6 prefixes: **23.93% / 14.29%**

0 100

IPv6 adoption statics,IPv6 prefixes

Information

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

Users

✓ いいね! 1

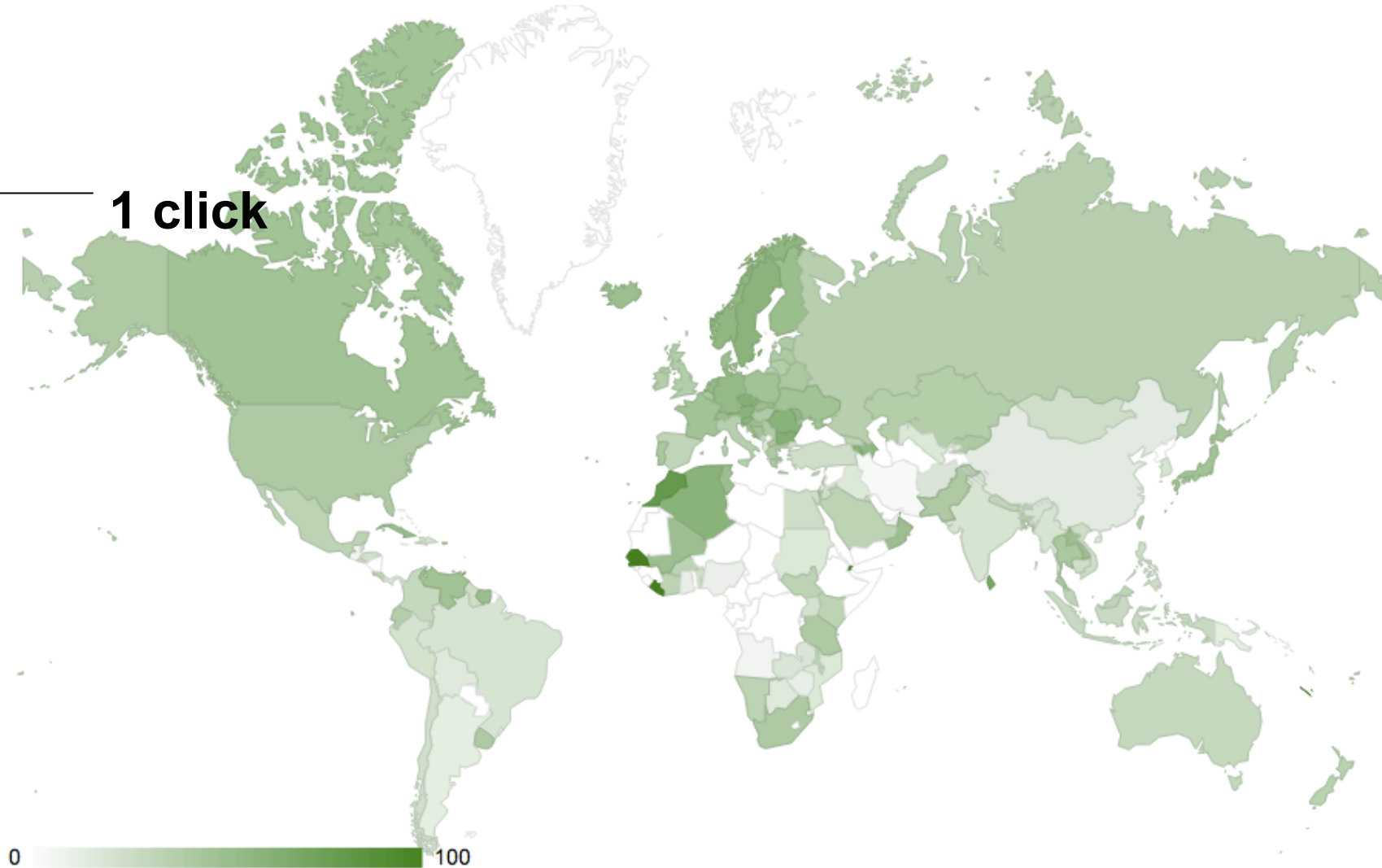
g+1

Tweet

Connecting through :

IPv6

1 click



IPv6 adoption statics, Transit AS

World-scale data

Information

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

Users

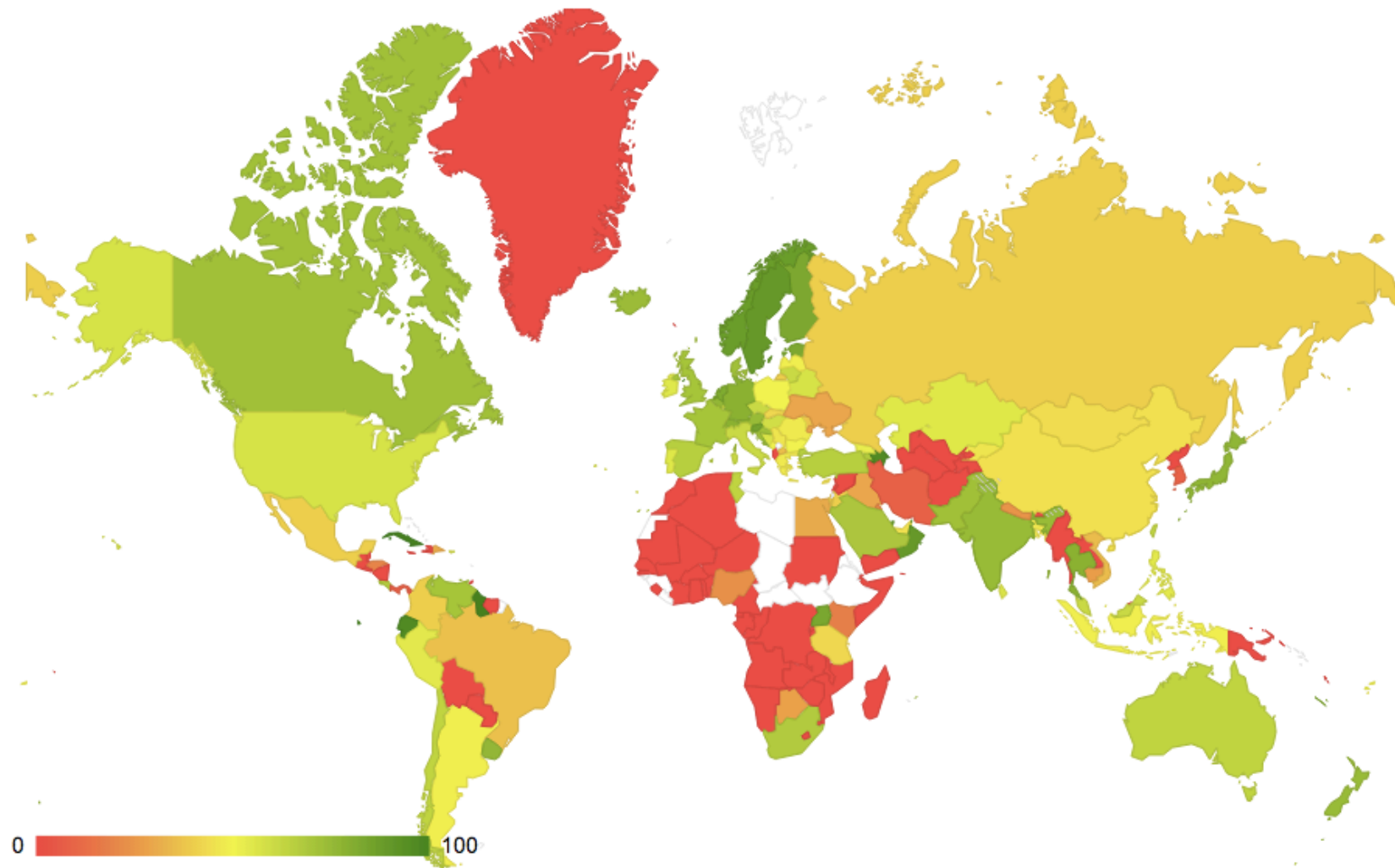
✓ いいね! 1

g+1

Tweet

Connecting through :

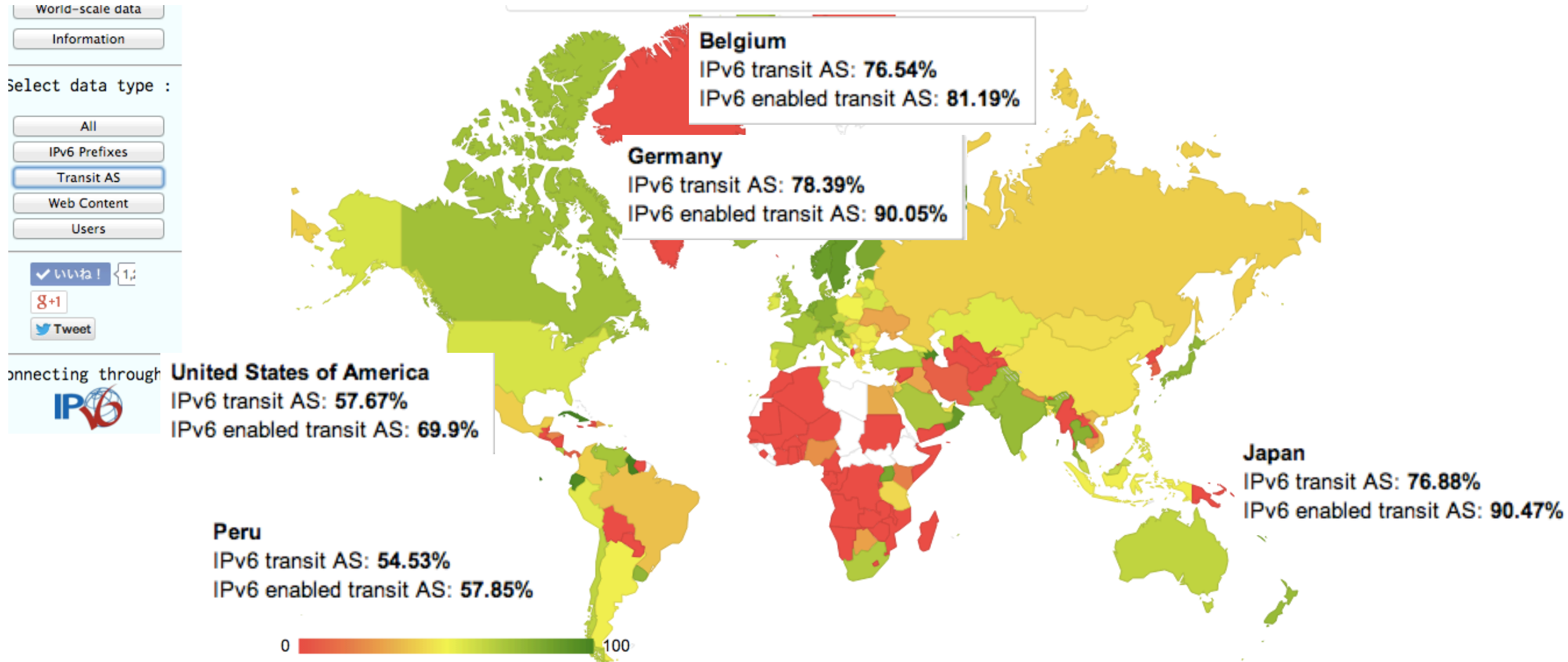
IPv6



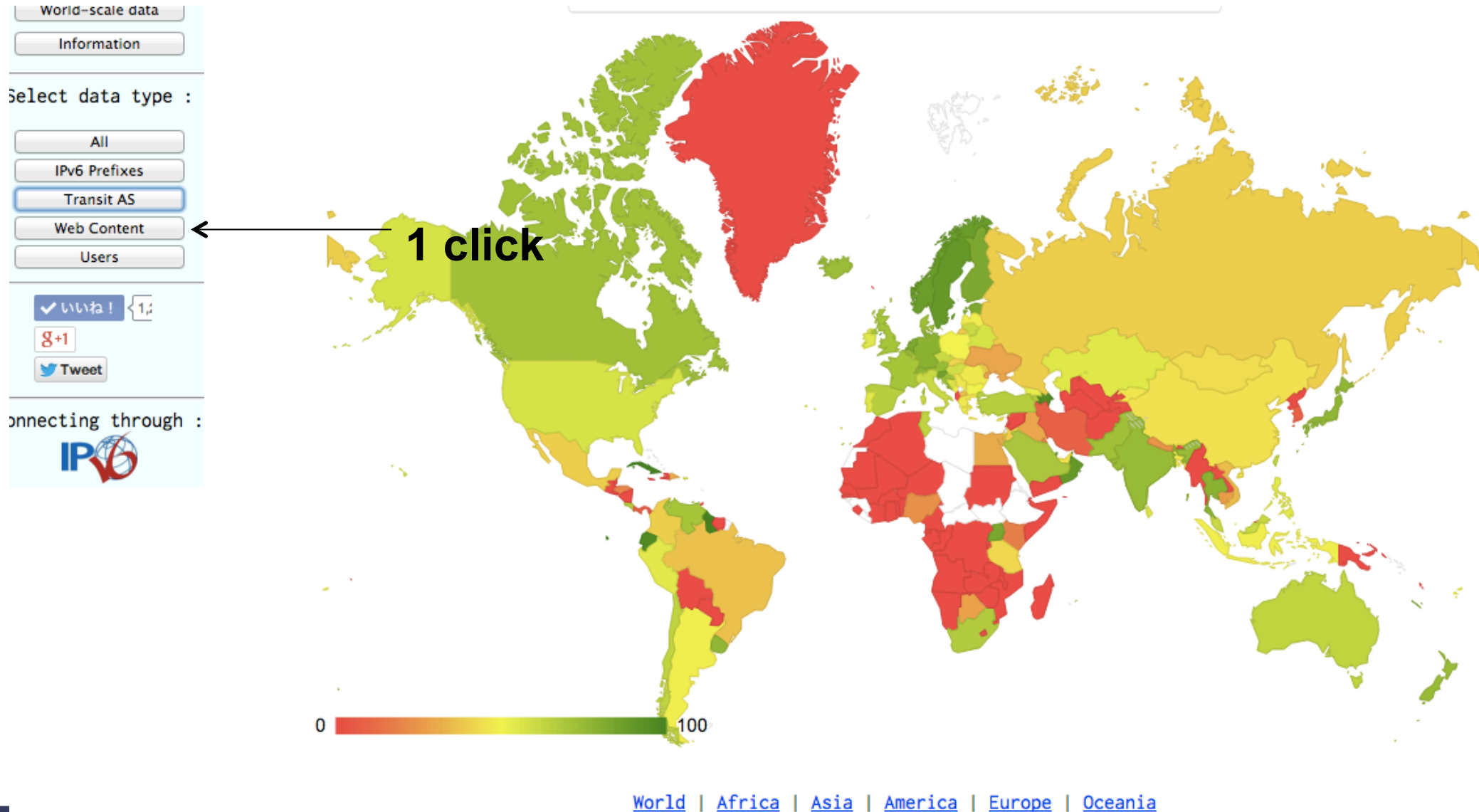
IPv6 adoption statics, Transit AS

- To measure the level of IPv6 readiness of the core of the internet, one good way is to analyze the BGP routing table and measure the IPv6 enablement of Transit ASs.
 - Color : Weighted ratio of AS that are Transit V6 to AS that are transit V4 (IPv6 Transit AS).
 - Indication : Weighted ratio of transit AS V4 that are V6 enabled to transit AS V4 (IPv6 enabled Transit AS).
- IPv6 Transit AS:an AS that is Transit on both IPv6 and IPv4.
- IPv6 enabled Transit AS:an AS that is transit on IPv4 network and has an IPv6 prefix

IPv6 adoption statics, Transit AS



IPv6 adoption statics, Transit AS



IPv6 adoption statics, web contents

Information

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

Users

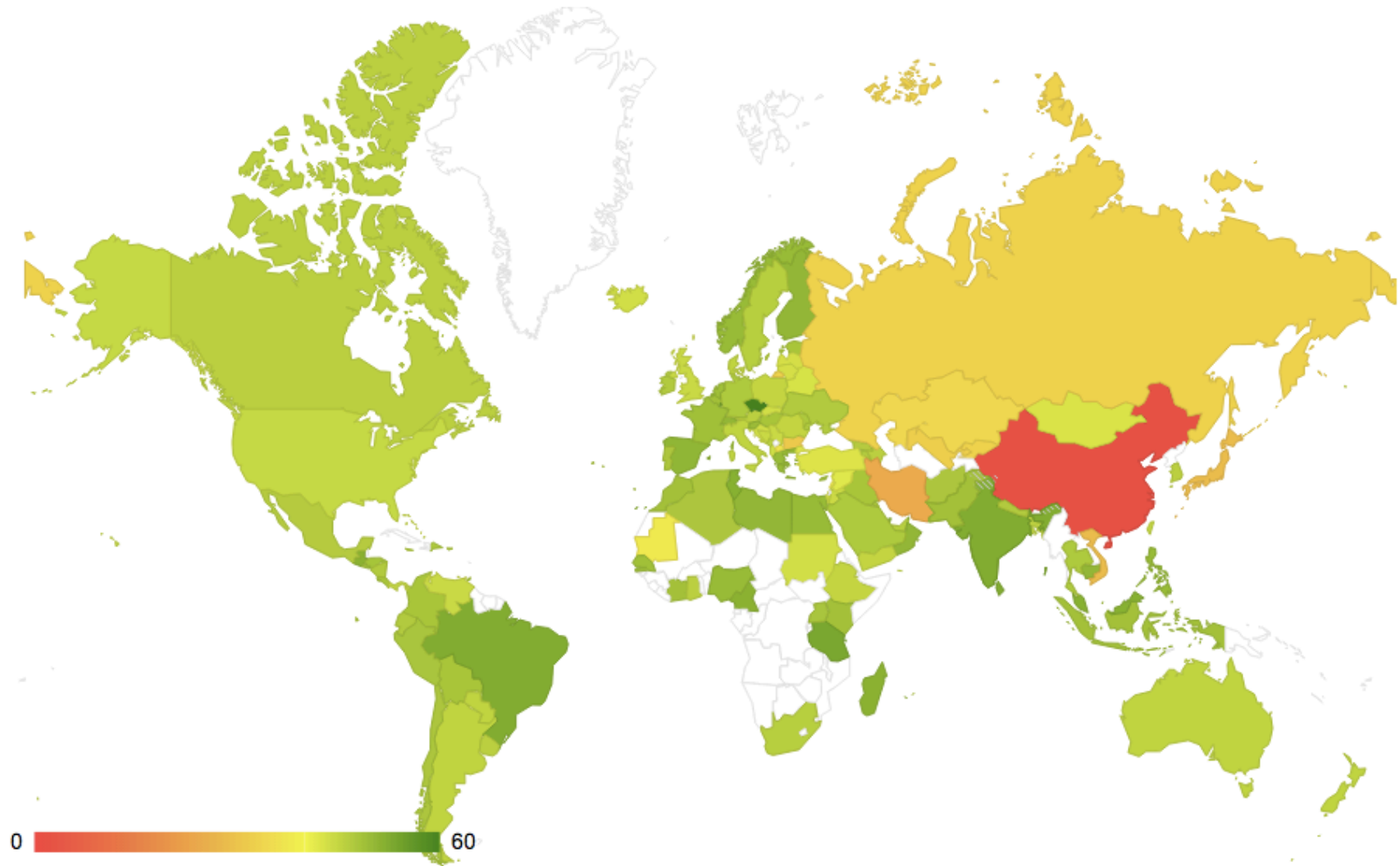
✓ いいね! 1,4

g+1

Tweet

connecting through :

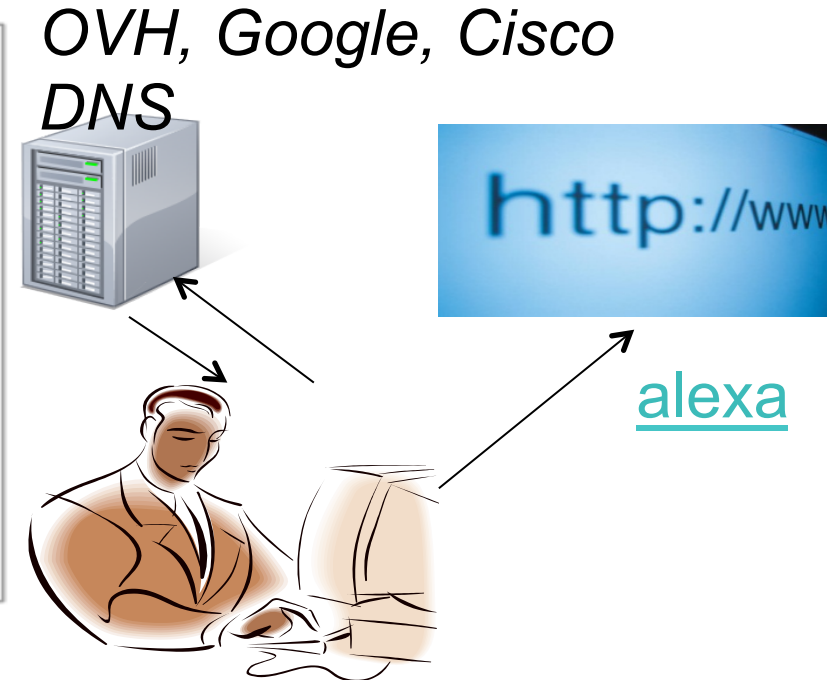
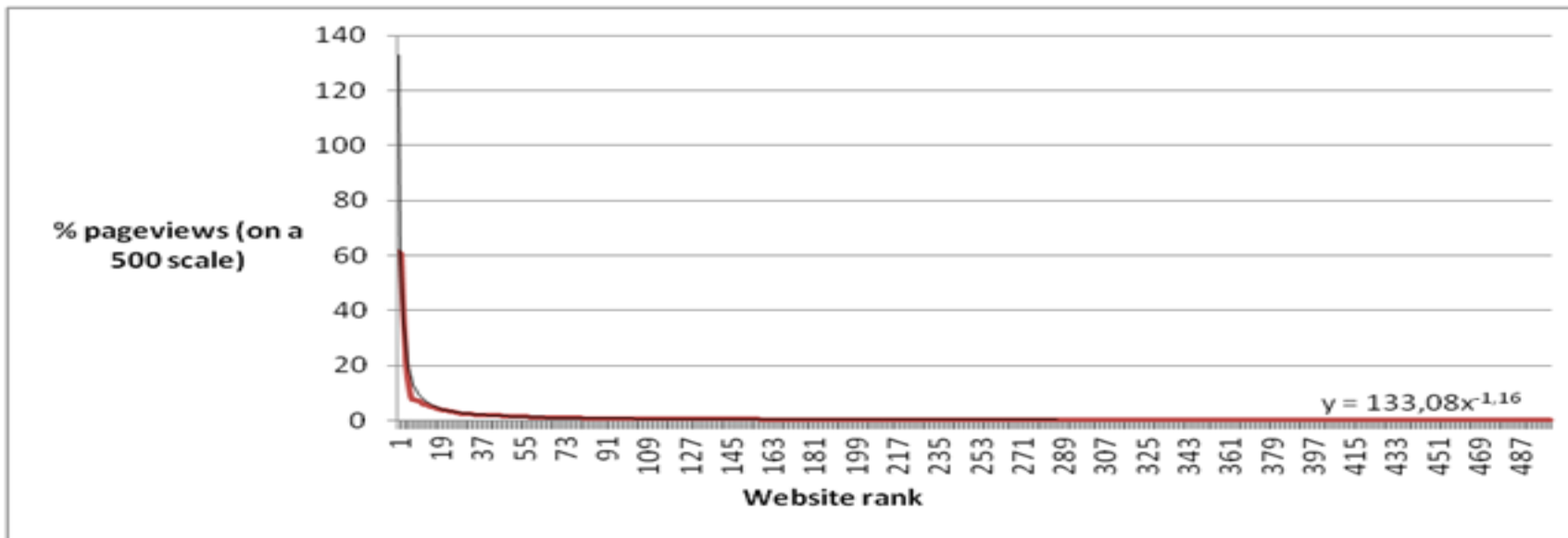
IPv6



IPv6 adoption statics,web contents

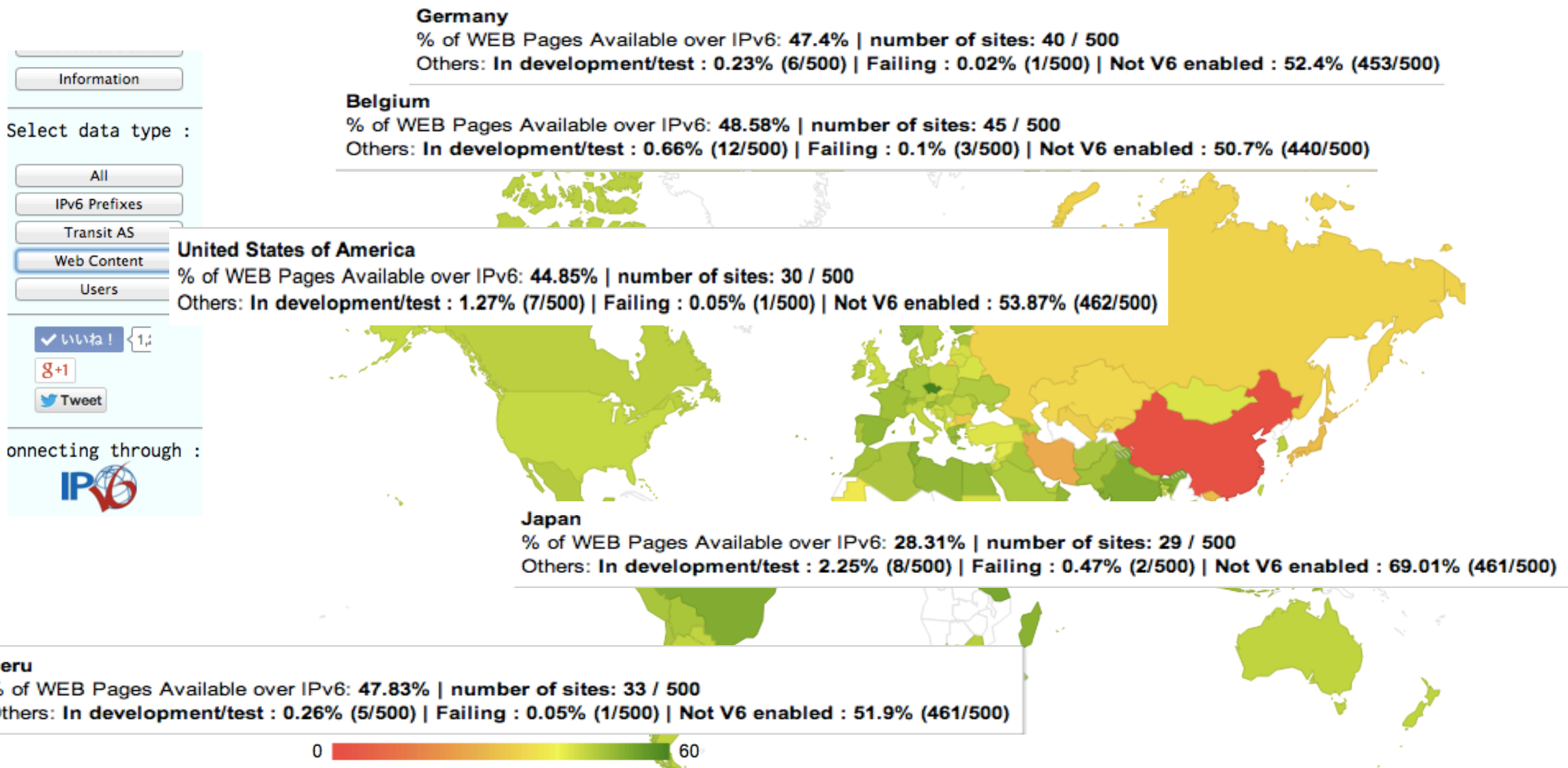
- [Alexa](#) ranks websites by pageviews and unique users per country.
- AAAA request is made to DNS servers for the exact domain name and also possible test names such as **www6**.mydomain.mytld or **ipv6**.mydomain.mytld.
 - Color : Weighted ratio of IPv6 enabled websites
 - Indication : Weighted ratio of IPv6:
 - in test : test domain name working in IPv6
 - failing : AAAA record exists but webpage not working in IPv6
 - other : not IPv6 enabled websites

IPv6 adoption statics,web contents



- The weight is calculated by the formula.
- $\sum((\text{computed weight for rank}) * (\text{IPv6 enabled WEB sites})) = \% \text{ of Web pages reachable over IPv6}$

IPv6 adoption statics, web contents



IPv6 adoption statics, web contents

Information

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

Users

✓ いいね! 1

g+1

Tweet

connecting through :

IPv6

1 click

0 60

IPv6 adoption statics ,users

World-scale data

Information

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

Users

MAX : 9.72

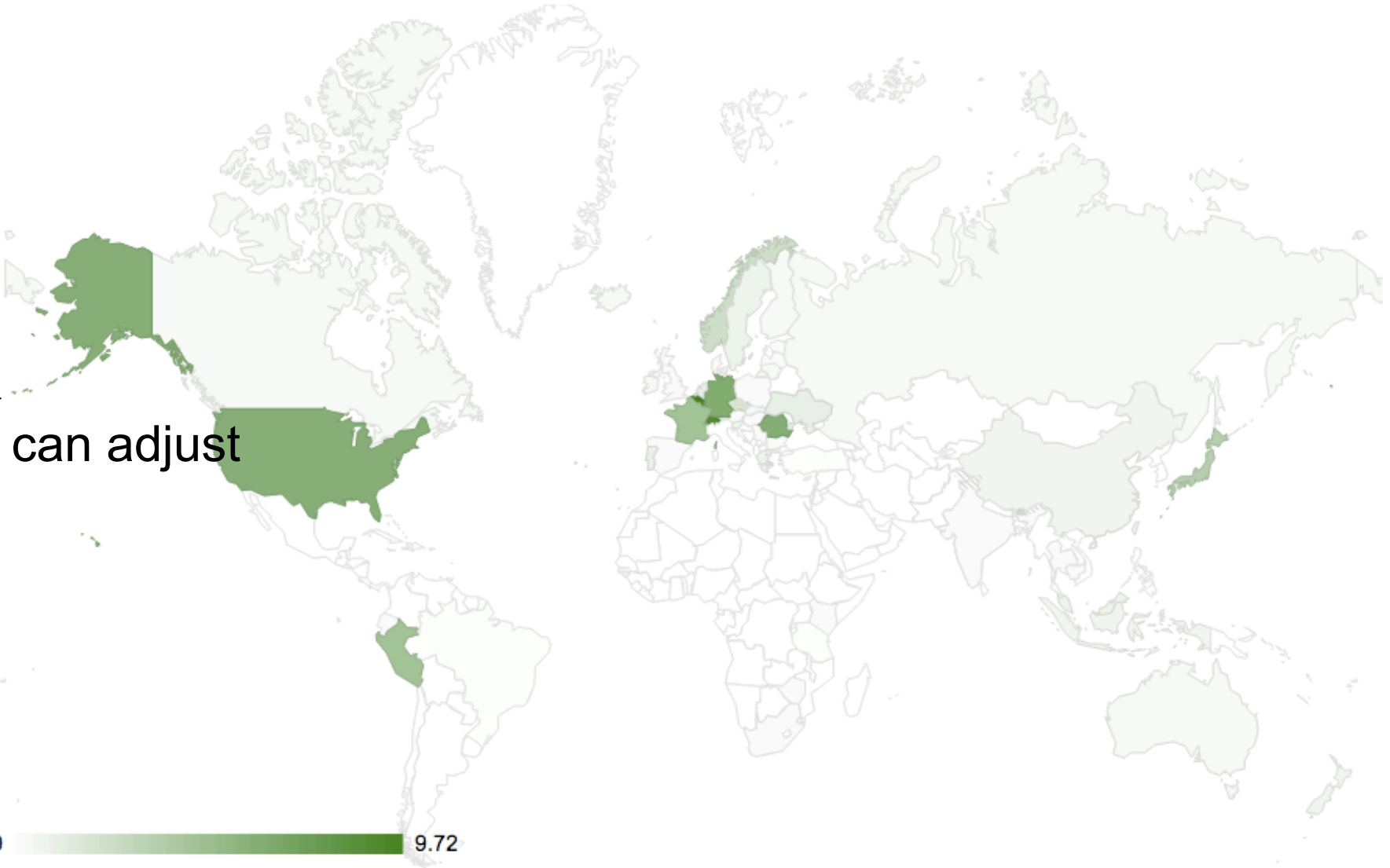
✓ いいね! 1

g+1

Tweet

Connecting through :

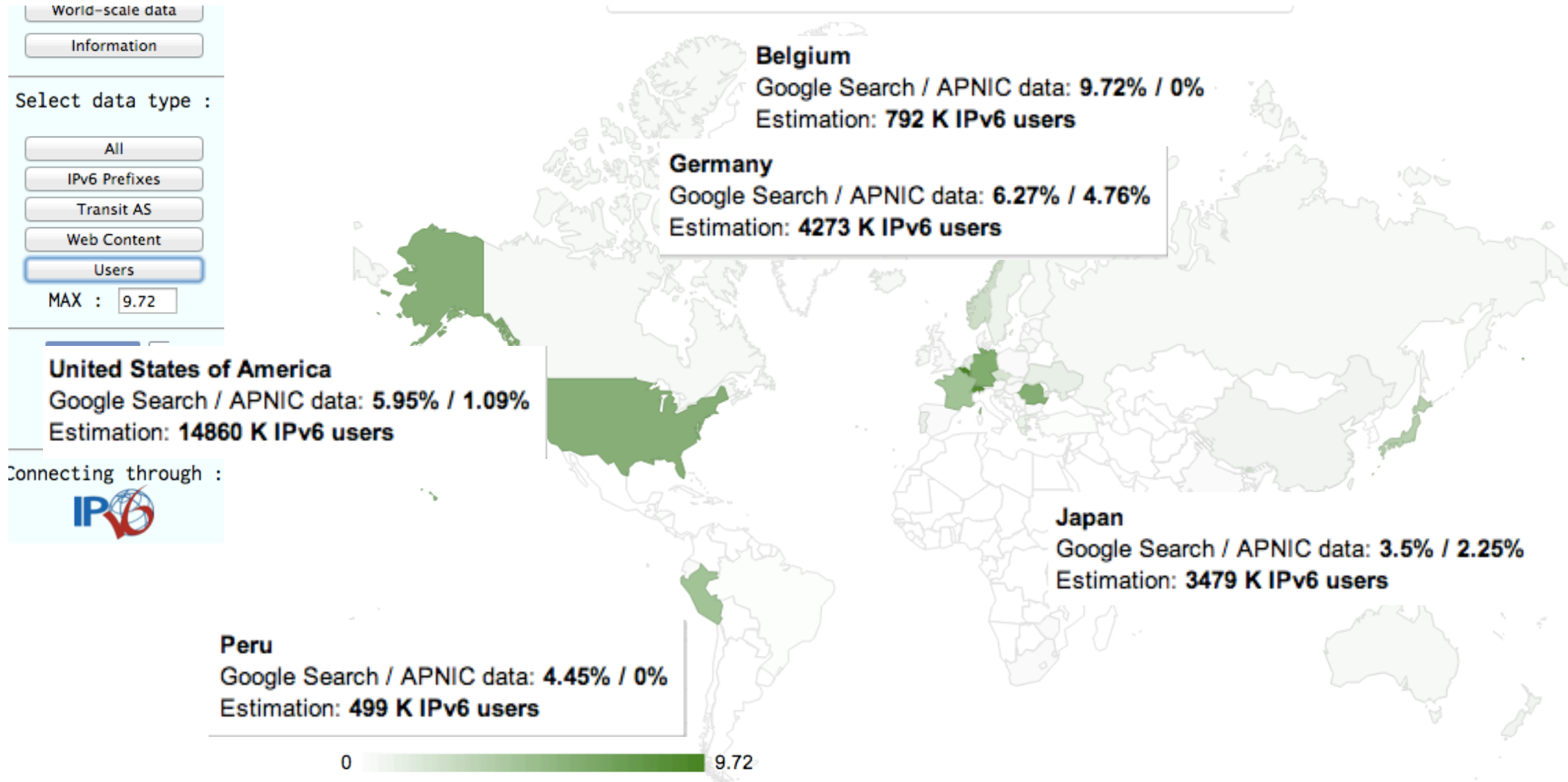
IPv6



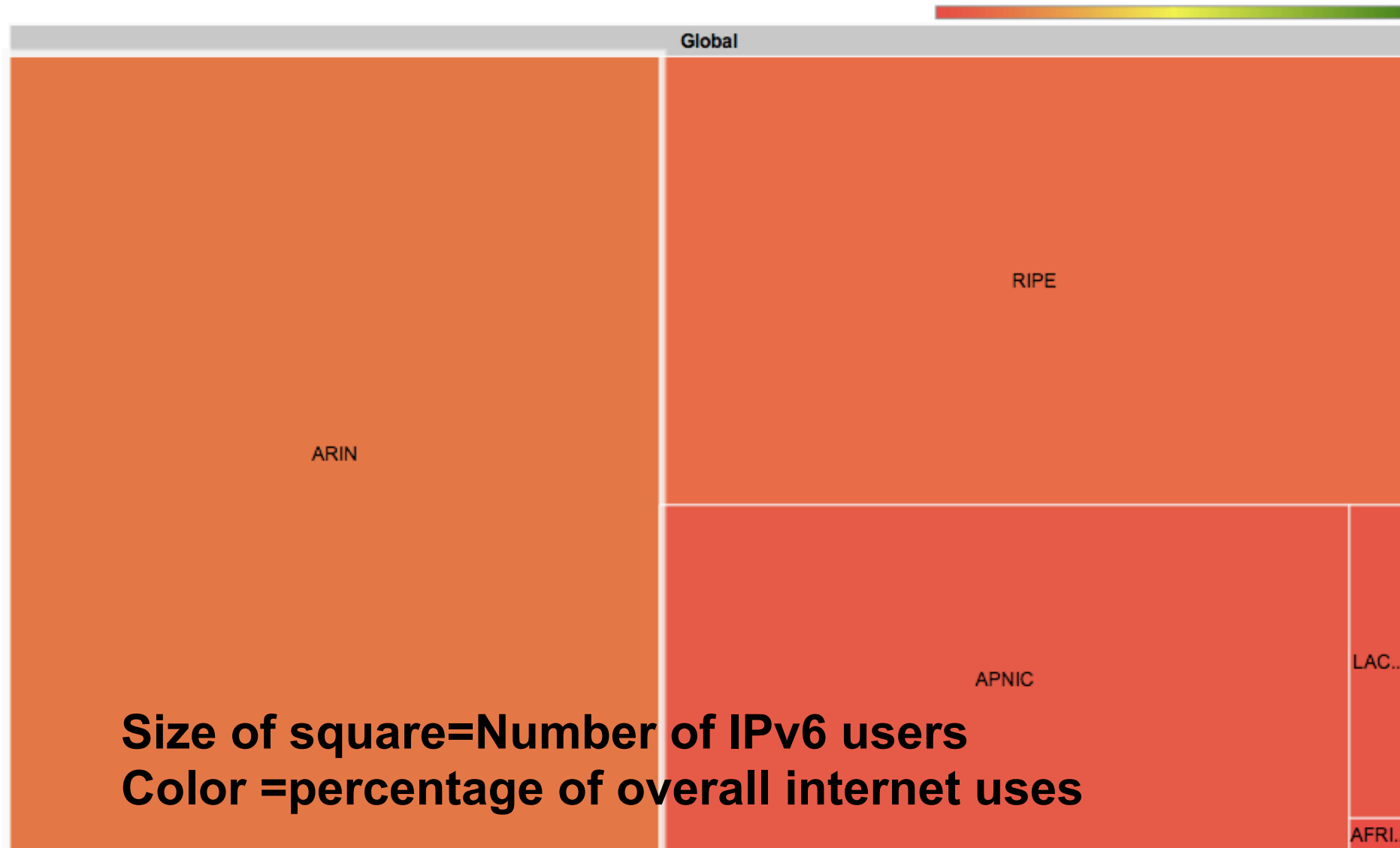
IPv6 adoption statics , users

- Google and APNIC lab measuring end-user IPv6 adoption.
- Results can differ slightly between Google and APNIC, as the sample is different.
- But the countries where Google is not #1 Alexa rank, and big access to APNIC the numbers are very consistent.(China and Japan)
- Sources:
 - Google - <http://www.google.com/intl/en/ipv6/statistics.html>
 - APNIC - <http://labs.apnic.net/dists/v6dcc.html>

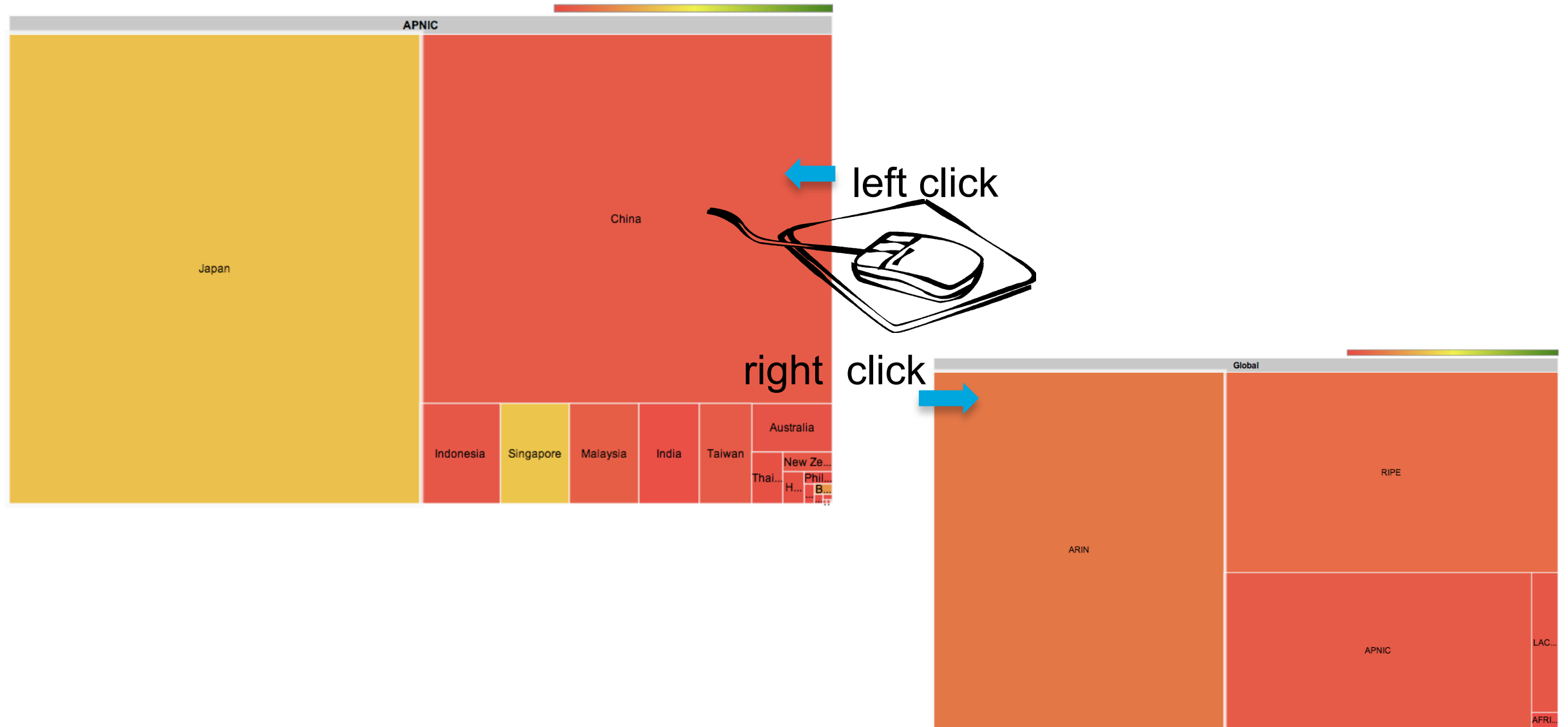
IPv6 adoption statics ,users



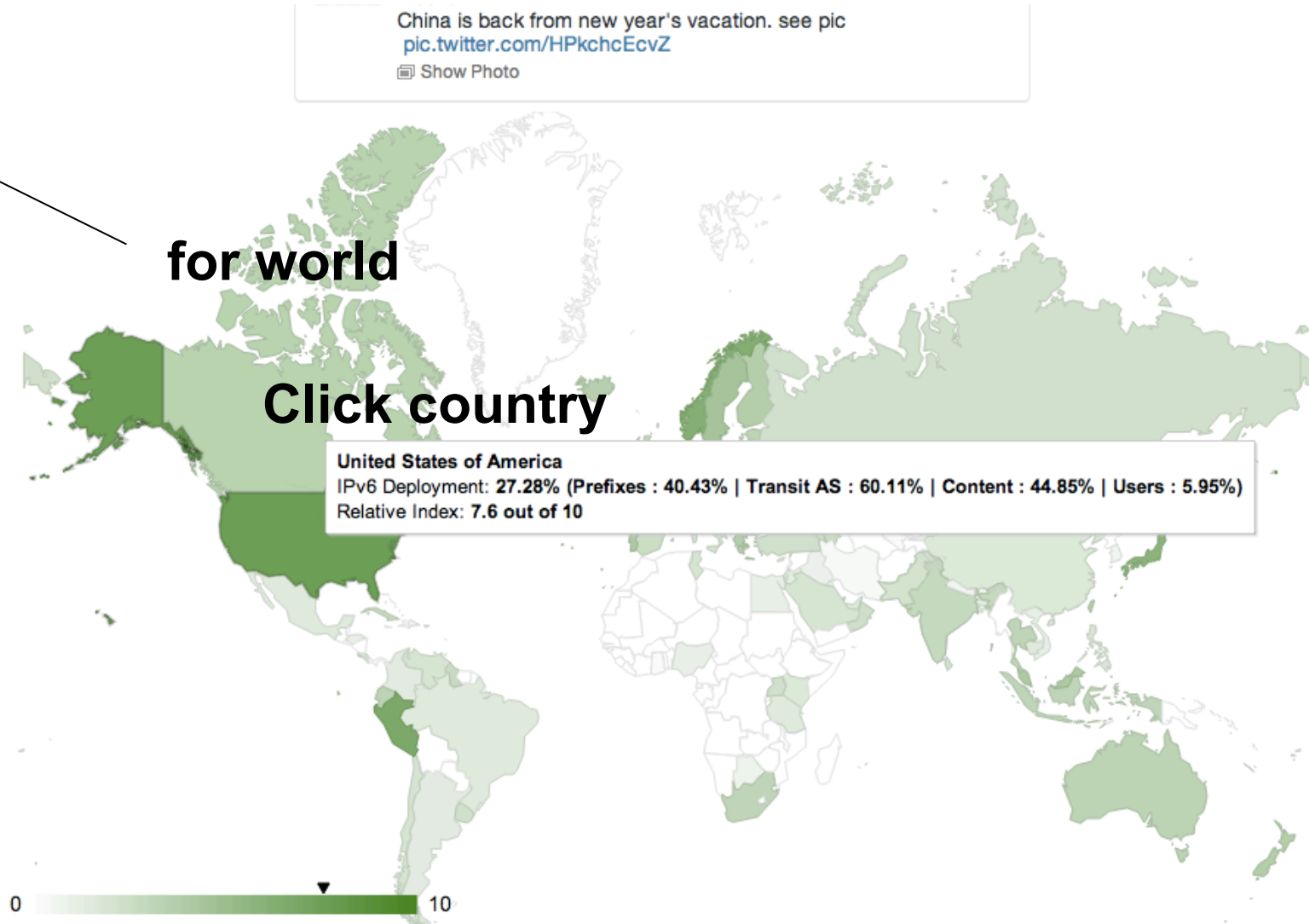
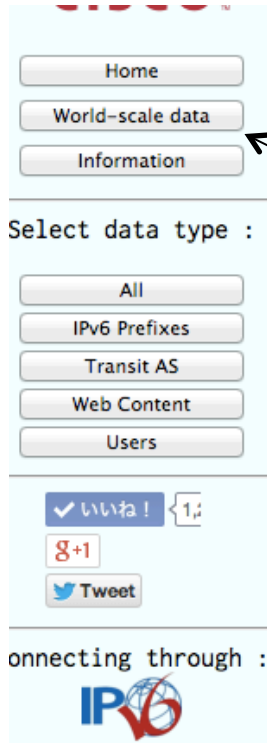
IPv6 adoption statics, users



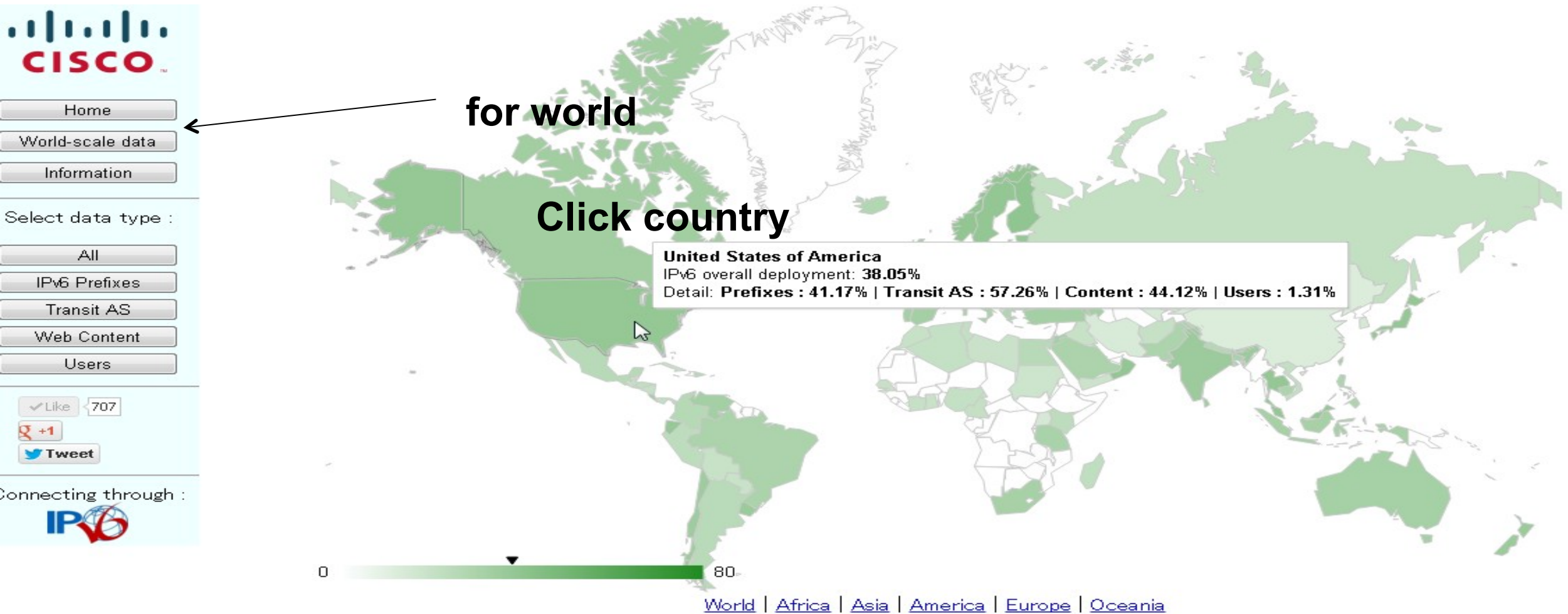
IPv6 adoption statics,users



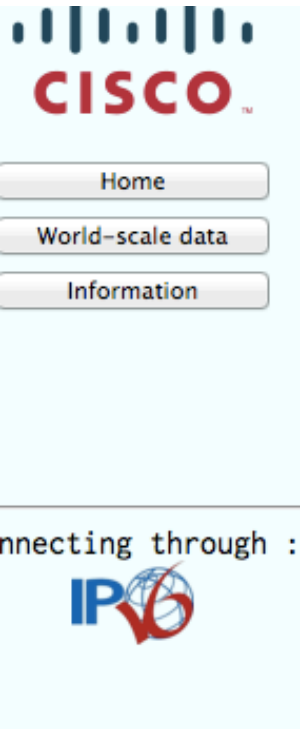
More detail world/country historical data



More detail world/country historical data



More detail world/country historical data



United States of America

Display IPv6 Prefixes Data

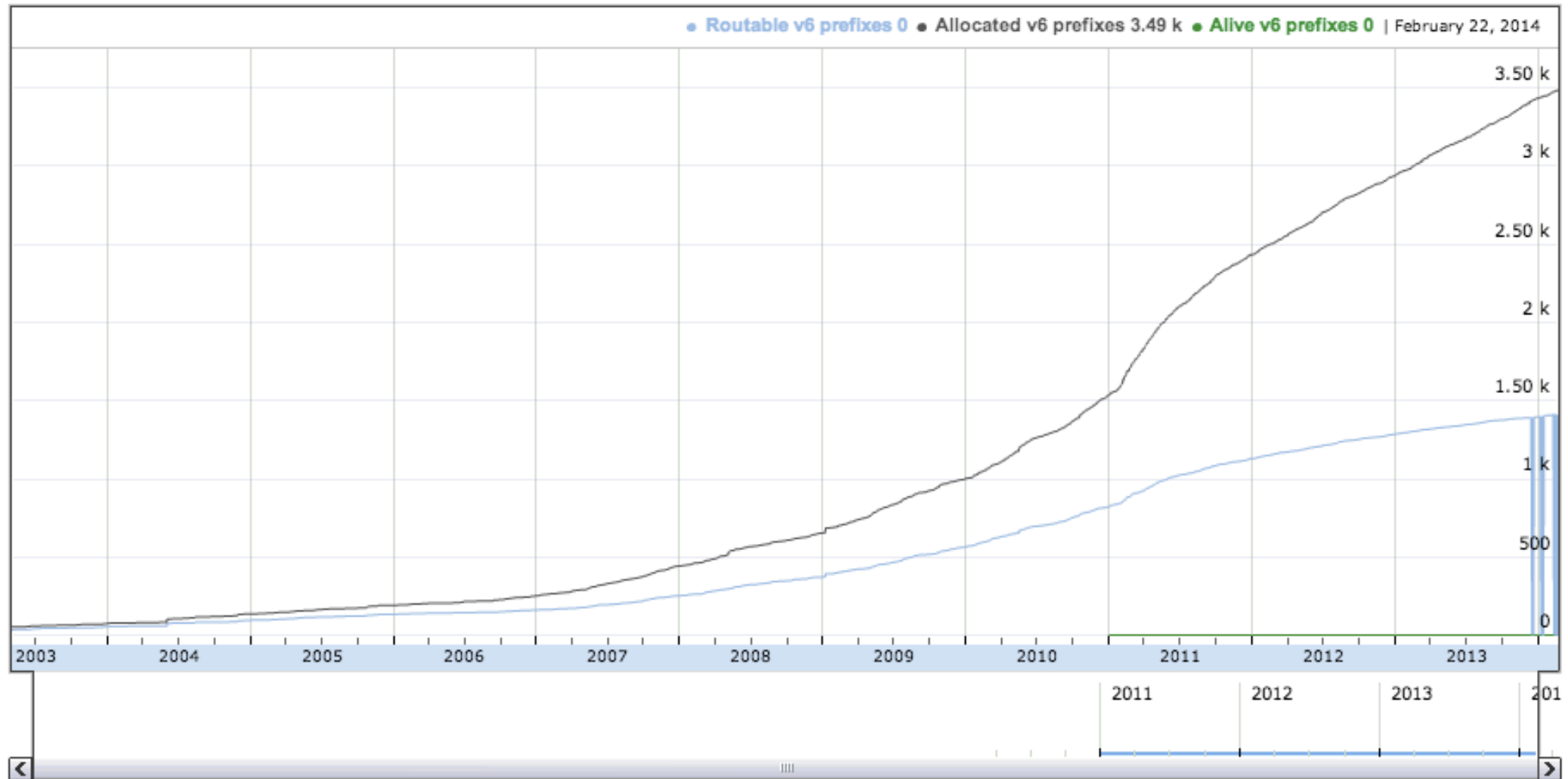
Display Transit AS Data

Display Content Data

Display Users Data

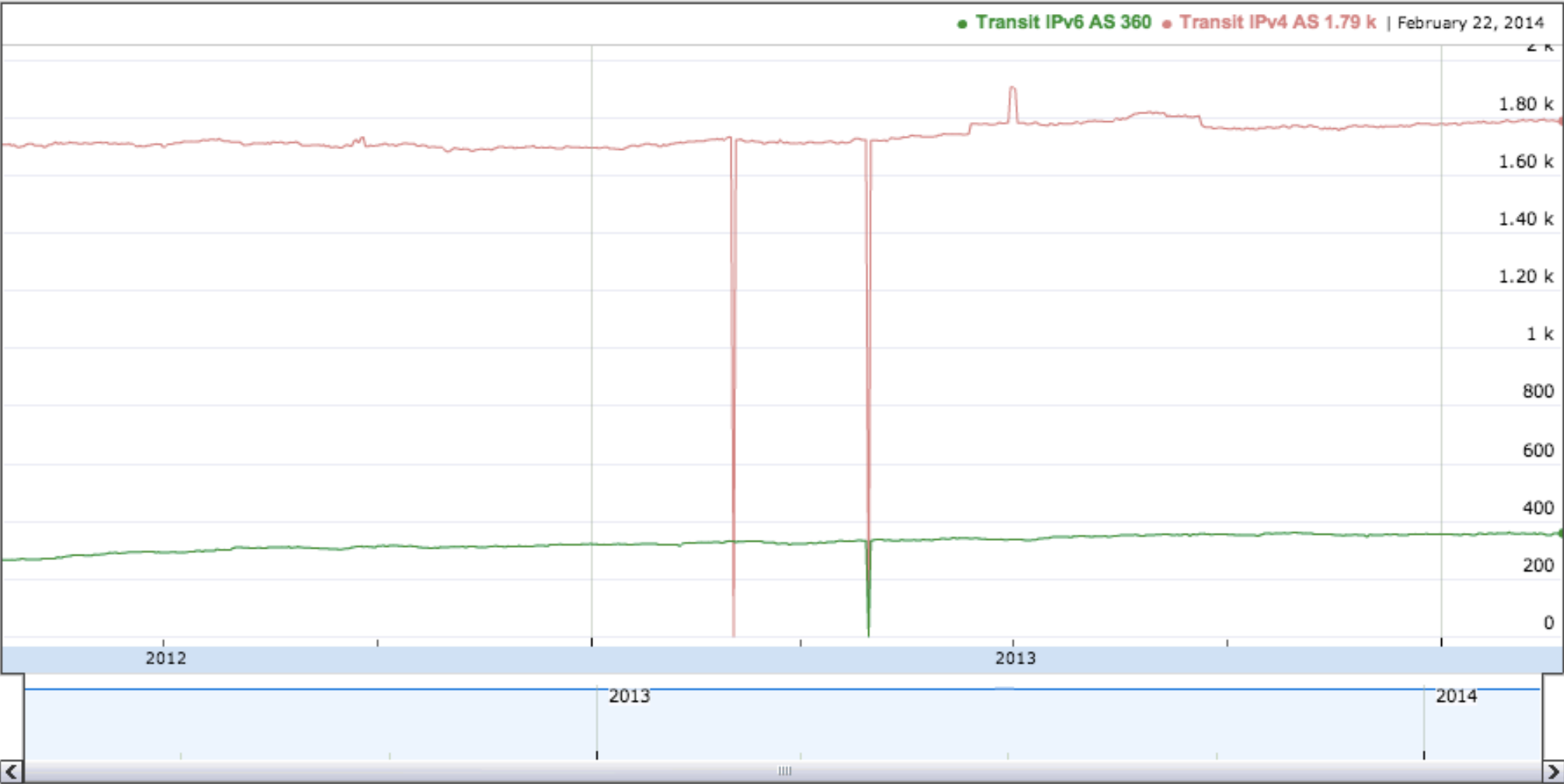
More detail world/country historical data

Display IPv6 Prefixes Data

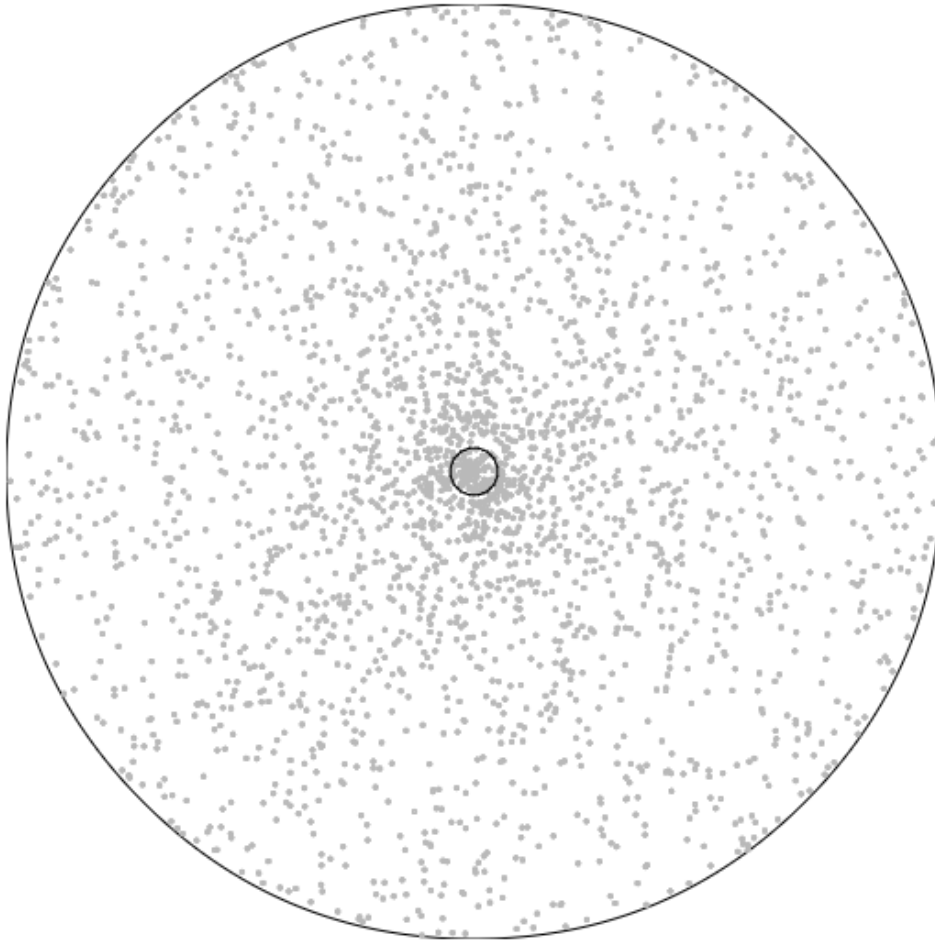


More detail world/country historical data

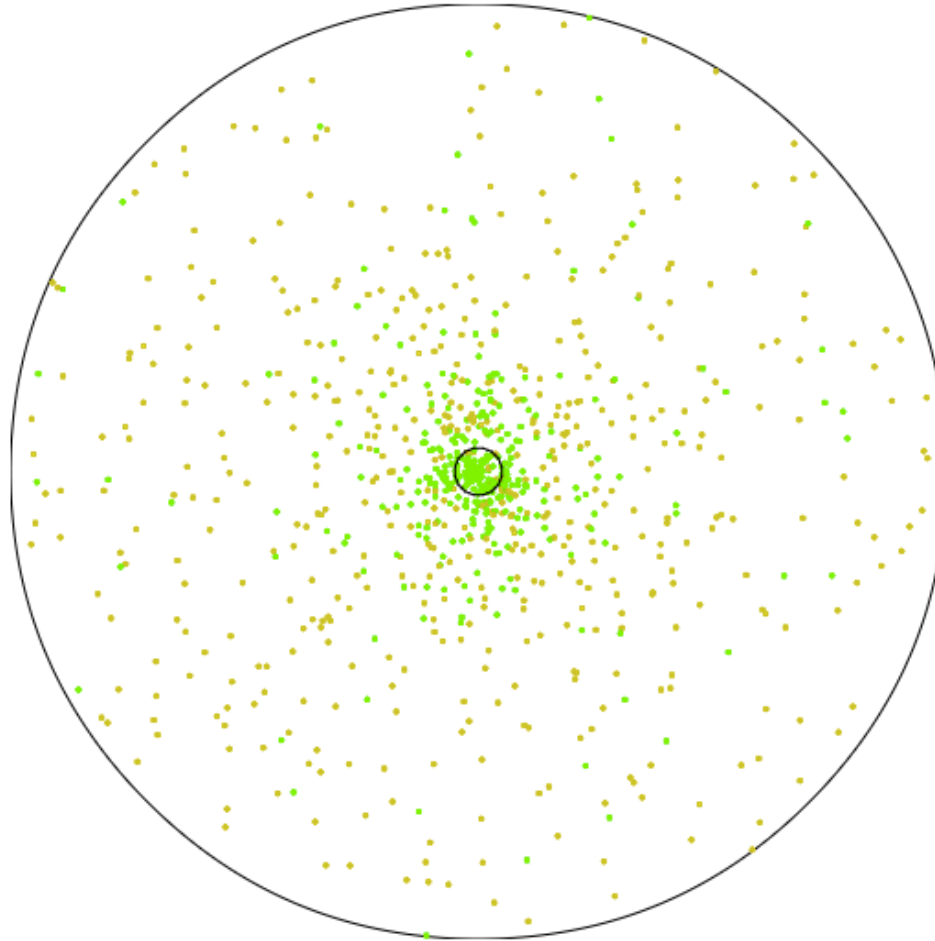
Display Transit AS Data



More detail world/country historical data



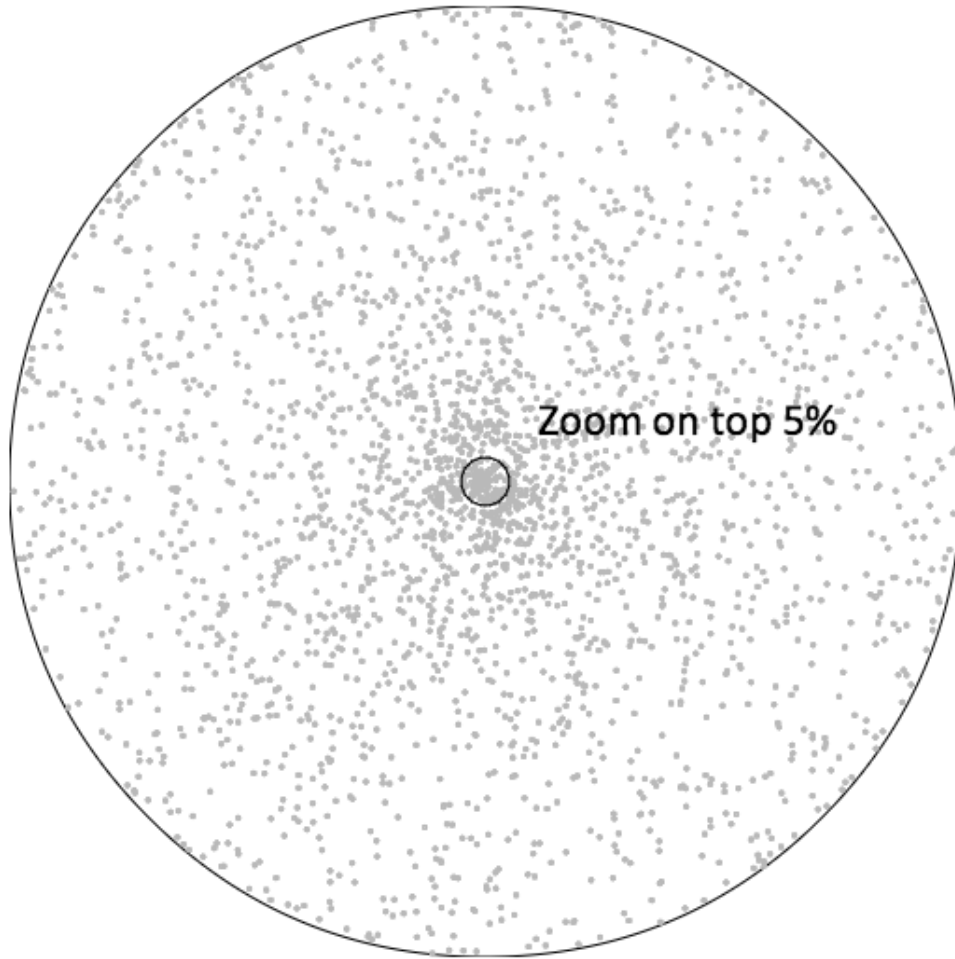
Transit V4 AS (2644)



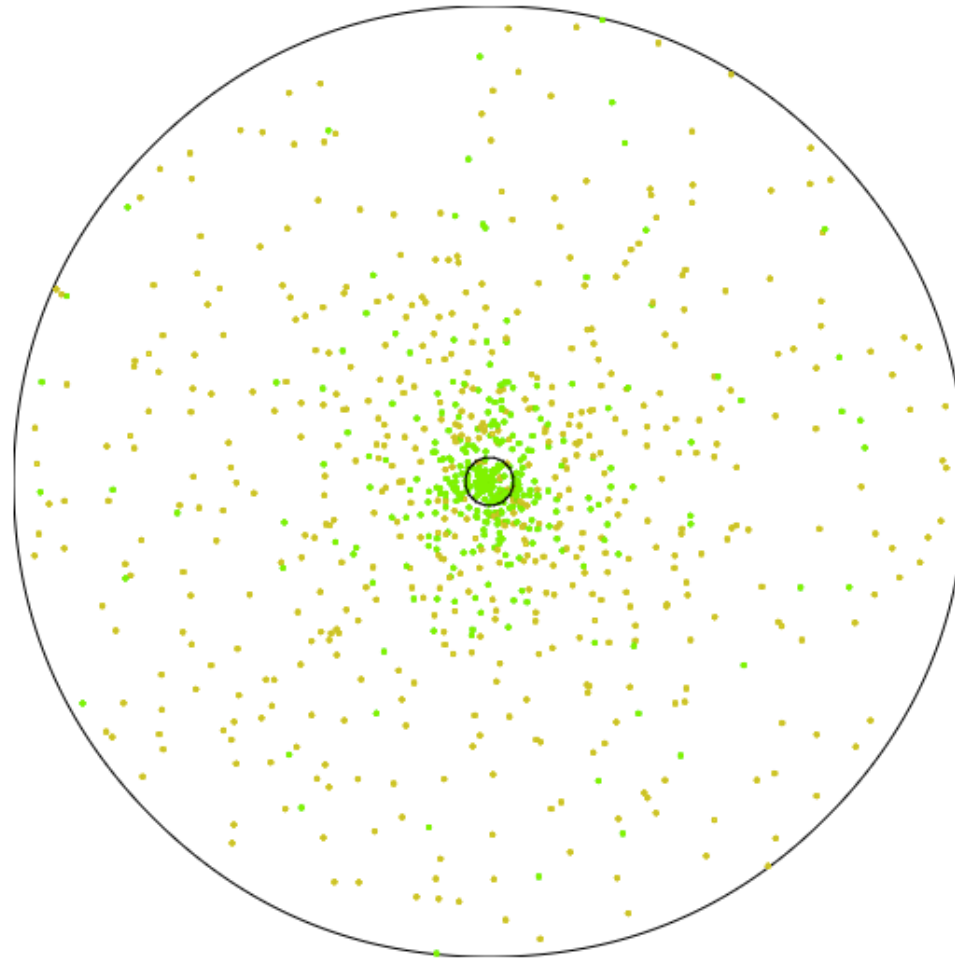
Transit V6 AS (360)

V6 enabled AS, Transit only on V4 (888)

More detail world/country historical data



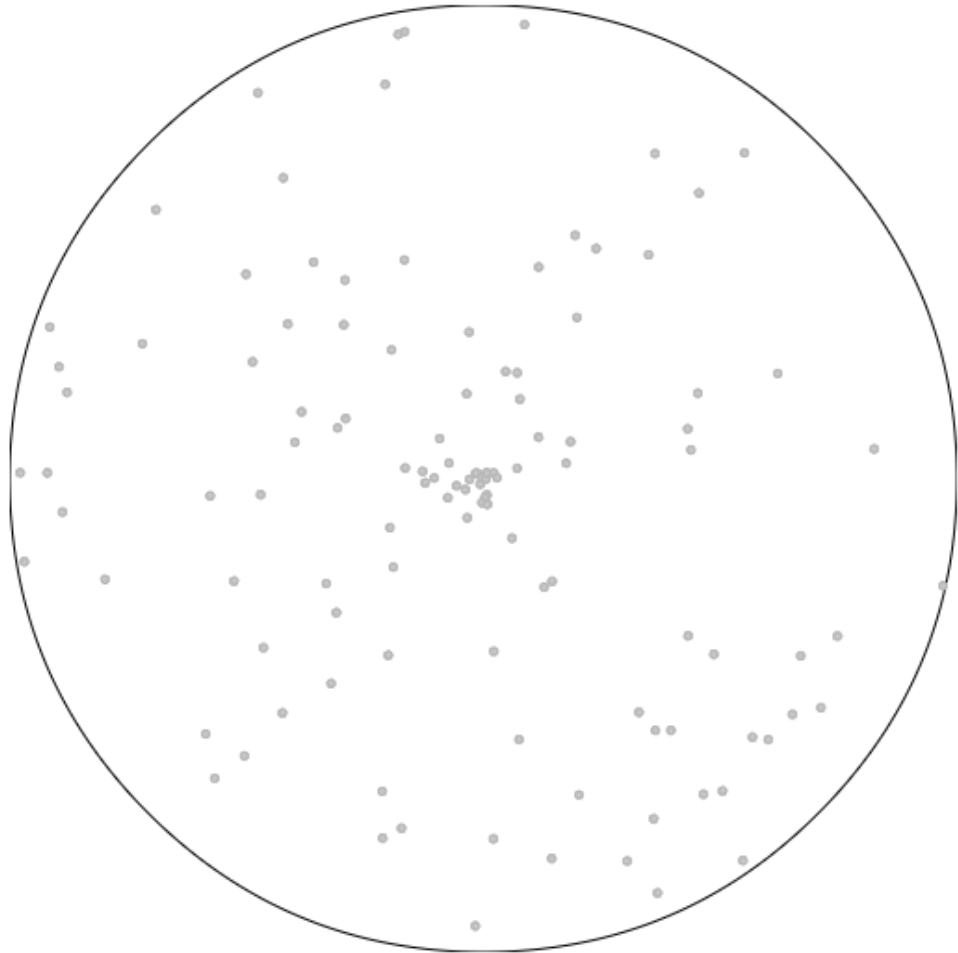
Transit V4 AS (2644)



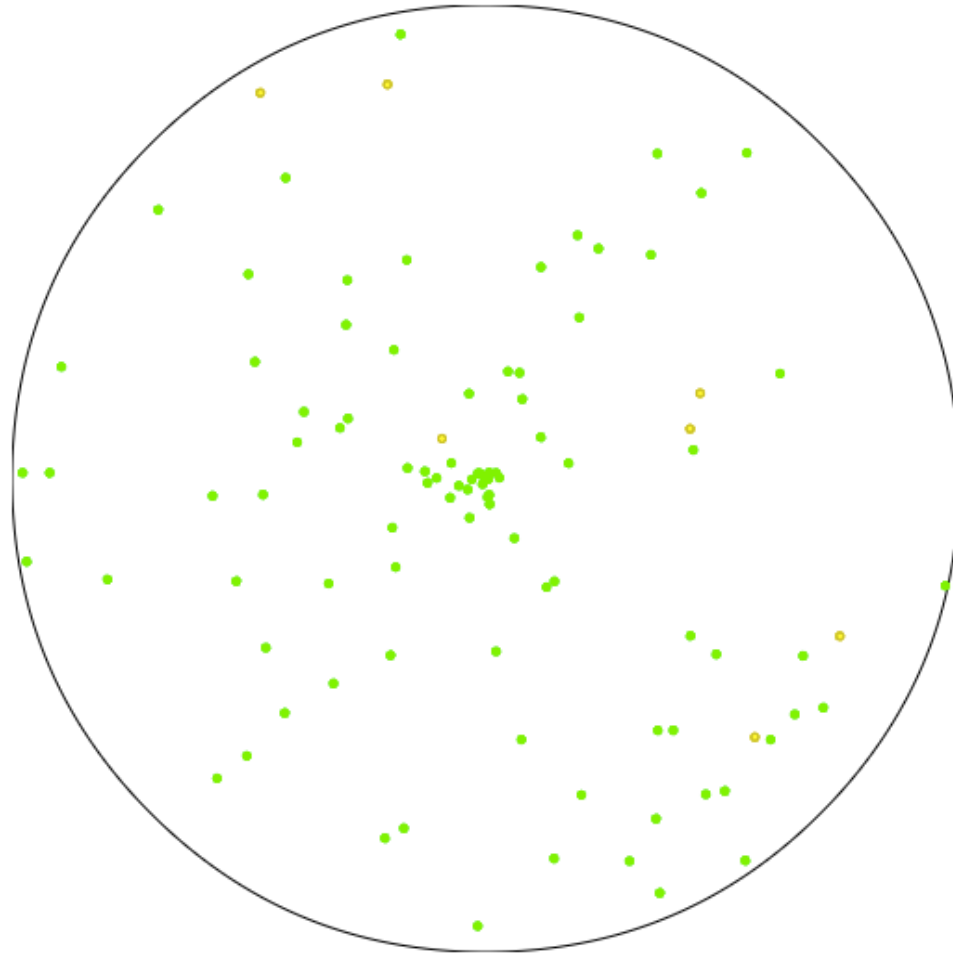
Transit V6 AS (360)

V6 enabled AS, Transit only on V4 (888)

More detail world/country historical data



Transit V4 AS (118)

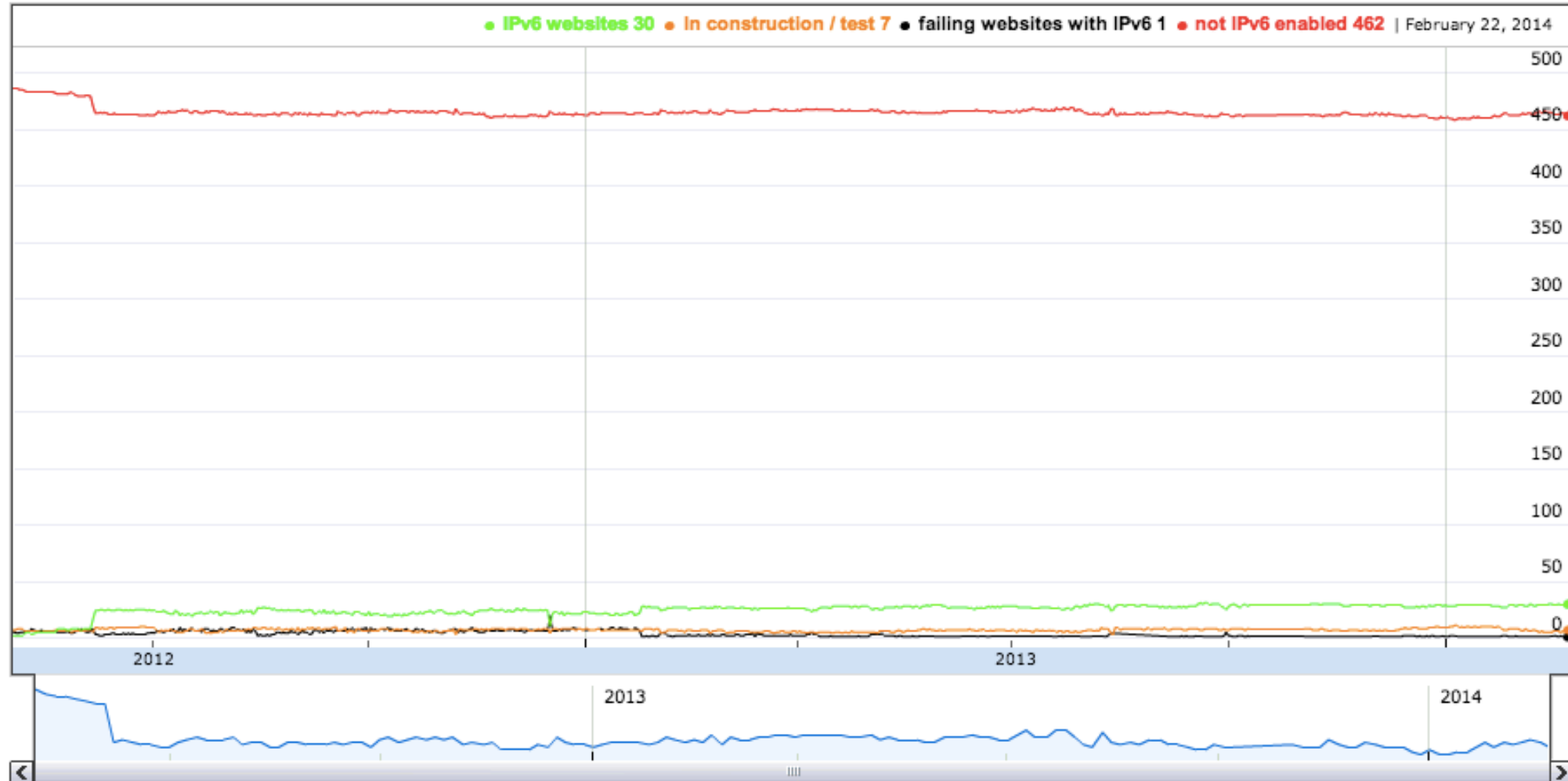


Transit V6 AS (93)

V6 enabled AS, Transit only on V4 (100)

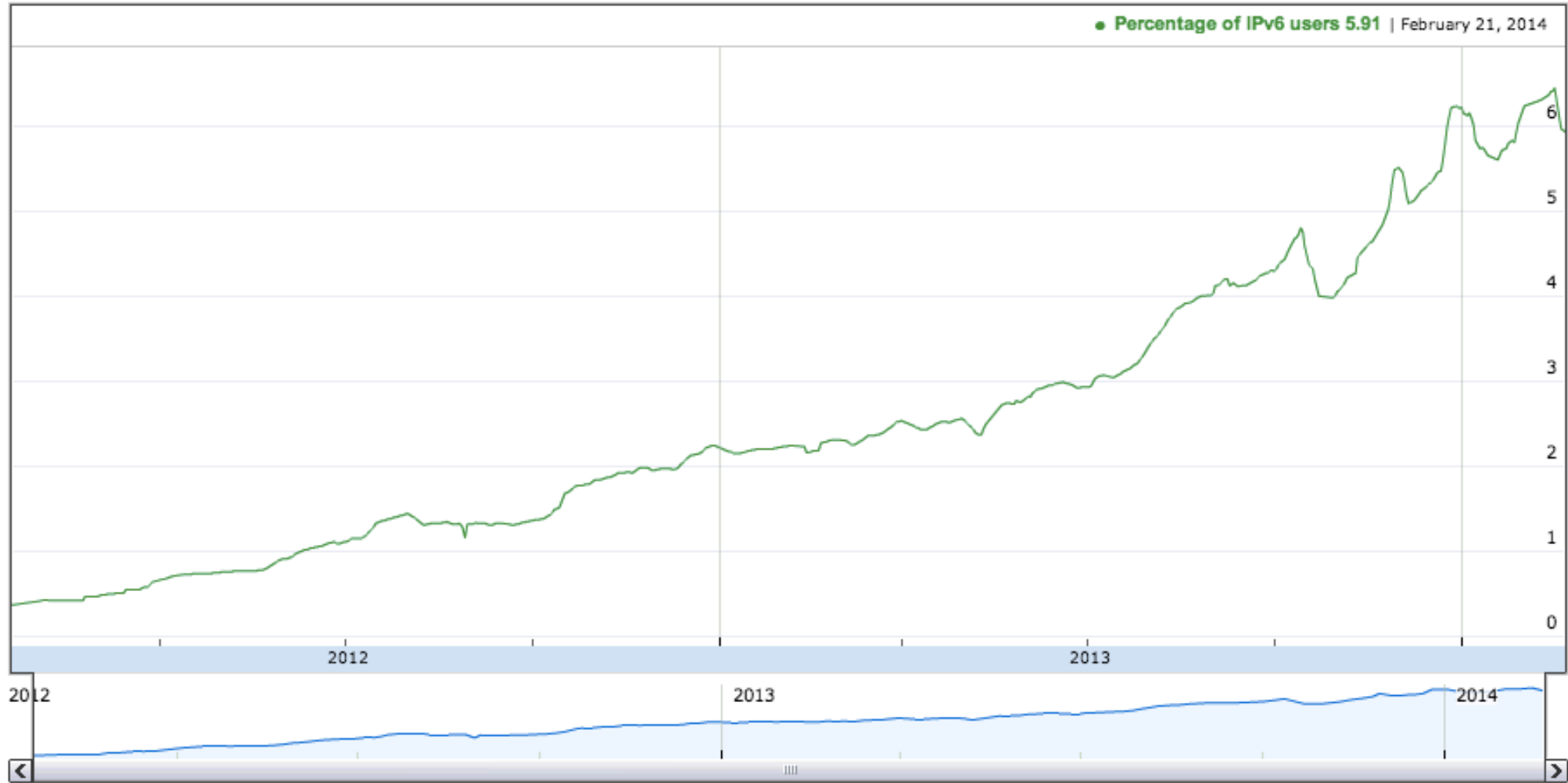
More detail world/country historical data

Display Content Data



More detail world/country historical data

Display Users Data



Summary

- IPv6 stats provides IPv6 adaptation of each of countries, graphically.
- The result data would be hint of ipv6 deployment plan of future for you.
- for example..

Users

- Germany is very high ratio(6.27% / 4.76%)
 - Deutsche Telekom AG offering dual stack on fixed customer since Sep 2013.
<http://www.worldipv6launch.org/no-let-up-in-ipv6-deployment-at-deutsche-telekom/>
<http://www.ipv6observatory.eu/wp-content/uploads/2012/11/01-06-Axel-Clauber1.pdf>
- Many cable operators are increasing IPv6 traffic. Because they has e-router,own fiber and DOCSIS3.0.
 - Comcast/Time Warner Cable from US:5.95%
<http://www.comcast6.net/>
<http://www.internetsociety.org/deploy360/blog/2013/11/comcast-and-time-warner-show-dramatic-increases-in-ipv6-deployment/>
 - Telenet from Belgium:9.72%
http://www.ipv6council.be/IMG/pdf/20130307-3_Telenet-pptx.pdf
 - iTSCOM/MediaCat from Japan:3.5%

Contents

- Singapore is now big IPv6 country in APAC. They enabled IPv6 contents since June of 2012(8->56). After that StarHub,M1 and Hughes Networks Systems joined world IPv6 launch in June/July of 2013.

http://conference.apnic.net/_data/assets/pdf_file/0010/58744/ida-ipv6-transition-programme-2013-apricot_1361845288.pdf

<http://www.worldipv6launch.org/new-ipv6-deployment-measurements-singapores-m1-and-hughes-network-show-notable-growth/>

<http://www.worldipv6launch.org/starhub/>

- Peru's IPv6 dramatically increased in 2013. IPv6 content site number is still 33. But 7 of top 10 already enabled IPv6. Telefonica decided Peru as 1st country for IPv6 deployment.

<http://www.cellular-news.com/story/60361.php>

<http://www.alexa.com/topsites/countries/PE>

Source

whois from RIPE, ARIN, APNIC, AFRINIC, LACNIC

- <http://archive.routeviews.org/>
- <http://www.team-cymru.org/Services/ip-to-asn.html>
- <https://www.arin.net/knowledge/rirs/countries.html>
- <http://www.alexa.com/topsites>
- <http://labs.apnic.net/dists/v6dcc.html>
- <http://www.google.com/ipv6/statistics.html>

Reference

- IPv6 Deployment Statistics
 - <http://6lab.cisco.com/stats/data/IPv6%20Adoption%20Statistics%20user%20guide.pdf>
 - Alain Fiocco, Hugo Kaczmarek
- Research Internship Report Internet IPv6 Adoption: Methodology, Measurement and Tools
 - <http://6lab.cisco.com/stats/data/Internet%20IPv6%20Adoption.pdf>
 - Hugo Kaczmarek

Thank you.

