

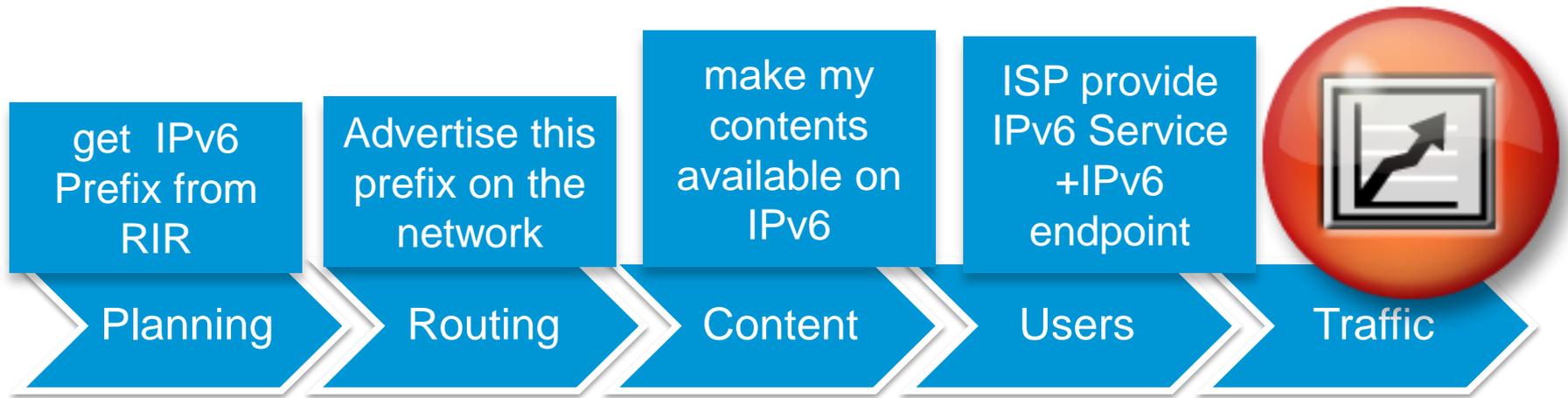


Cisco IPv6 Deployment Statistics

Shishio Tsuchiya Cisco Japan 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

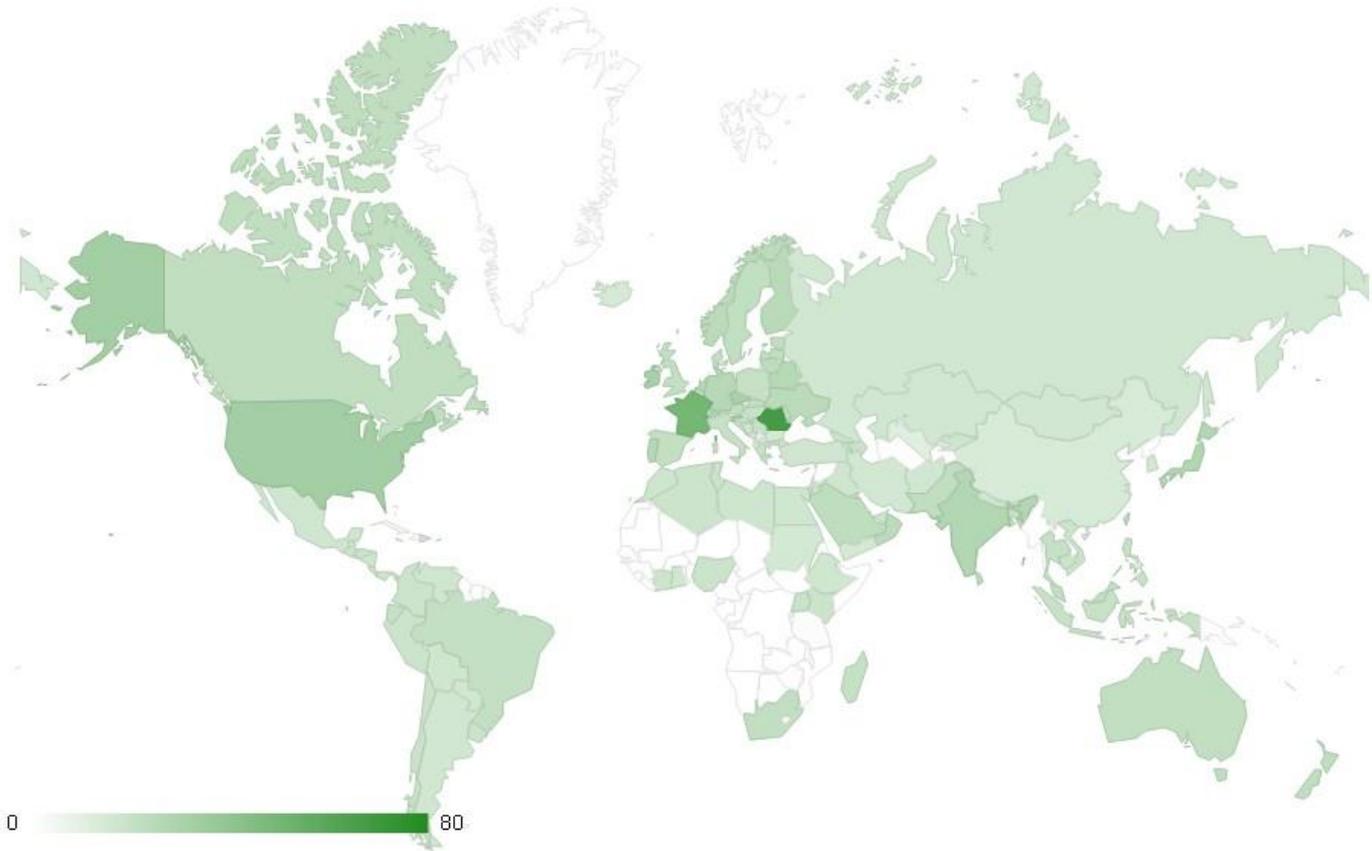
Users

Like 864

+1

Tweet

Connecting through :



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

Based on original data from RIR, routeviews, Alexa, Google, ITU and APnic

Please send feedback to: 6stats-feedback@cisco.com

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.*
- Color indicates IPv6 adoption rate of each of countries.
- “All” calculate from
 - % IPv6 transit AS : 20 %
 - % IPv6 enabled transit AS : 5 %
 - Content : 25 %
 - Users : 50 %



IPv6 adoption statics,at a glance



Home

World-scale data

Information

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

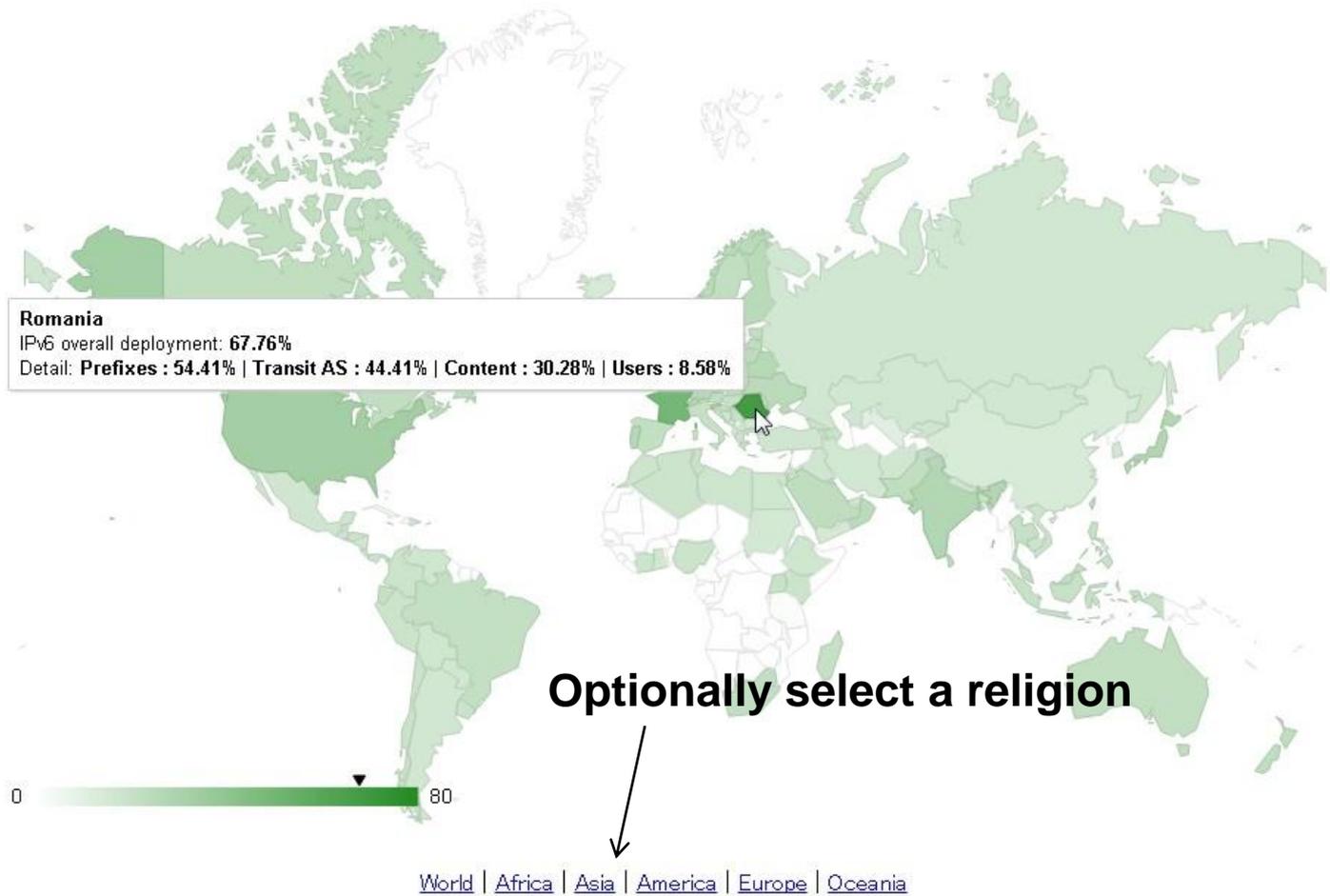
Users

Like 864

+1

Tweet

Connecting through :



IPv6 adoption statics,Asia



Home

World-scale data

Information

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

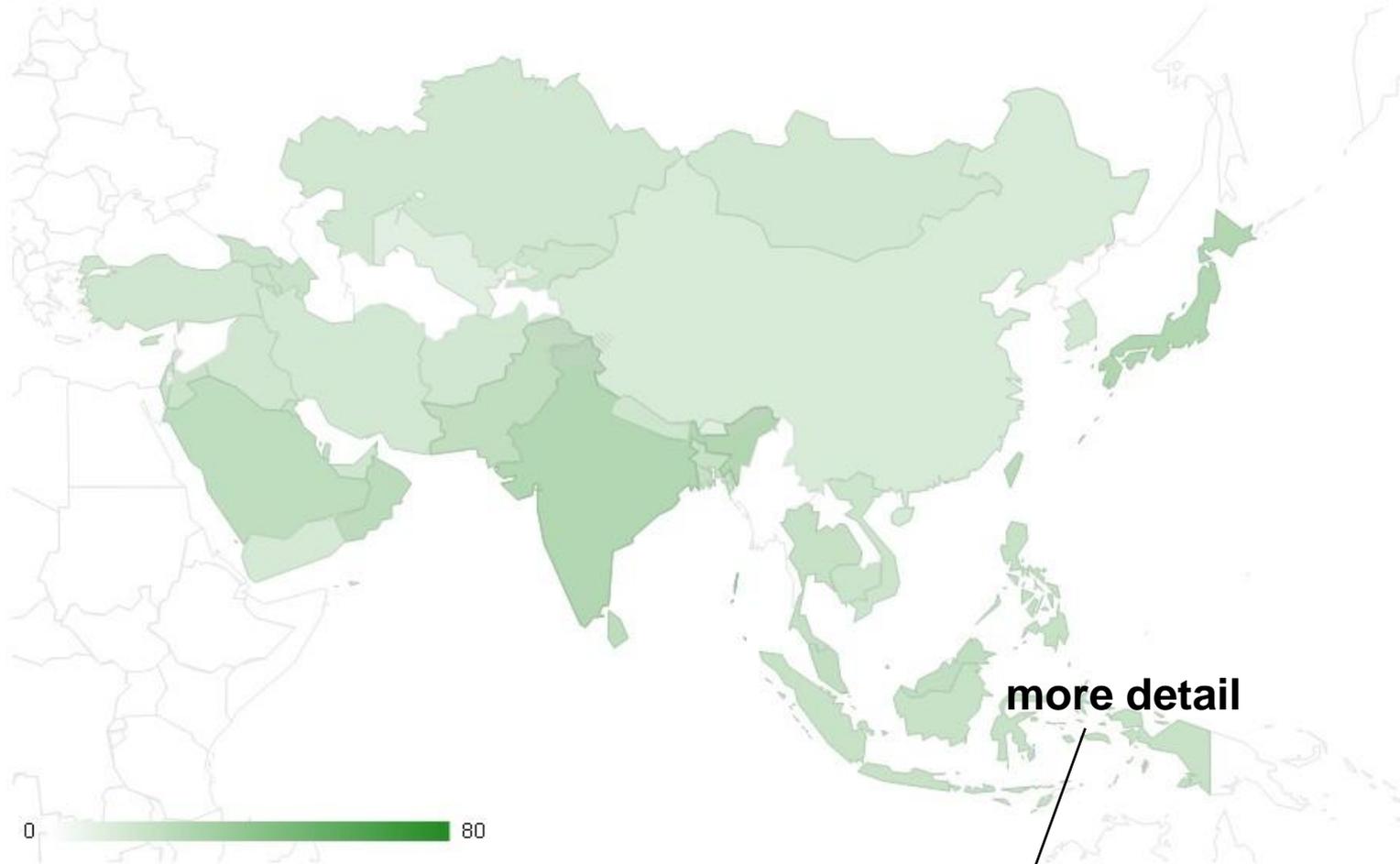
Users

✓ Like 864



Tweet

Connecting through :



more detail

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

IPv6 adoption statics, South-Eastern Asia



Home

World-scale data

Information

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

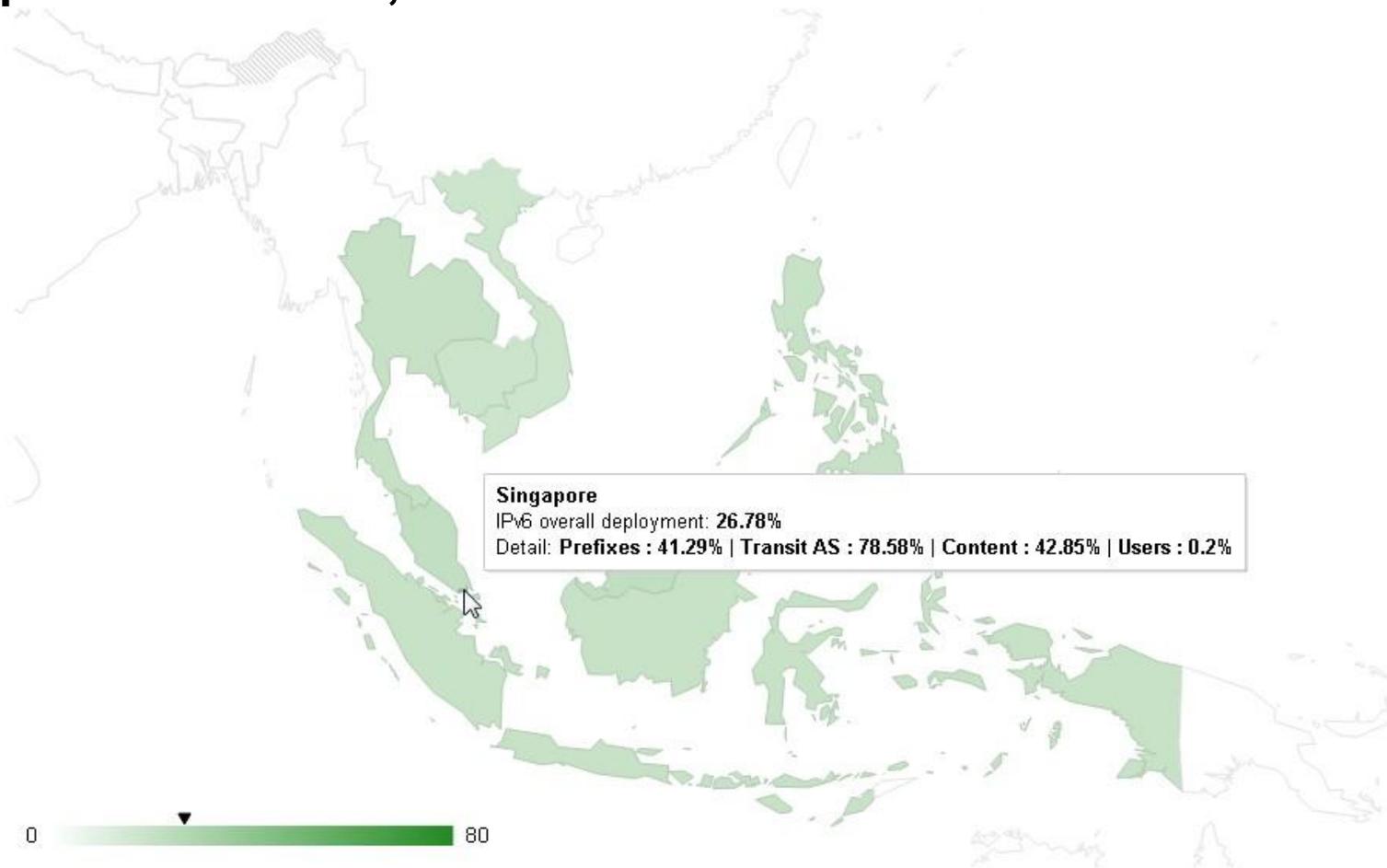
Users

Like 864

+1

Tweet

Connecting through :



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

IPv6 adoption statics,home



Home

World-scale data

Information

United States of America

IPv6 overall deployment: **31.96%**

Detail: **Prefixes : 42.21% | Transit AS : 57.99% | Content : 34.19% | Users : 2.15%**

IPv6 Prefixes

Transit AS

Web Content

Users

Like 864



+1



Tweet

Brazil

IPv6 overall deployment: **19.69%**

Detail: **Prefixes : 67.27% | Transit AS : 36.82% | Content : 36% | Users : 0.03%**

Norway

IPv6 overall deployment: **23.86%**

Detail: **Prefixes : 61.08% | Transit AS : 85.55% | Content : 33.76% | Users : 0.69%**

France

IPv6 overall deployment: **49.13%**

Detail: **Prefixes : 49.5% | Transit AS : 68.62% | Content : 35.78% | Users : 4.85%**

Japan

IPv6 overall deployment: **26.41%**

Detail: **Prefixes : 45.14% | Transit AS : 76.5% | Content : 22.15% | Users : 2.17%**

0 80

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

Based on original data from RIR, routeviews, Alexa, Google, ITU and APNIC

Please send feedback to: 6stats-feedback@cisco.com

IPv6 adoption statics,home



Home

World-scale data

Information

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

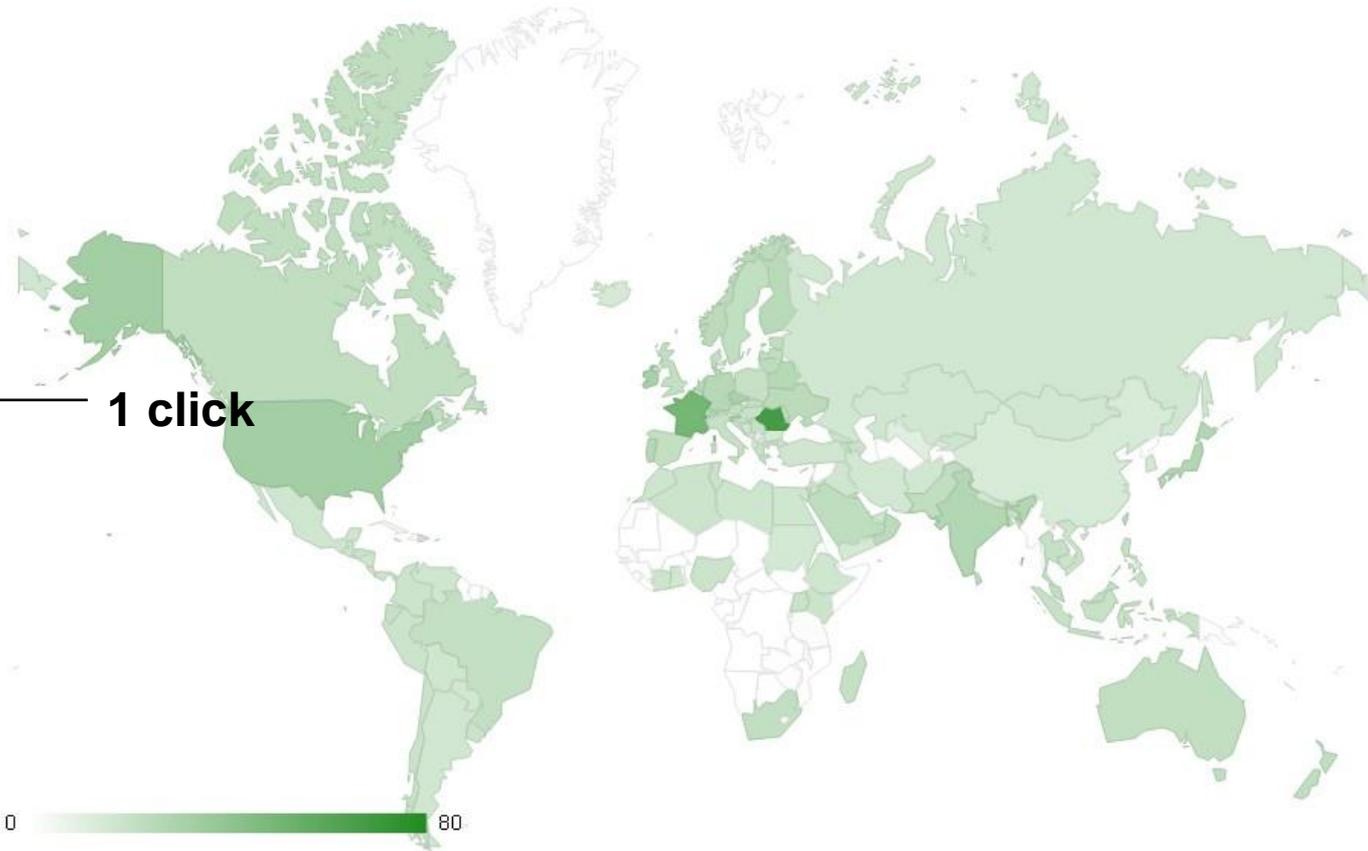
Users

Like 864

+1

Tweet

Connecting through :



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

Based on original data from RIR, routeviews, Alexa, Google, ITU and APnic

Please send feedback to: 6stats-feedback@cisco.com

IPv6 adoption statics, IPv6 prefixes



Home

World-scale data

Information

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

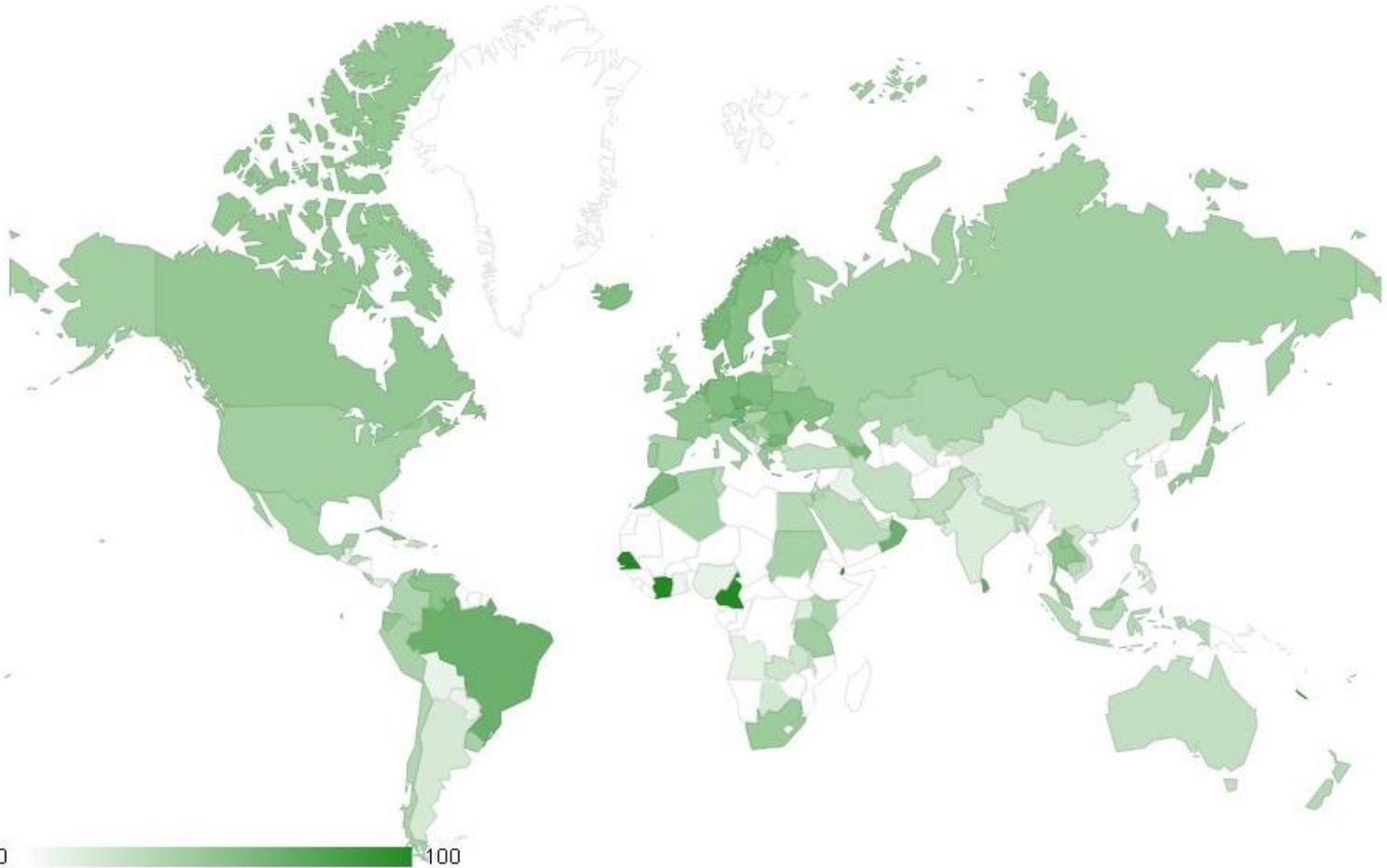
Users

Like 864

+1

Tweet

Connecting through :



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

IPv6 adoption statics, IPv6 prefixes

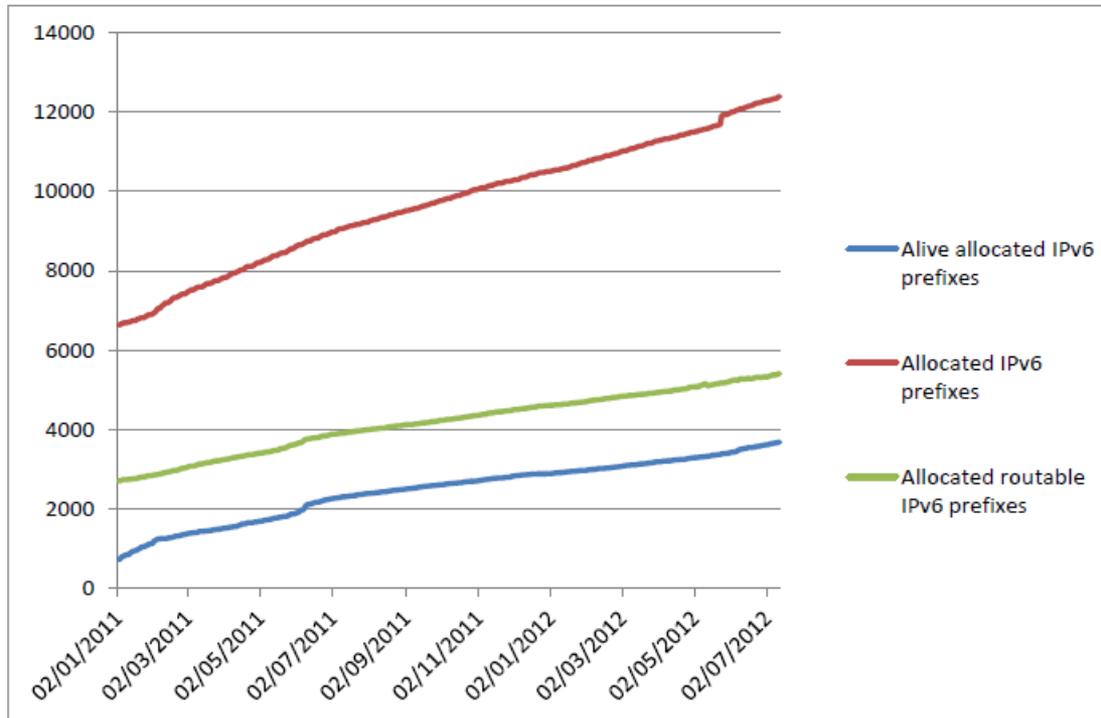
- When an entity plans to enable IPv6 on its network, the first step is to ask the **RIR** for an IPv6 prefix.
- The second step is to make this prefix reachable on the network, which means make an entry in **BGP** tables for this prefix: the prefix is then routable.
- If we've seen traffic from one 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



Home

World-scale data

Information

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

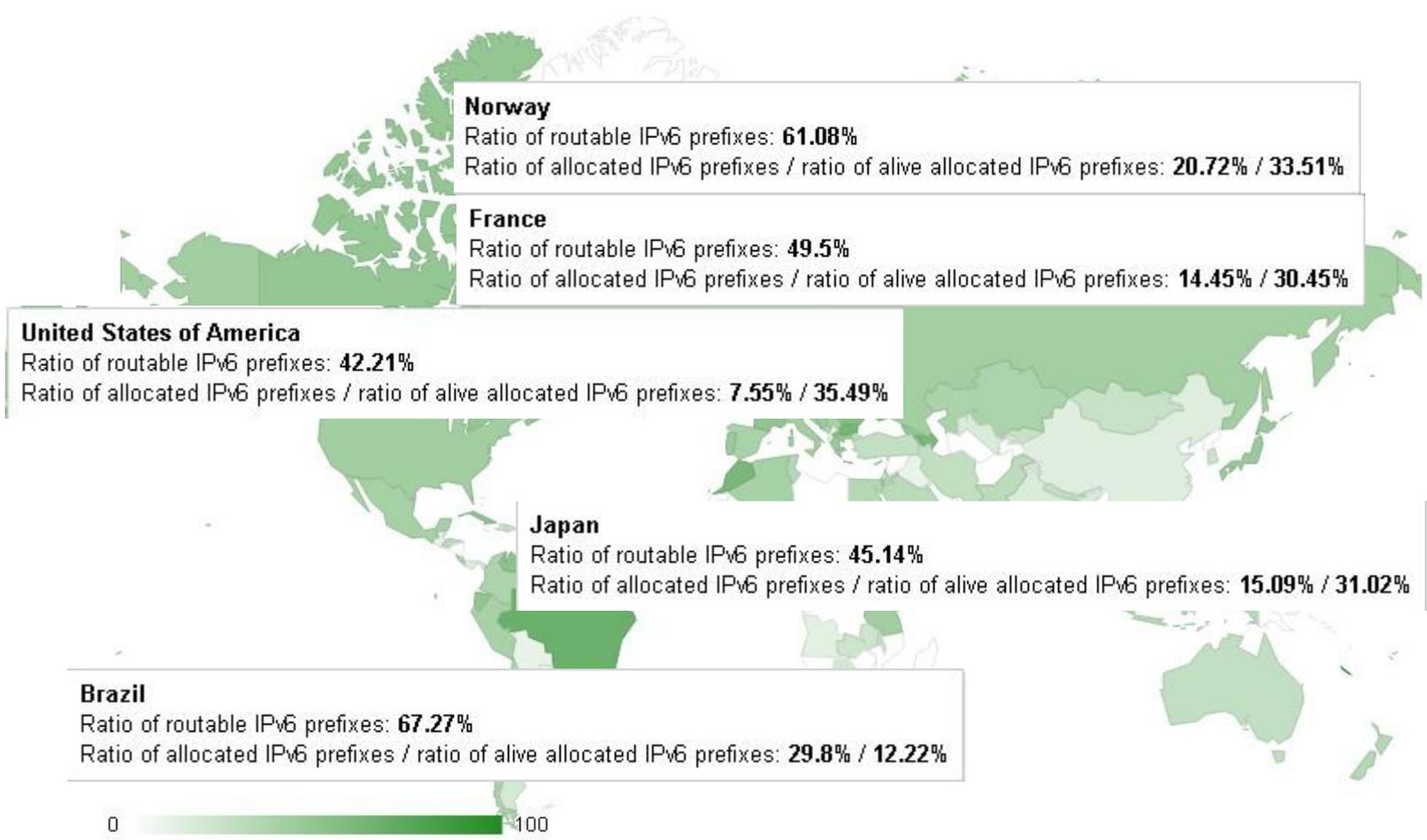
Users

Like 864

+1

Tweet

Connecting through :



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

IPv6 adoption statics, IPv6 prefixes



IPv6 adoption statics, Transit AS



Home

World-scale data

Information

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

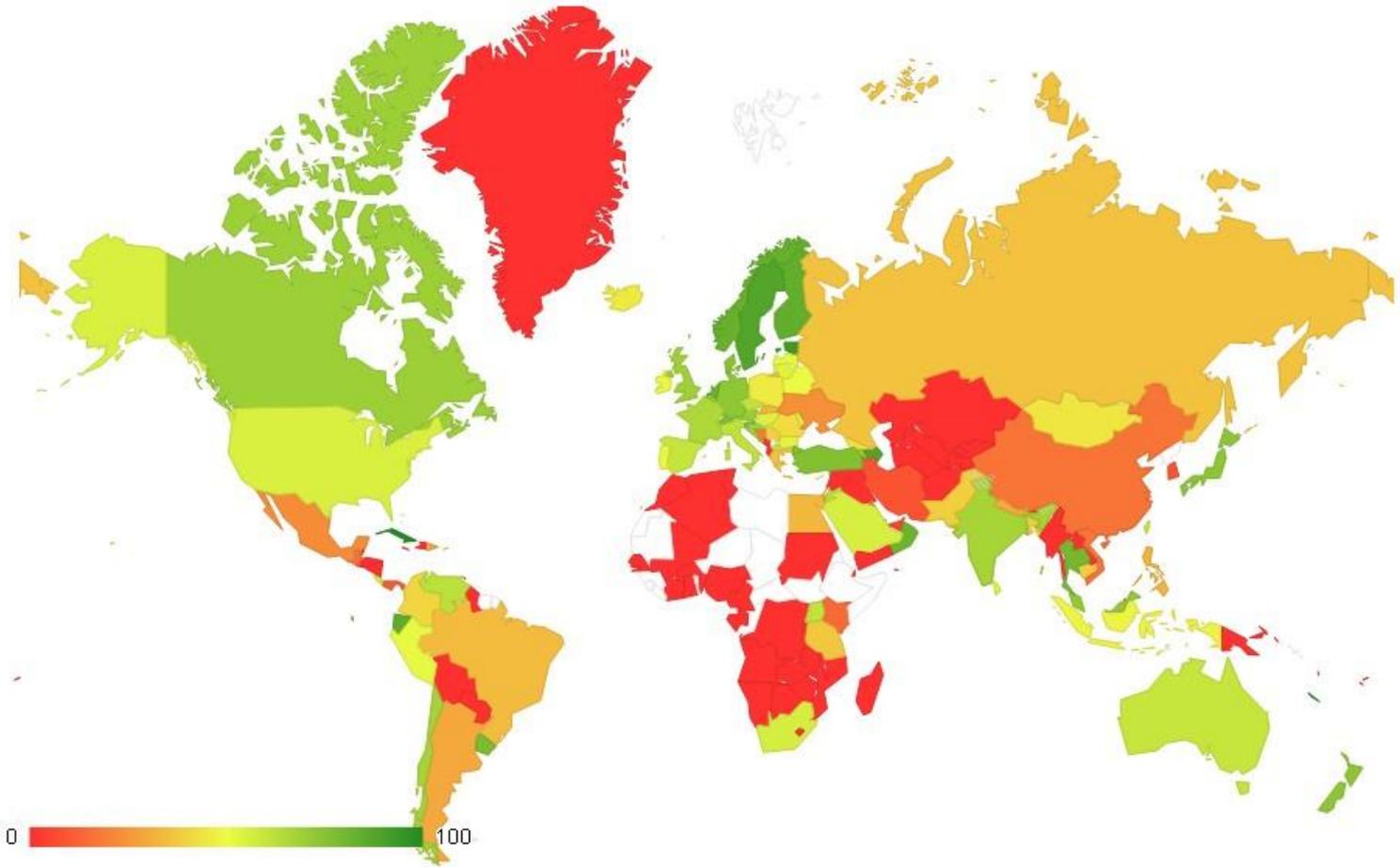
Users

✓ Like 864

+1

Tweet

Connecting through :



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



Home

World-scale data

Information

Select data type :

All

IPv6 Prefixes

Transit AS

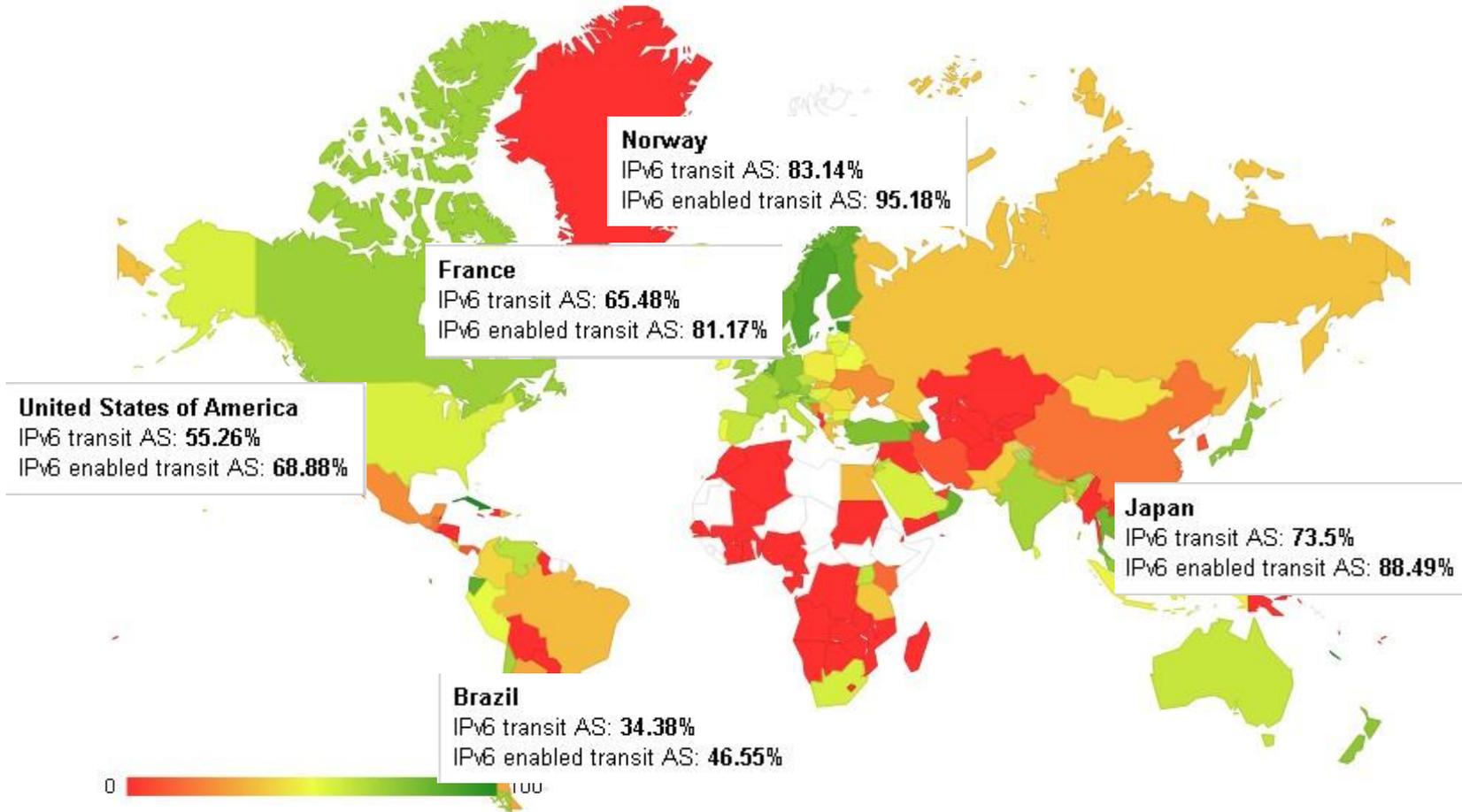
Web Content

Users

Like 864

Tweet

Connecting through :



IPv6 adoption statics, Transit AS



Home

World-scale data

Information

Select data type :

All

IPv6 Prefixes

Transit AS

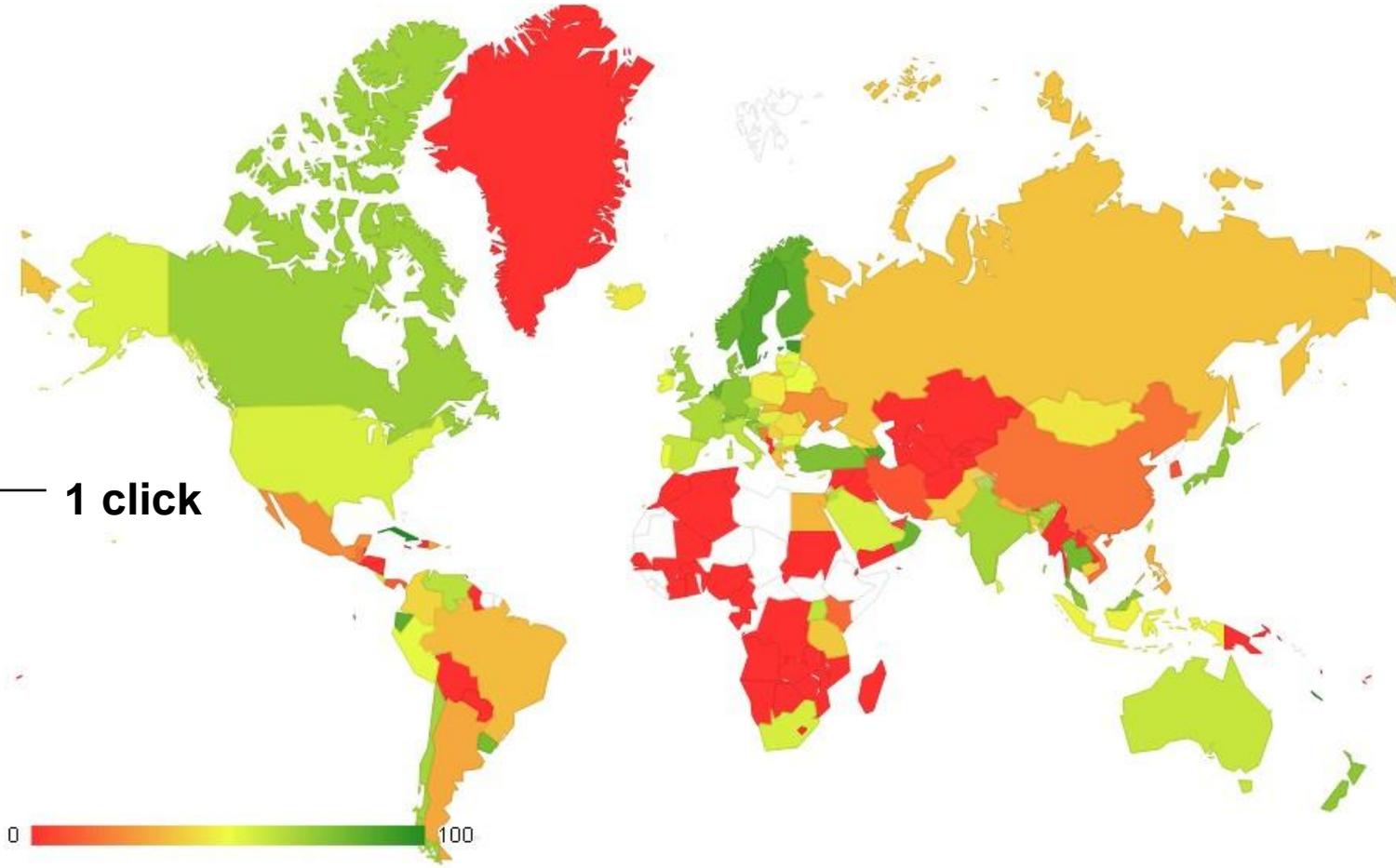
Web Content ← 1 click

Users

Like 864

Tweet

Connecting through :



IPv6 adoption statics,web contents



Home

World-scale data

Information

Select data type :

All

IPv6 Prefixes

Transit AS

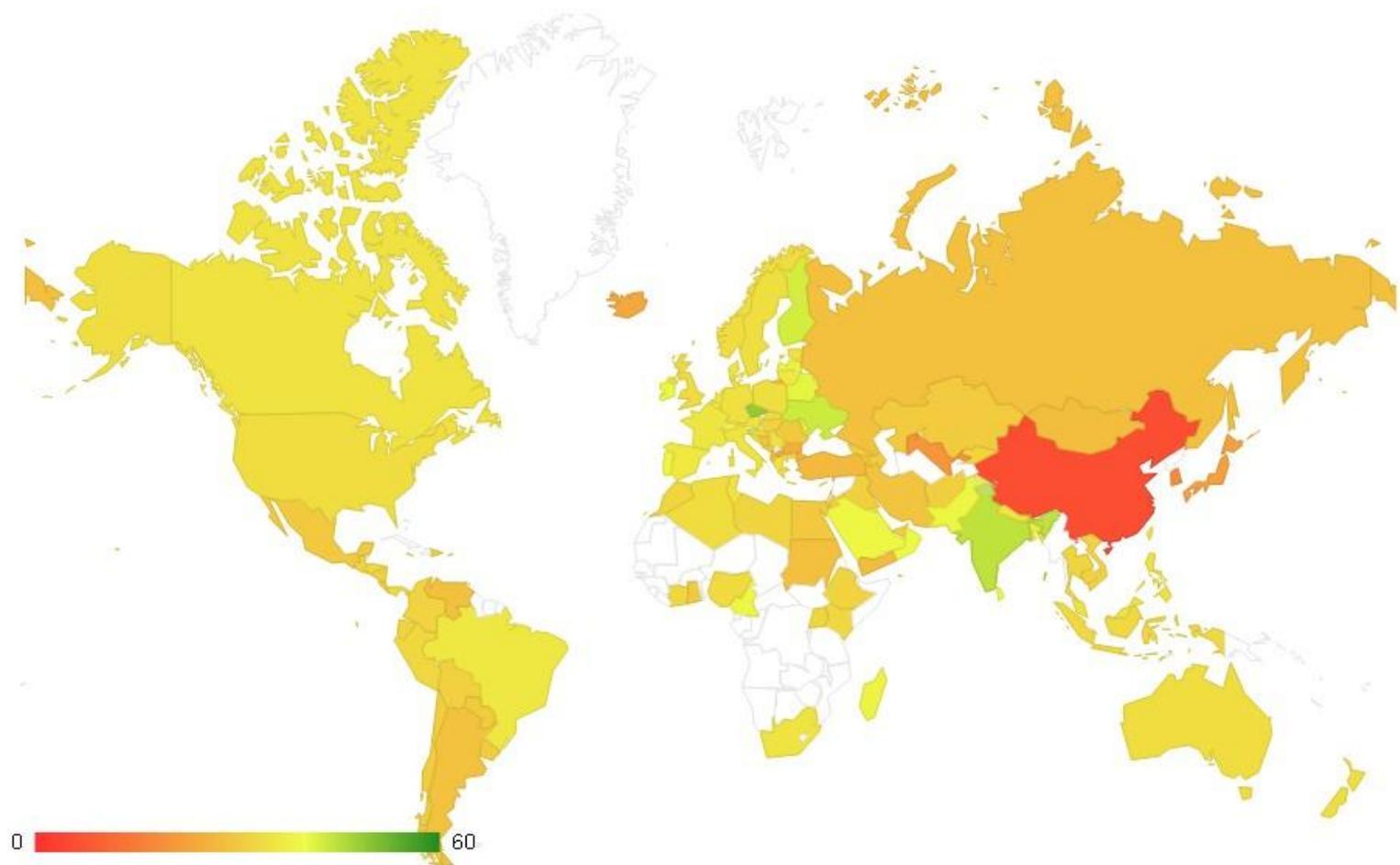
Web Content

Users

Like 864

Tweet

Connecting through :



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

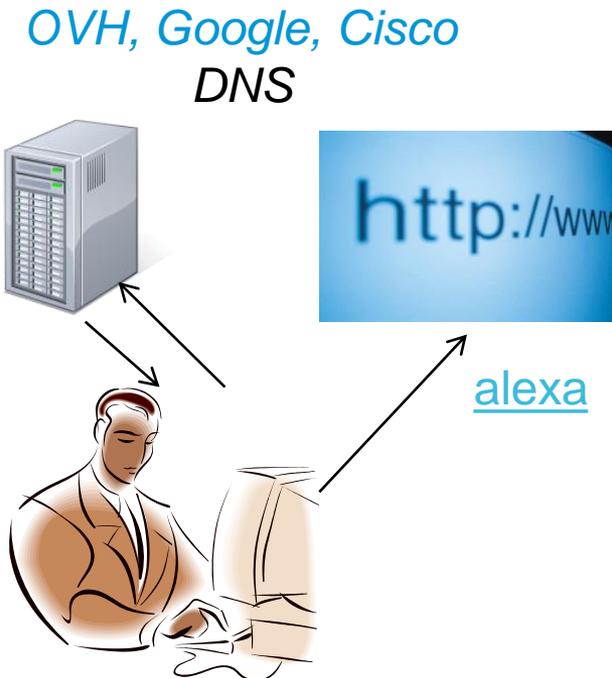
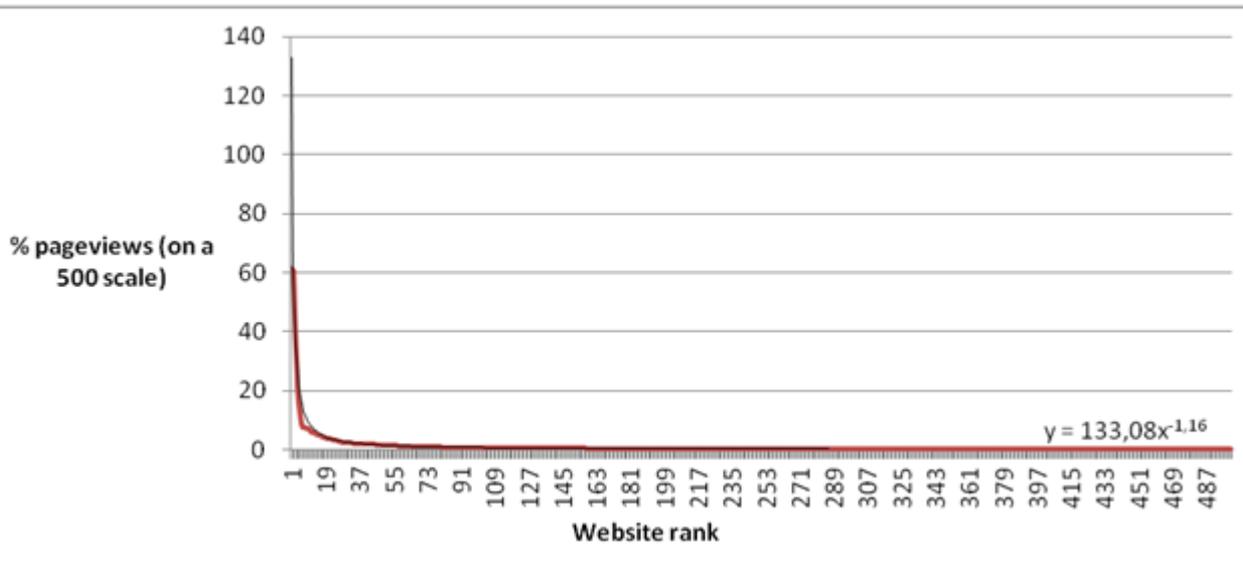
Indication : Weighted ratio of IPv6:

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



Home

World-scale data

Information

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

Users

Like 864

Tweet

Connecting through :



United States of America

% of WEB Pages Available over IPv6: **34.19%** | **number of sites: 20 / 500**

Others: **In development/test : 1.5% (7/500)** | **Failing : 12.33% (9/500)** | **Not V6 enabled : 52.02% (464/500)**

Norway

% of WEB Pages Available over IPv6: **33.76%** | **number of sites: 49 / 500**

Others: **In development/test : 2.75% (8/500)** | **Failing : 15.95% (7/500)** | **Not V6 enabled : 47.58% (436/500)**

France

% of WEB Pages Available over IPv6: **35.78%** | **number of sites: 29 / 500**

Others: **In development/test : 0.52% (4/500)** | **Failing : 11.04% (4/500)** | **Not V6 enabled : 52.7% (463/500)**

Japan

% of WEB Pages Available over IPv6: **22.15%** | **number of sites: 27 / 500**

Others: **In development/test : 2.92% (8/500)** | **Failing : 3.08% (4/500)** | **Not V6 enabled : 71.9% (461/500)**

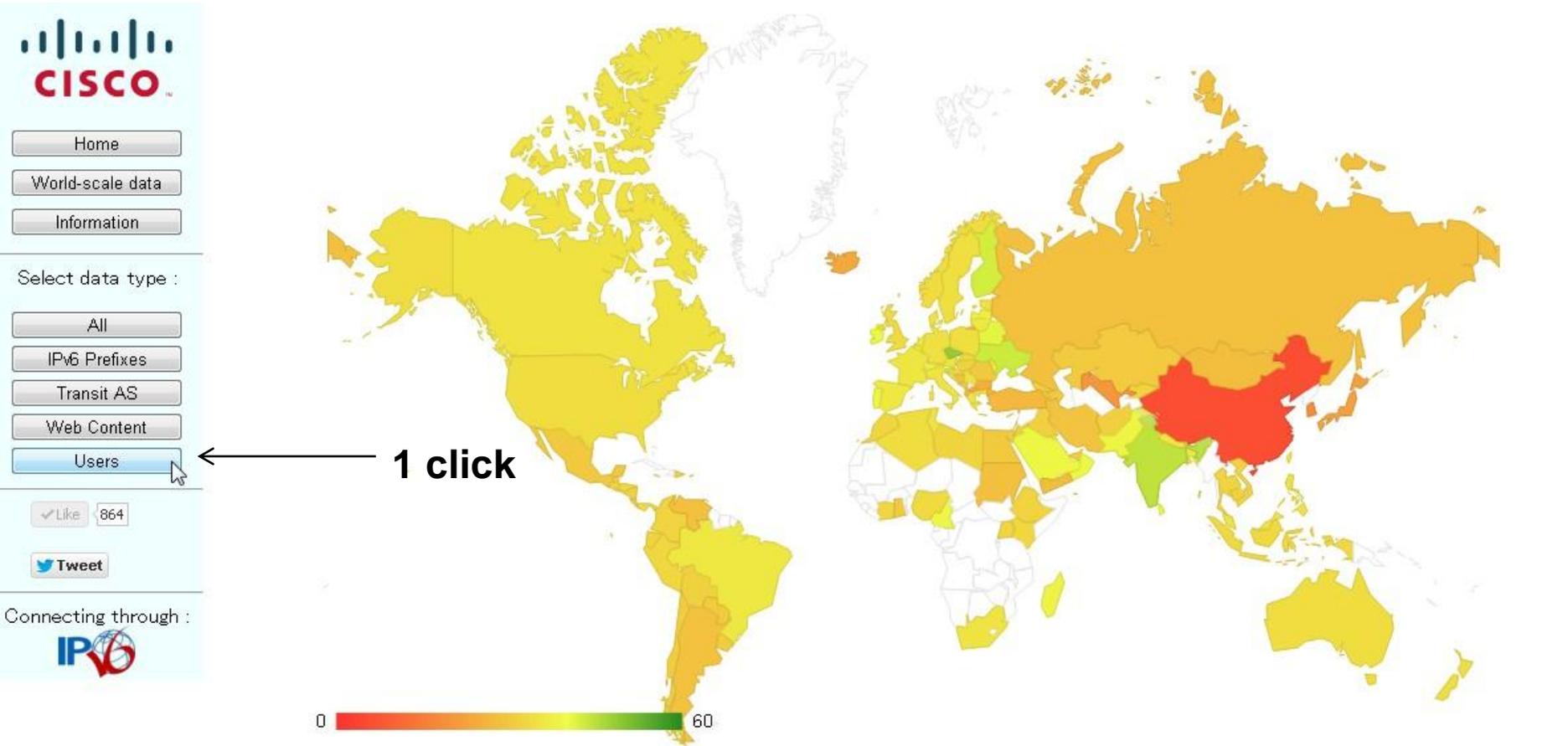
Brazil

% of WEB Pages Available over IPv6: **36%** | **number of sites: 49 / 500**

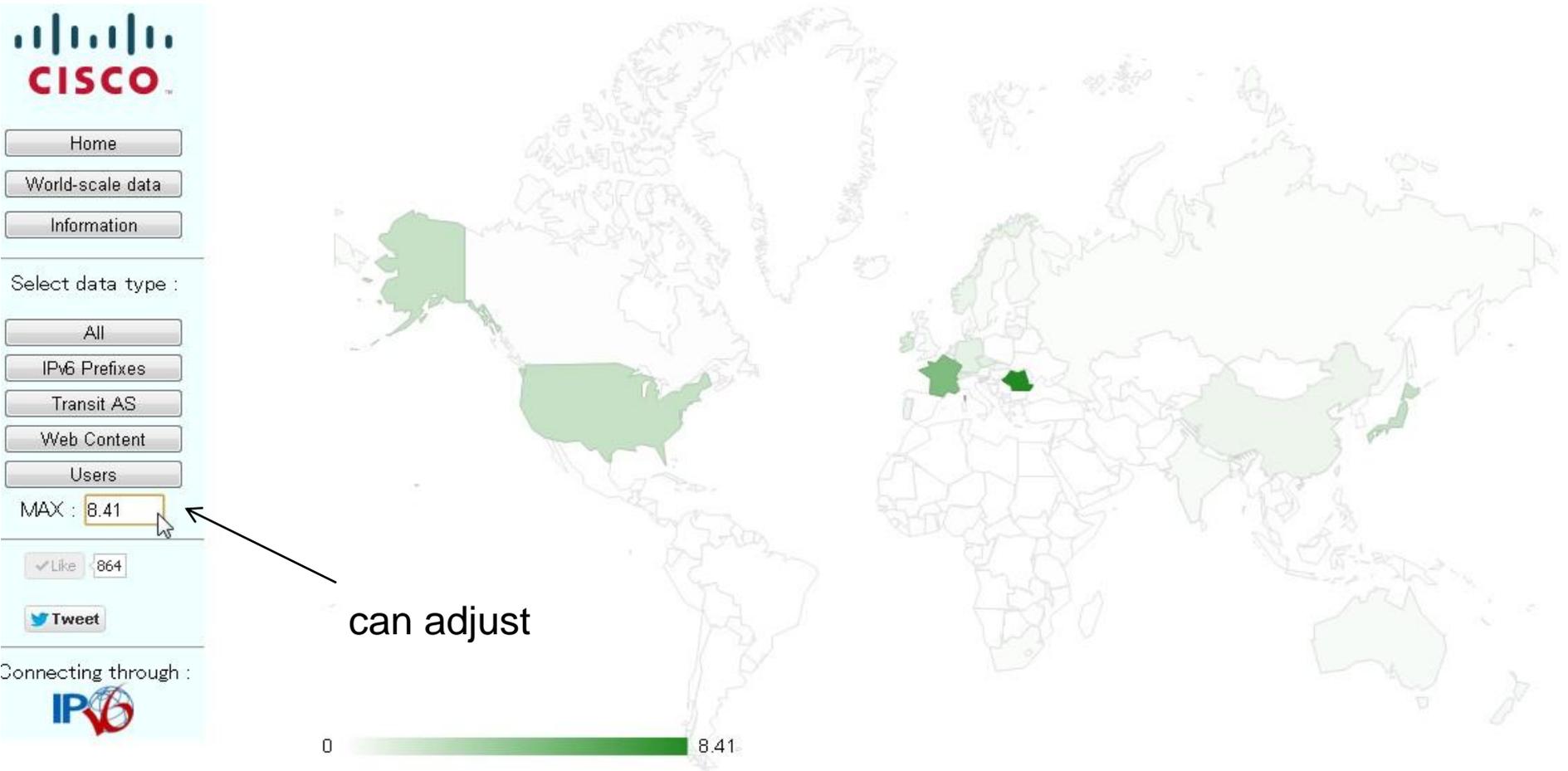
Others: **In development/test : 0.48% (5/500)** | **Failing : 19.53% (21/500)** | **Not V6 enabled : 44.03% (425/500)**

U  6U

IPv6 adoption statics,web contents



IPv6 adoption statics,users



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 apart from countries where Google is not #1 search engine, numbers are very consistent.
- APNIC is probably more representative in theses countries (ex: China,Japan)
- Sources:
 - Google - <http://www.google.com/intl/en/ipv6/statistics.html>
 - APNIC - <http://labs.apnic.net/dists/v6dcc.html>

IPv6 adoption statics,users



Home

World-scale data

Information

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

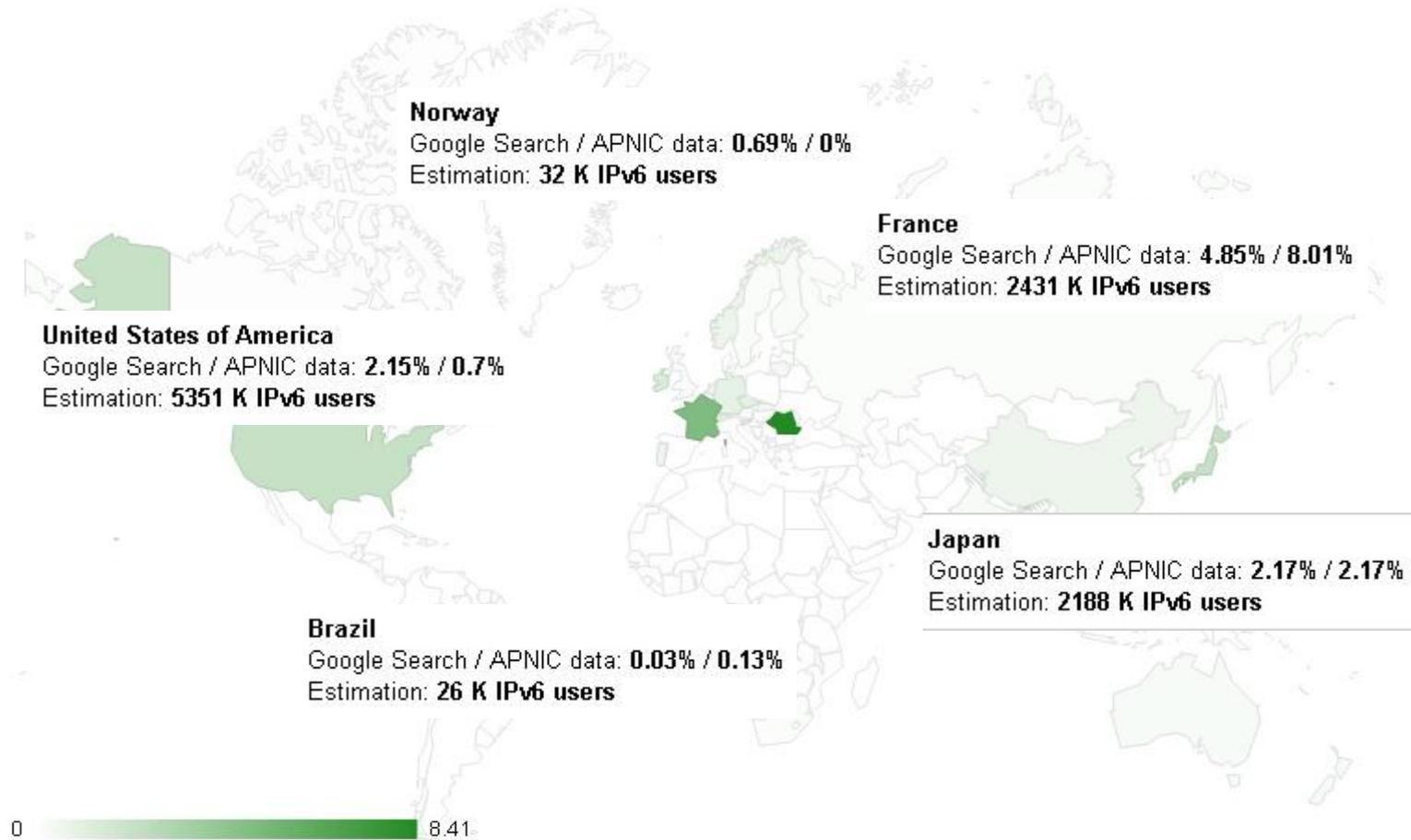
Users

MAX : 8.41

Like 864

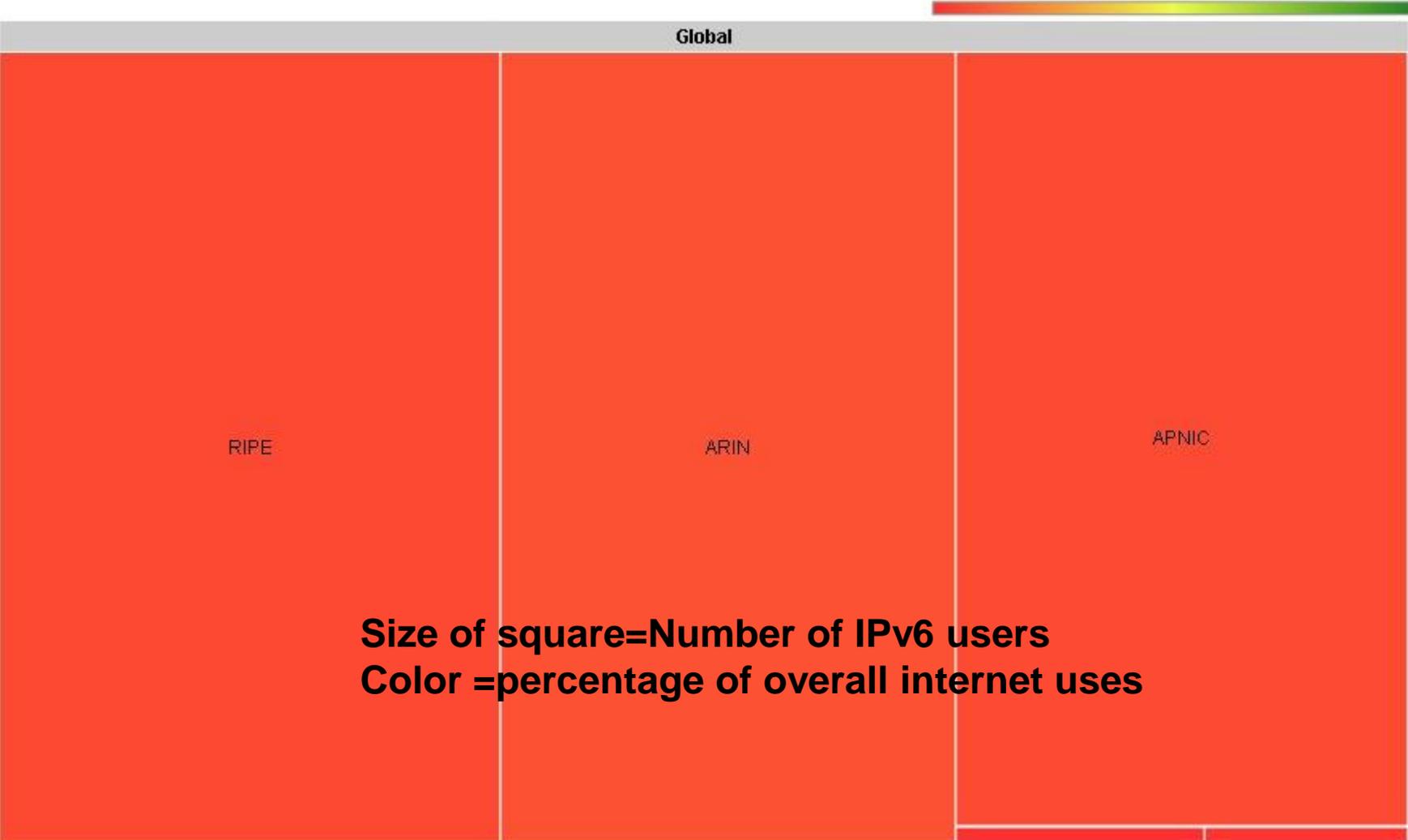
Tweet

Connecting through :



IPv6 adoption statics,users

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



Size of square=Number of IPv6 users
Color =percentage of overall internet uses

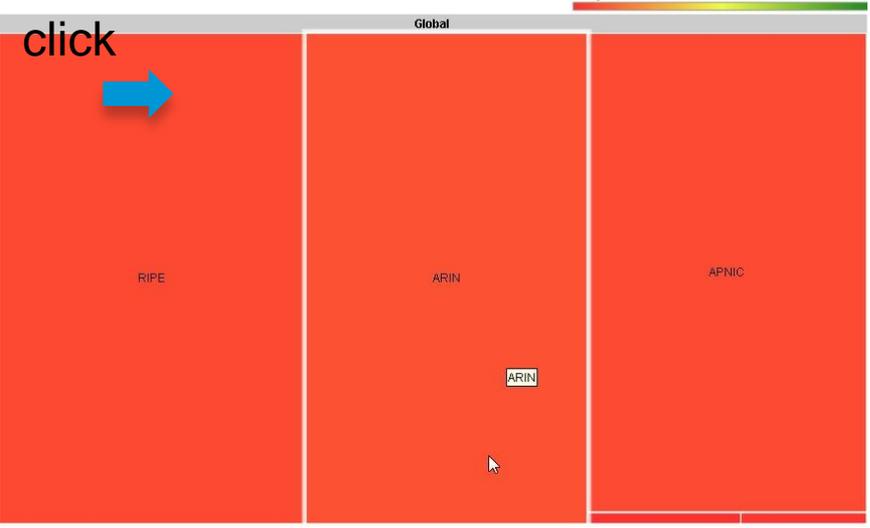
IPv6 adoption statics, users



← left click



right click



More detail world/country historical data



Home

World-scale data

Information

Select data type :

All

IPv6 Prefixes

Transit AS

Web Content

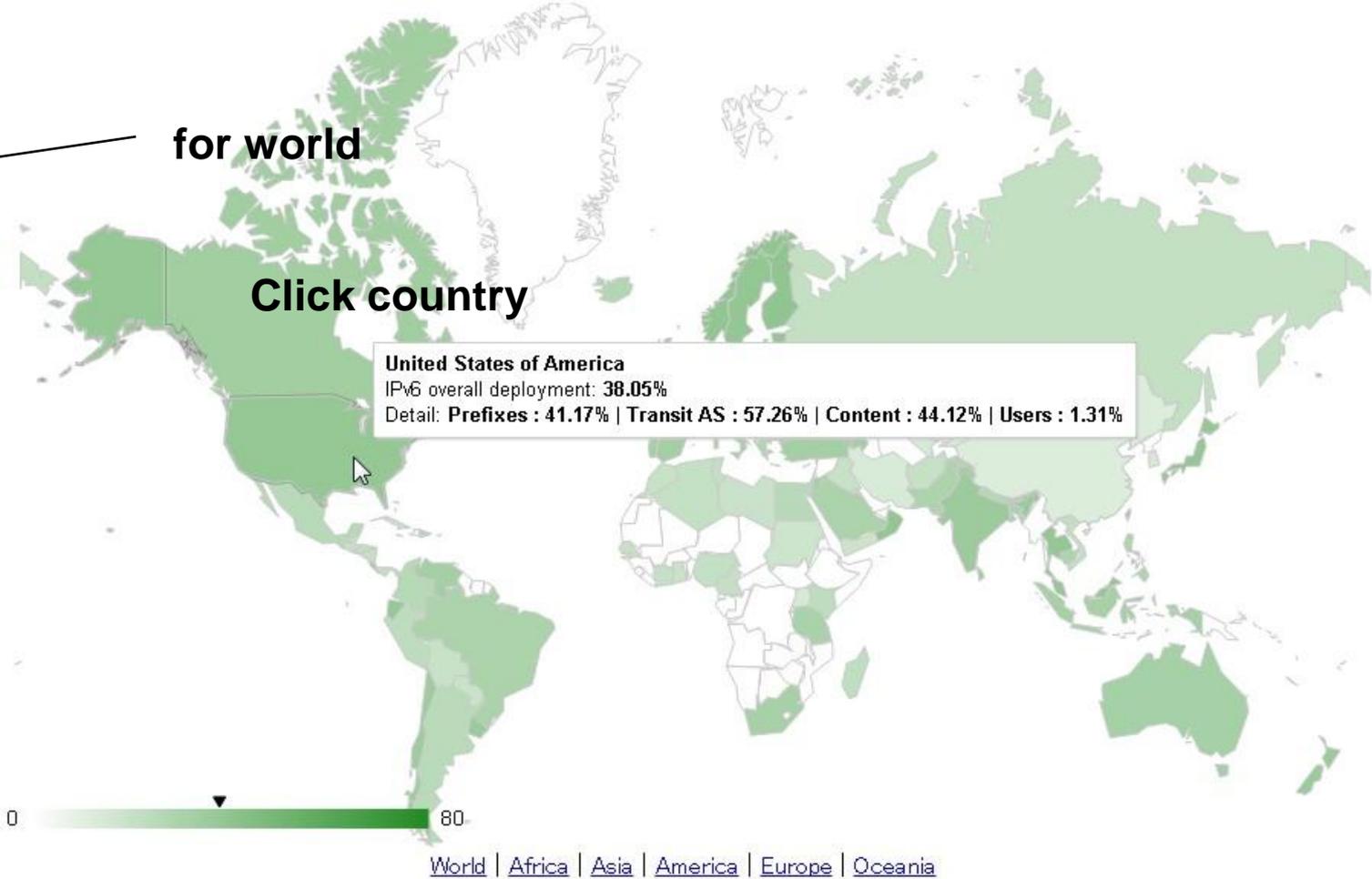
Users

Like 707

+1

Tweet

Connecting through :



More detail world/country historical data



Home

World-scale data

Information

Connecting through :



United States of America

Display IPv6 Prefixes Data

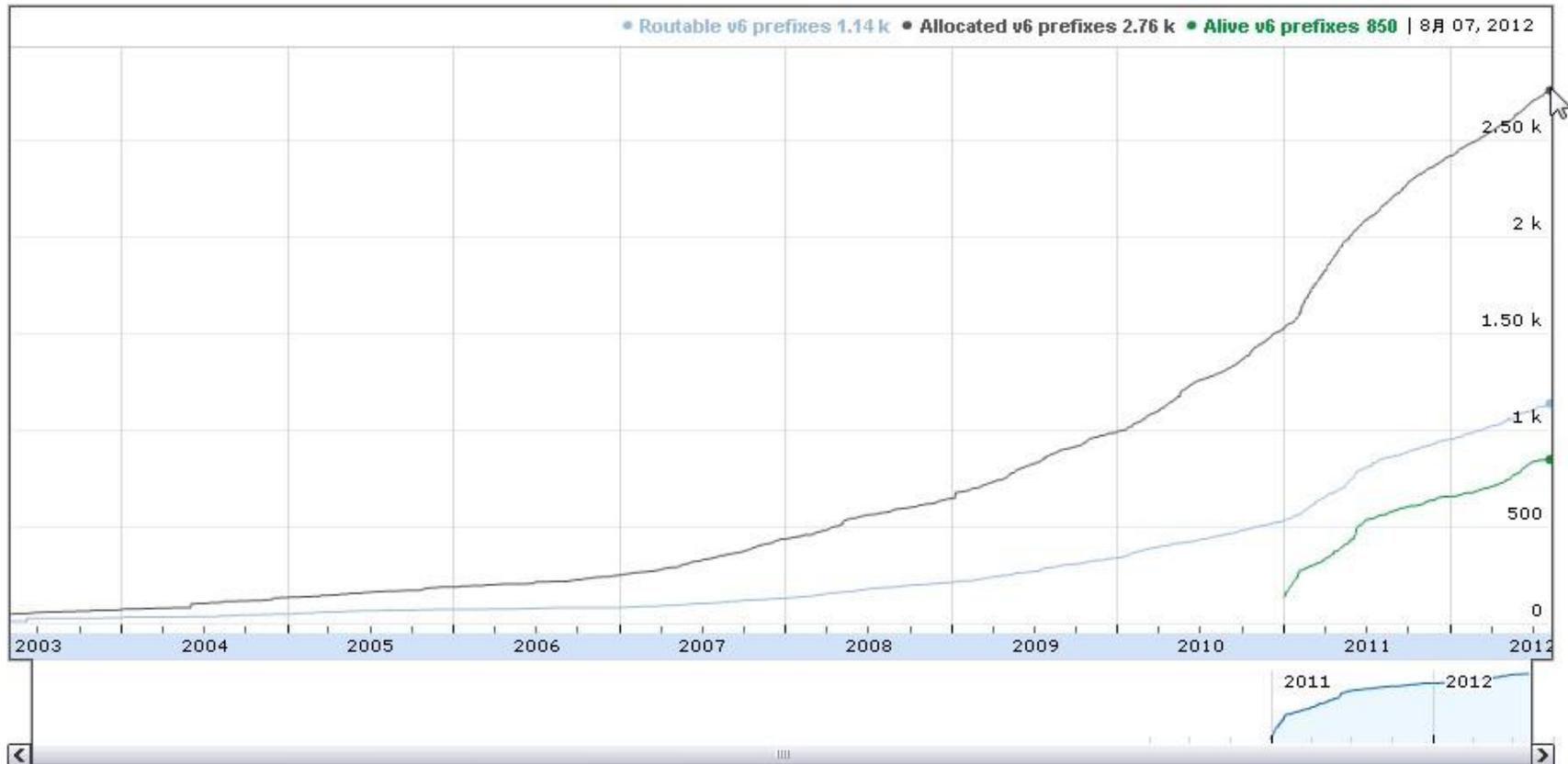
Display Transit AS Data

Display Content Data

Display Users Data

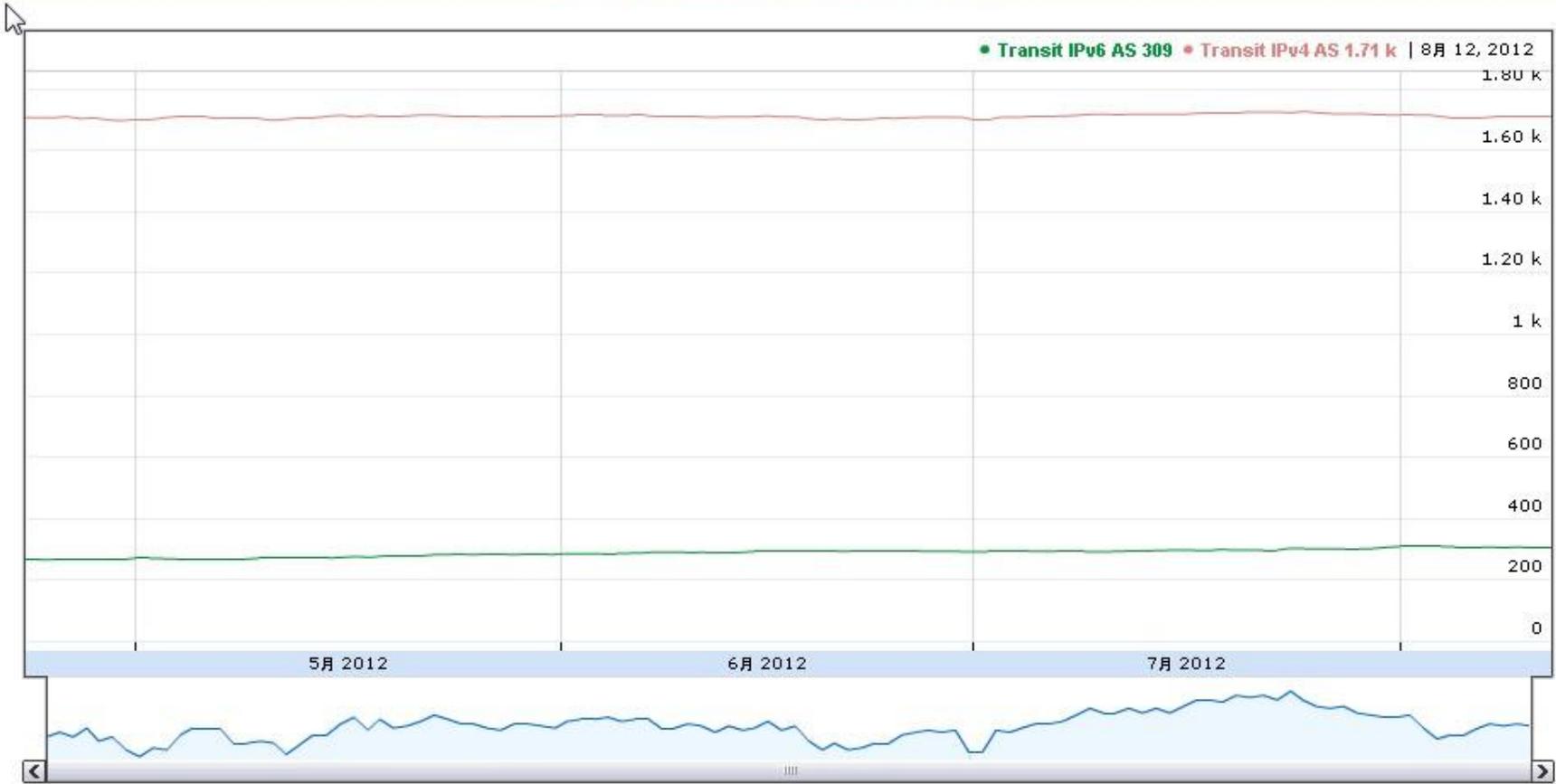
More detail world/country historical data

Display IPv6 Prefixes Data

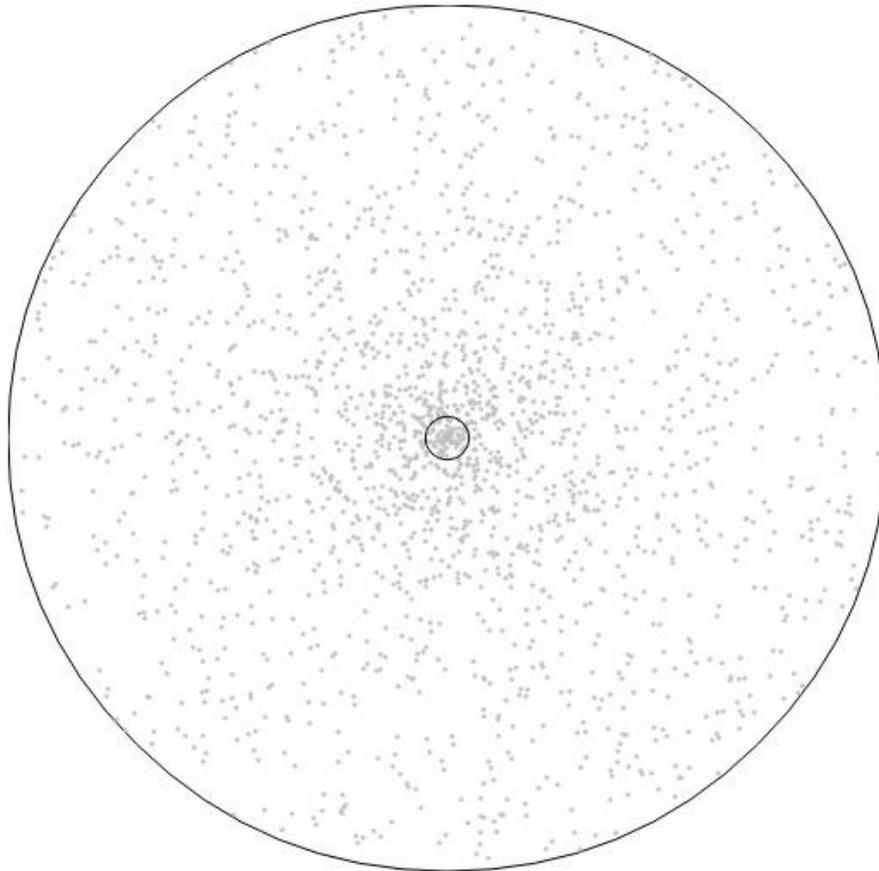


More detail world/country historical data

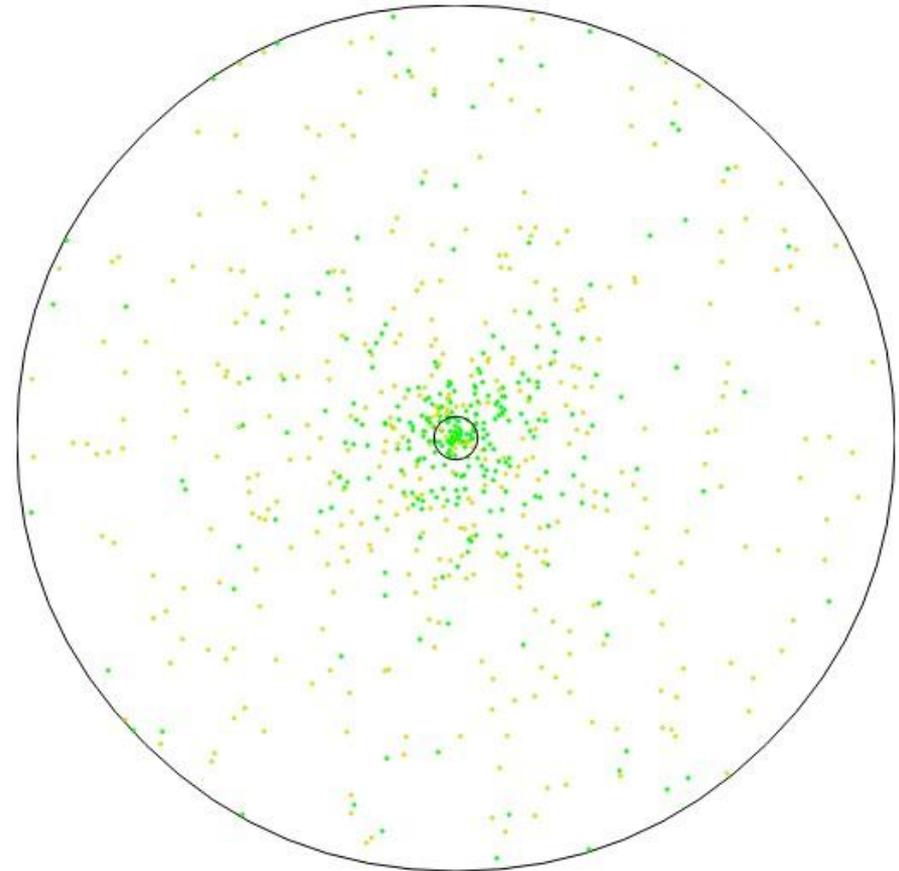
Display Transit AS Data



More detail world/country historical data



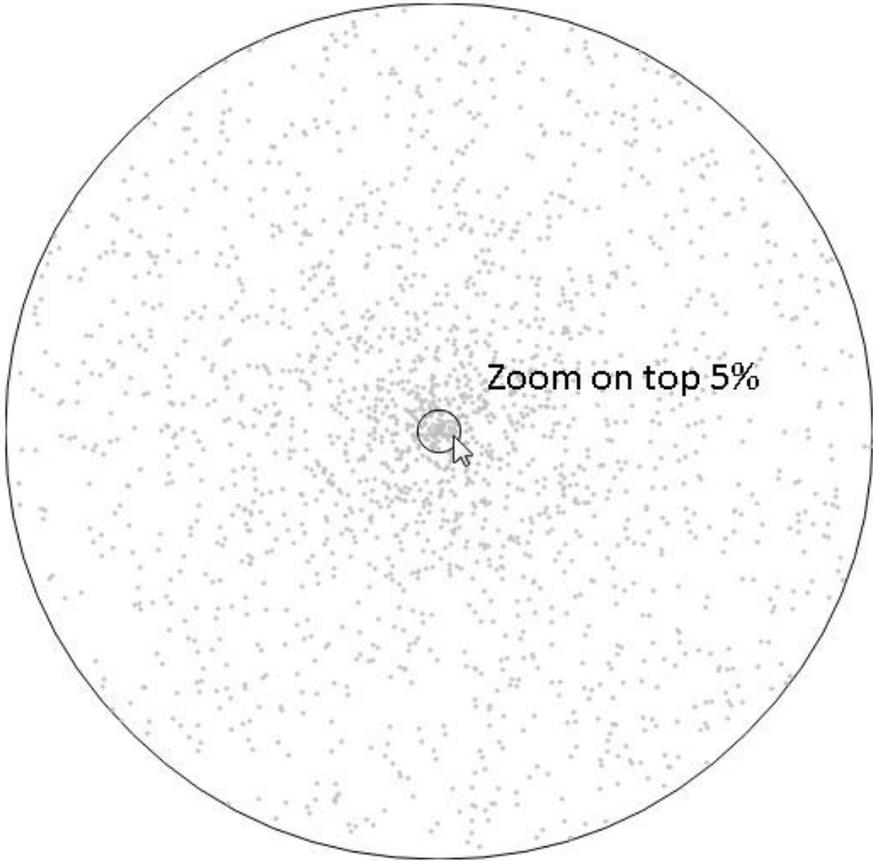
Transit V4 AS (1889)



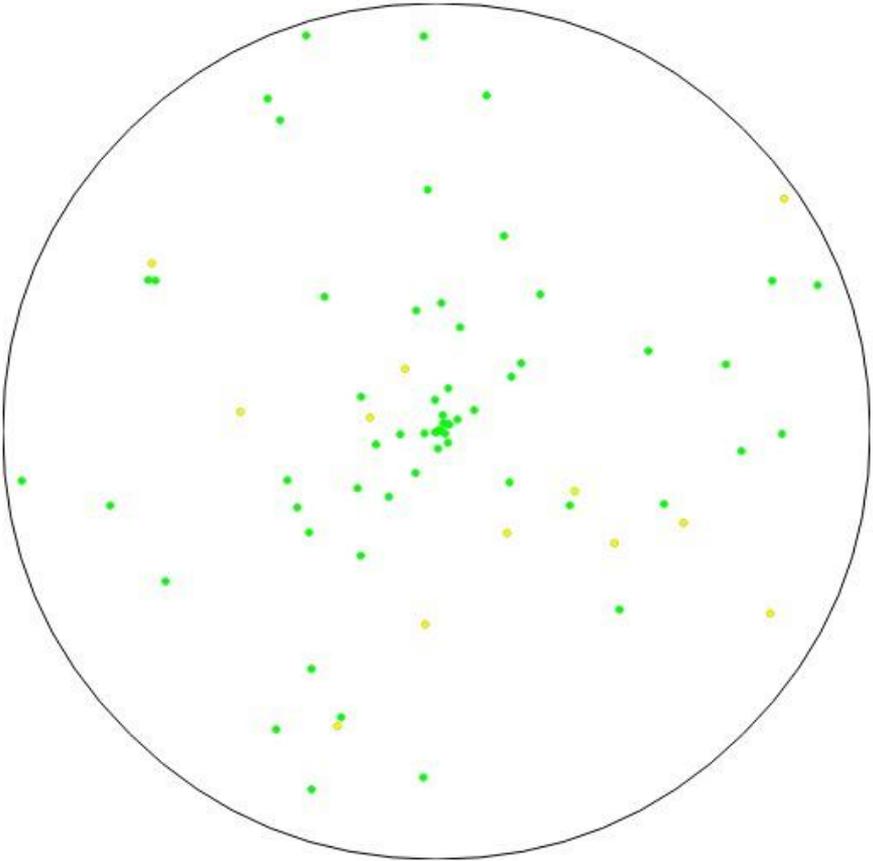
Transit V6 AS (309)

V6 enabled AS, Transit only on V4 (703)

More detail world/country historical data



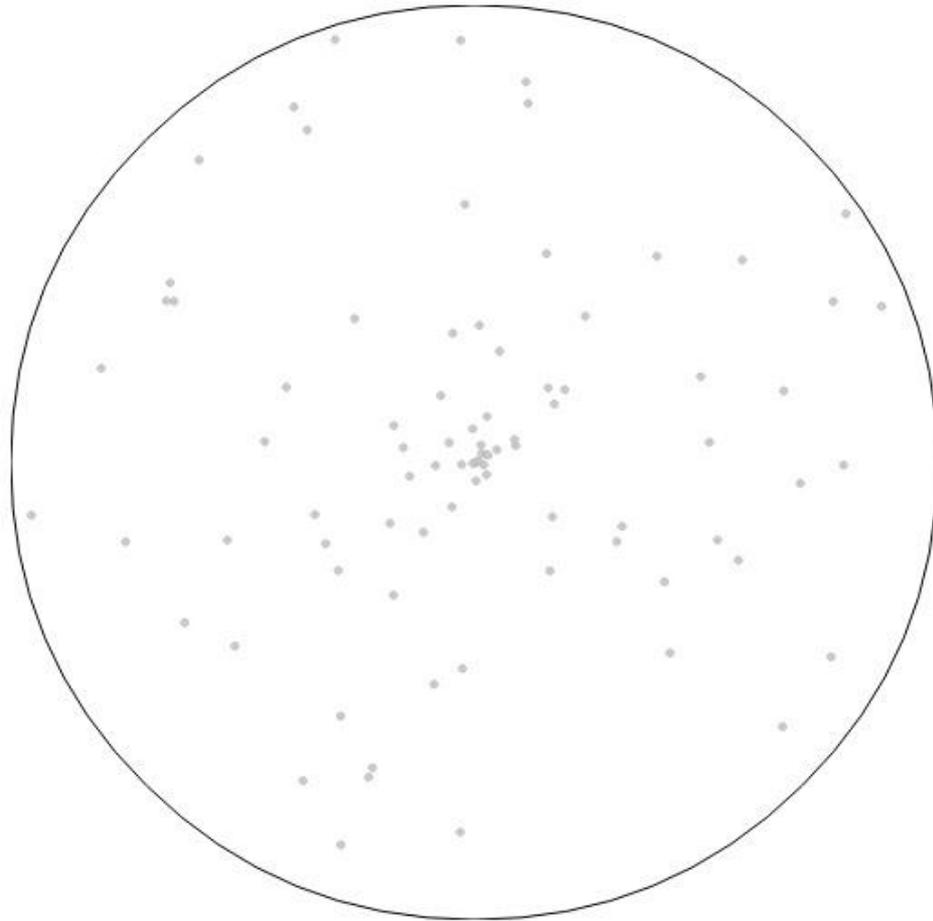
Transit V4 AS (1889)



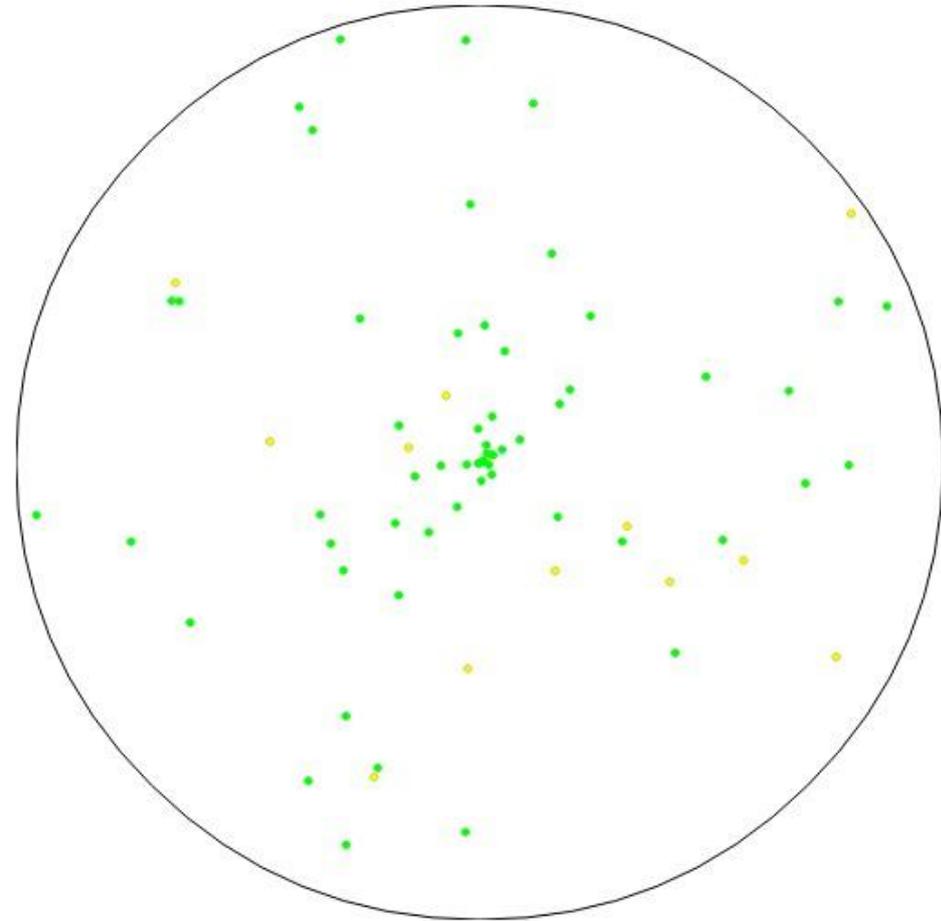
Transit V6 AS (60)

V6 enabled AS, Transit only on V4 (72)

More detail world/country historical data



Transit V4 AS (86)

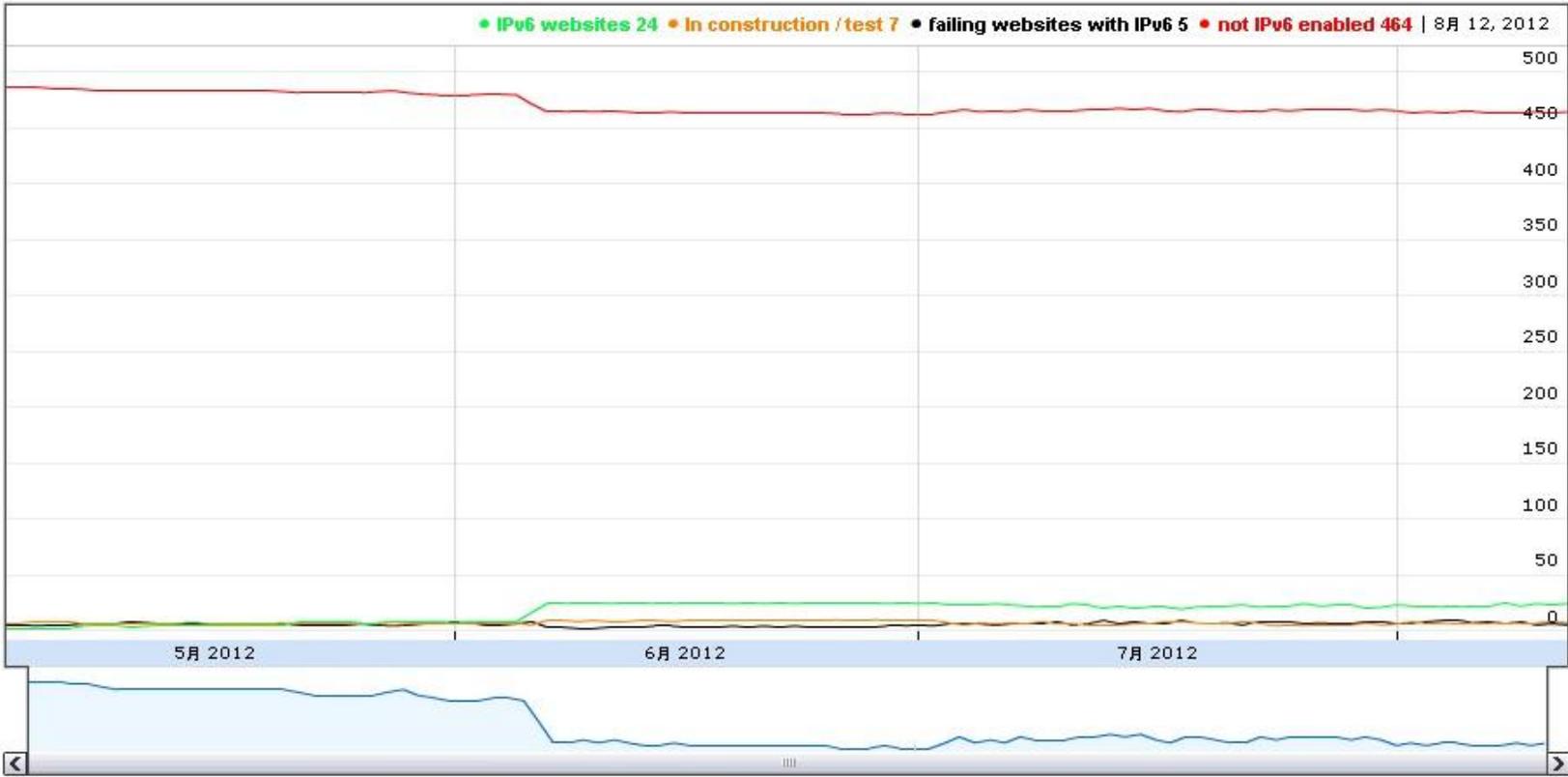


Transit V6 AS (60)

V6 enabled AS, Transit only on V4 (72)

More detail world/country historical data

Display Content Data



More detail world/country historical data

Display Users Data



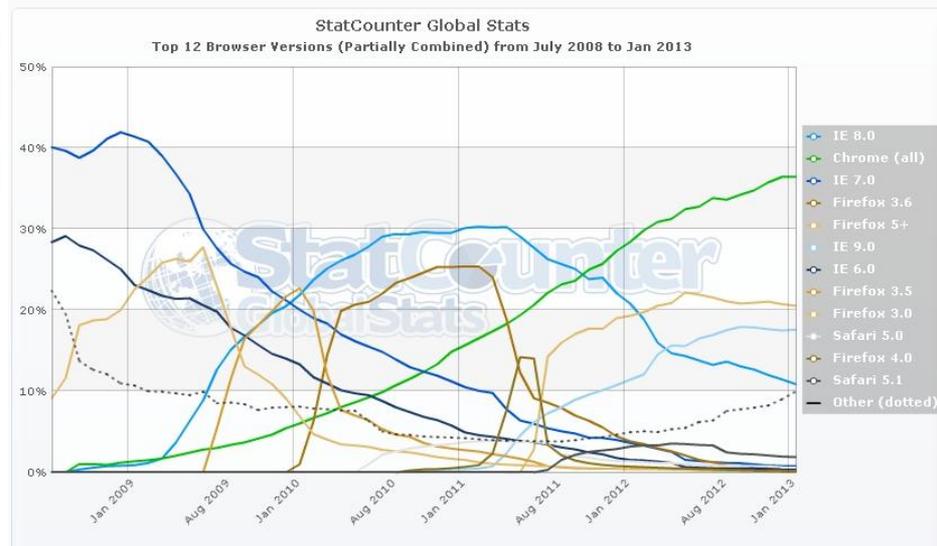
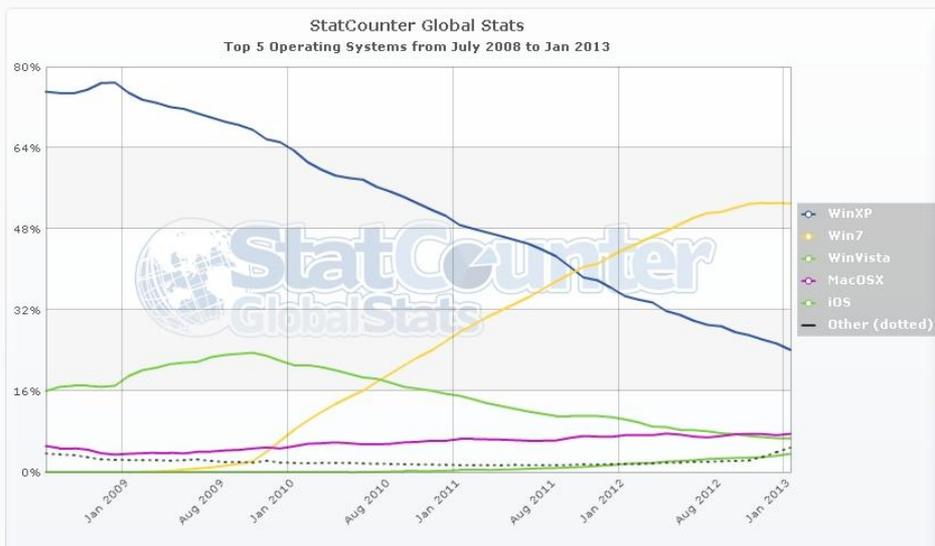
Summary

- 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

- France is very high ratio of users(4.85%/8.01%). free.fr provides 6rd/IPv6 CPE in default
<http://ripe58.ripe.net/content/presentations/ipv6-free.pdf>
- As well as know,Japan has big problem in access network.But it looks good ratio(2.17%)
KDDI Au Hikari providing IPv6 native internet service in their own access network in default.
<http://www.janog.gr.jp/meeting/janog30/doc/janog30-w6l-after-tsuru-01.pdf>
- Many US service provider attending World IPv6 launch.(2.15%)Especially Verizon wireless provide IPv6 IMS and internet in their LTE network.
http://conference.apnic.net/data/assets/pdf_file/0017/50813/vzw_apnic_1346215_2832-2.pdf

Why IPv6 traffic growth, only just enabled IPv6 default.



- Windows7 (IPv6 default) exceeded than XP.
- Most browser enhancements by RFC6555 (Happy Eyeball).

Nation wide IPv6 launch events

- Norway(Prefix:61.08%,TransitAS:85.55%)

Norway did IPv6 day in nation wide.As the result Transit AS and Prefix was growthed .49 site has AAAA in top 500 alexa site.It might need to enable ipv6 access provider and CPE in default.

http://www.fud.no/talks/20110513-IPv6-Kongress-Inciting_Norwegian_IPv6_deployment.pdf

- Brazil(Prefix:67.27%,Contents:36%)

Brazil did IPv6 day in nation wide.Prefix rate is very good and 49 site has AAAA in top 500 alexa site.

But failing rate is also high(21).As the potential reason,Transit AS (34.38%) is very low.It should enable IPv6 core network as the next step.

<http://www.cu.ipv6tf.org/lacnic17/antoniom-summary-ipv6-week.pdf>

- Akamai IPv6 white paper would be useful to enable ipv6 for contents.

<http://www.akamai.co.jp/enja/ipv6>

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.

