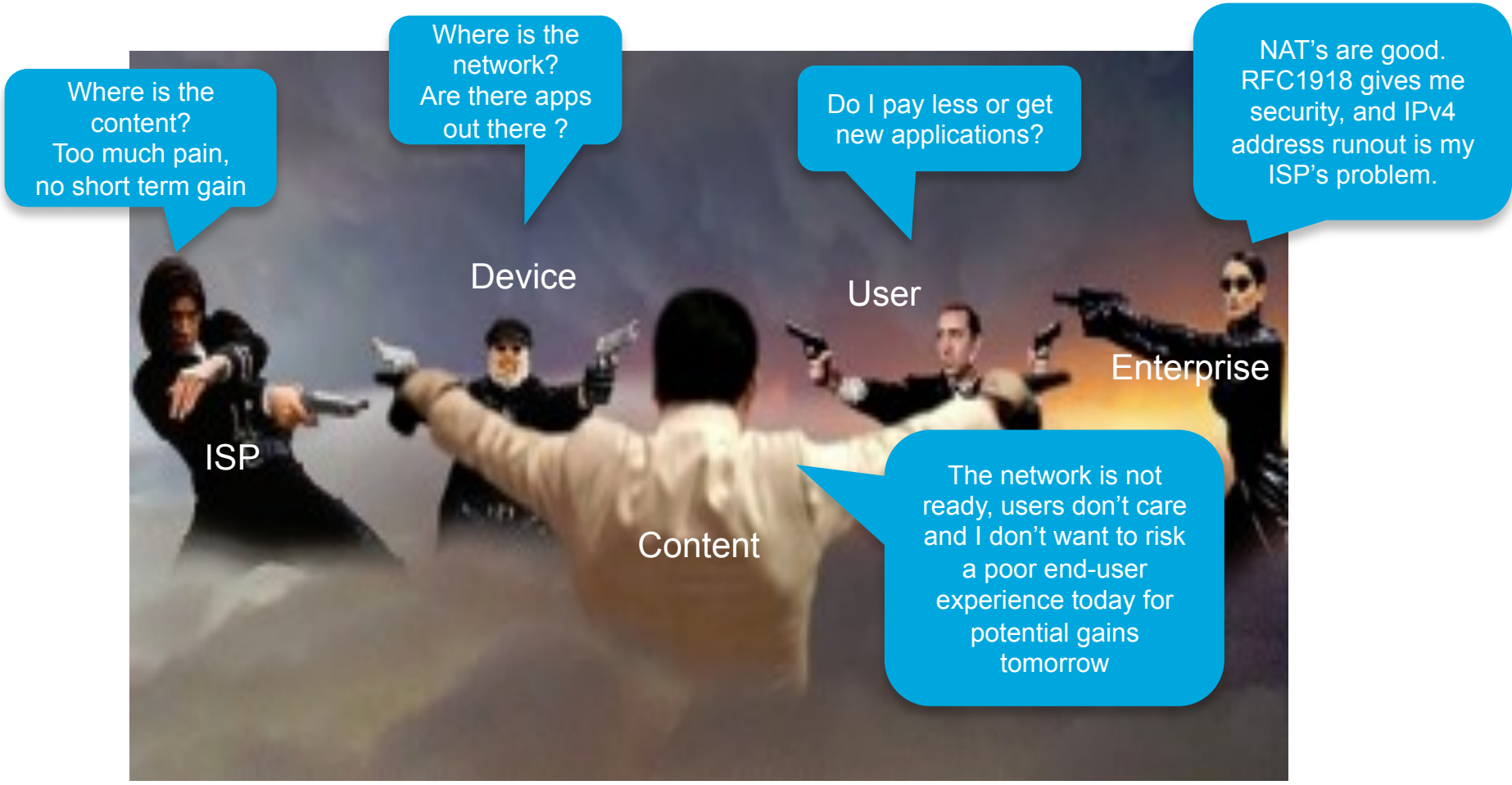
IPv6 Deployment Statistics

Alain Fiocco, Hugo Kaczmarek

© 2010 Cisco and/or its affiliates. All rights reserved.

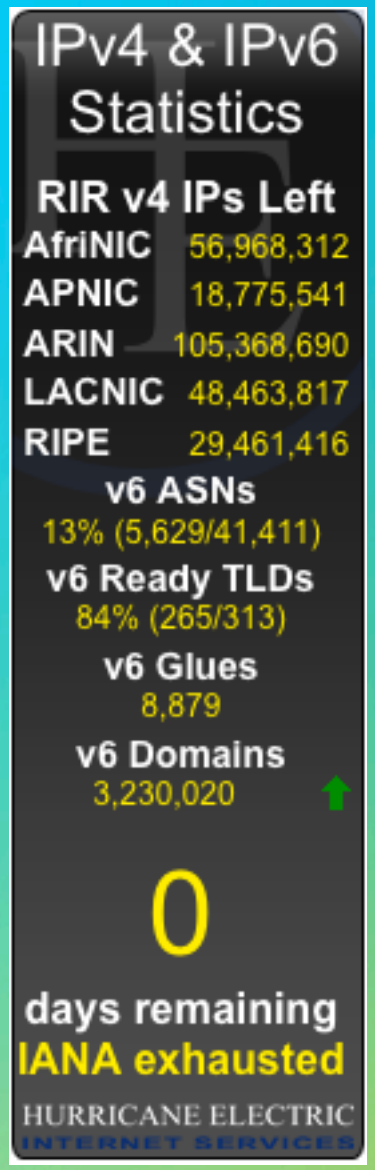
IPv6 migration: A Classic Mexican Standoff

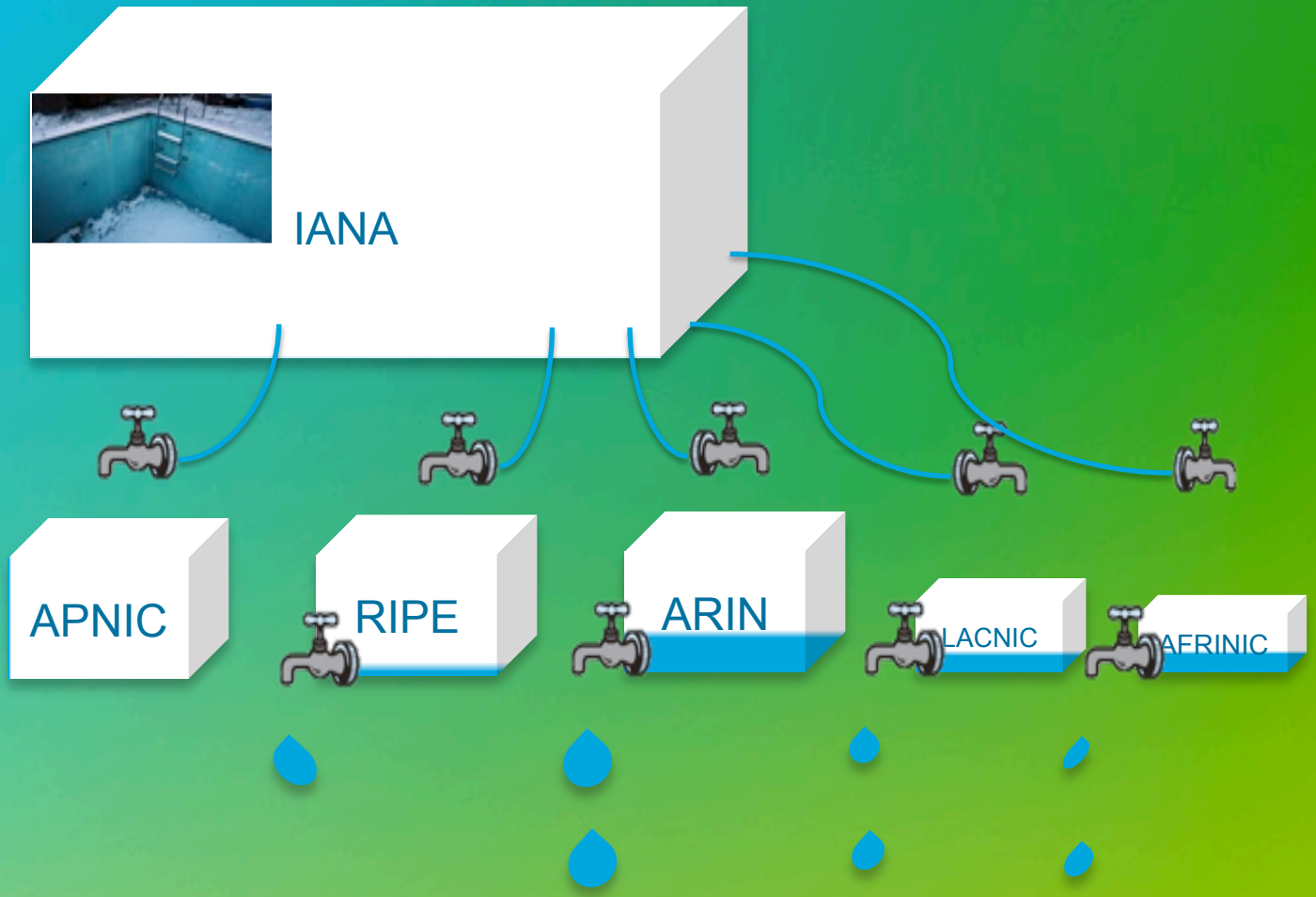


"A deadlock, stalemate, impasse; a roughly equal (frequently unsatisfactory) outcome to a conflict in which there is no clear winner or loser,"

© 2010 Cisco and/or its affiliates. All rights reserved.

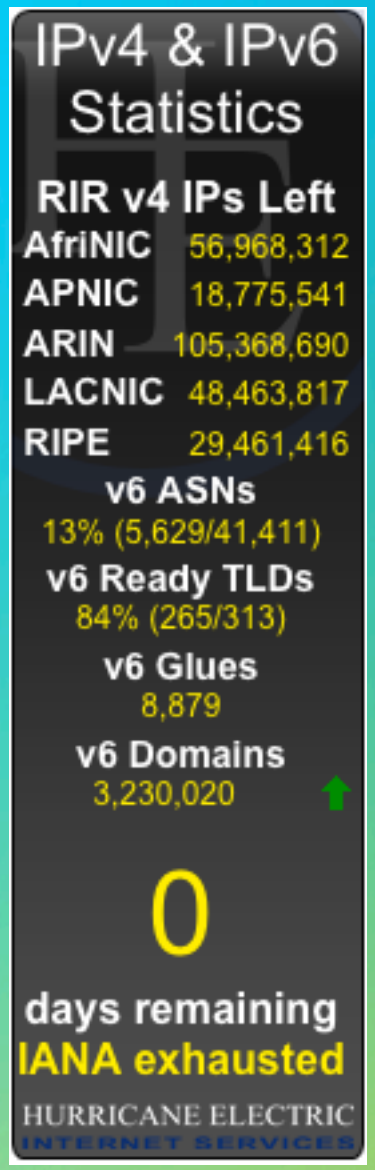
Mean while …IPv4 run-out is very real





- Large Enterprises
- Service Providers
- Local Registry

Mean while …We are running empty !



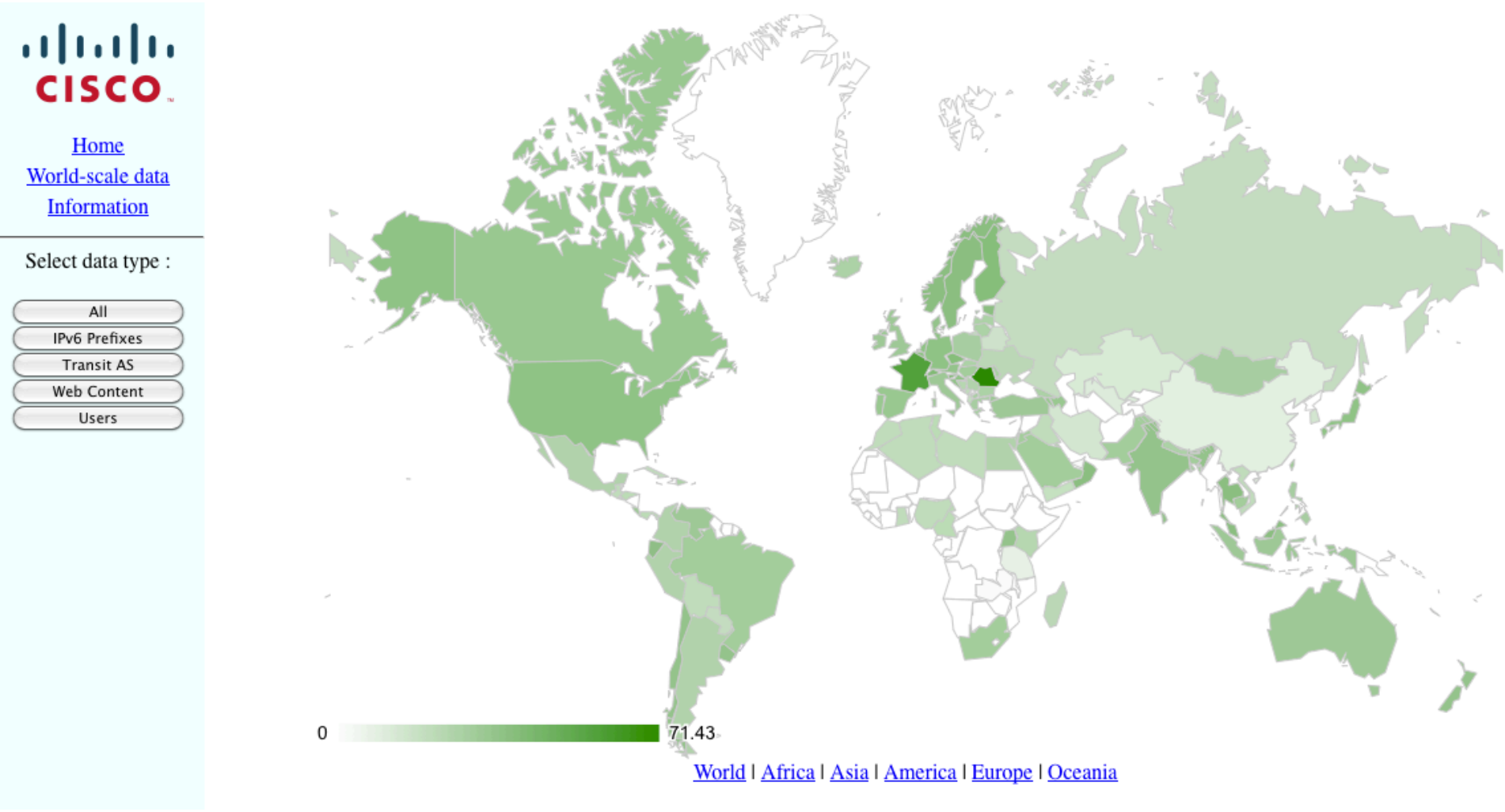
- Large Enterprises
- Service Providers
- Local Registry

Measuring IPv6 adoption lifecycle, enabling data driven business decision

- A multi-step system level transition:
  - IPv6 adoption requires to go through multiple steps, at Global, Regional, Country and Local level
  - Measuring the end stage (IPv6 traffic) is counter productive fm and education standpoint.
  - This life cycle transition can take years before any significant IPv6 traffic can be measured
- Each of theses steps must be measured in order to understand how far along in IPv6 adoption.
  - There are publically available data's, representing most of theses steps that can be gathered and monitored over a period of time.
  - Some of the necessary data's needs to be collected by crawling the WEB and testing web sites.
- Global vs Local:
  - The Core of the Internet, aka Internet Transit is mostly global. However large economies have a local transit system as well, that interconnect all Service providers, Government, University/Education, Local content providers and Enterprises. So both Global transit as well as National transit have to be measured.
  - Although the WEB is truly a global system, users and content statistics have local relevance (language and locality are important aspects of the WEB) and need to be looked at and evaluated locally.
- Information/Data => Better business decision
  - Investment, Business Case, Timing, Government mandate/incentives, Design decision, Education

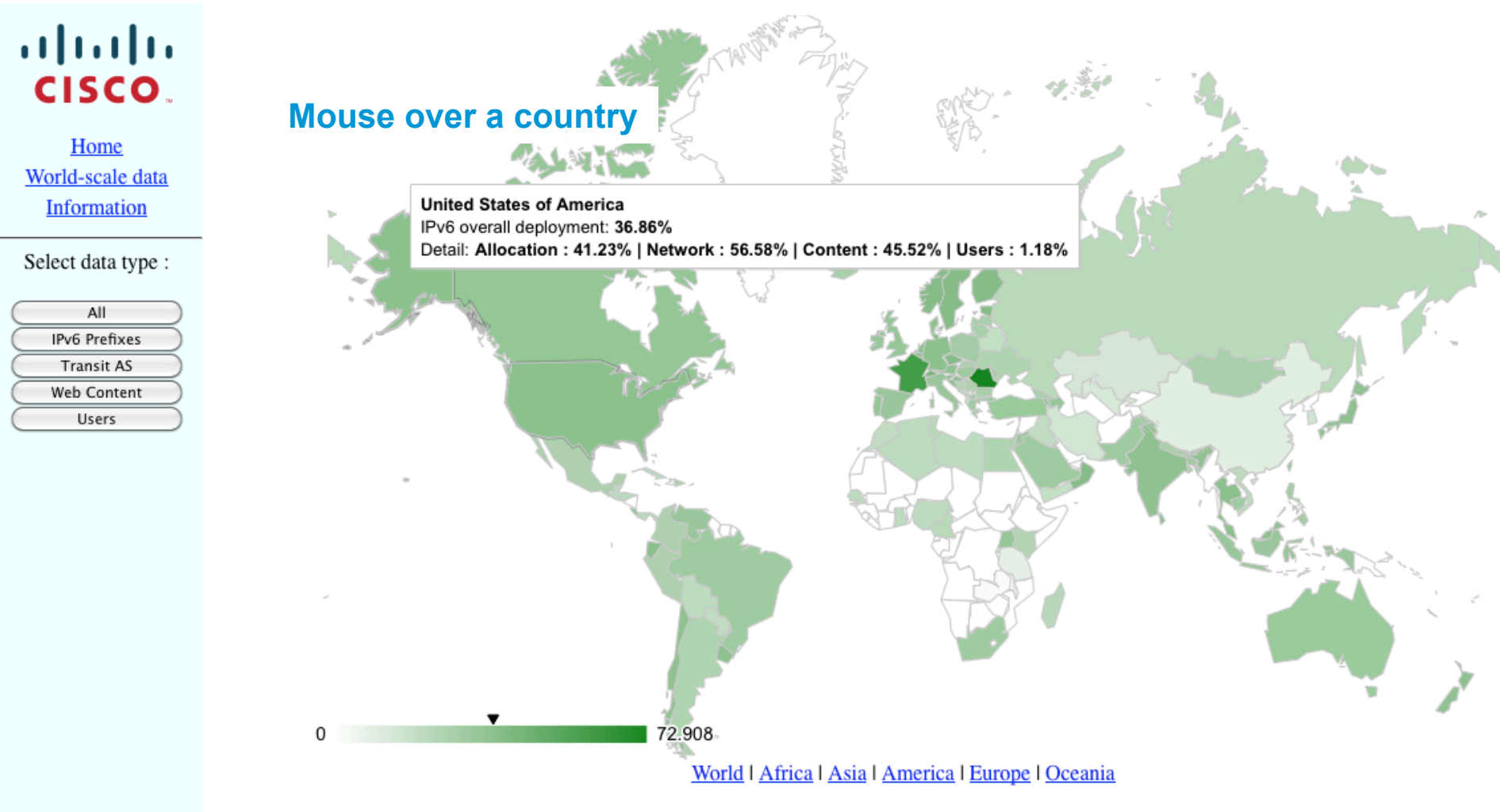
© 2010 Cisco and/or its affiliates. All rights reserved.

Introducing: 6lab.cisco.com/stats



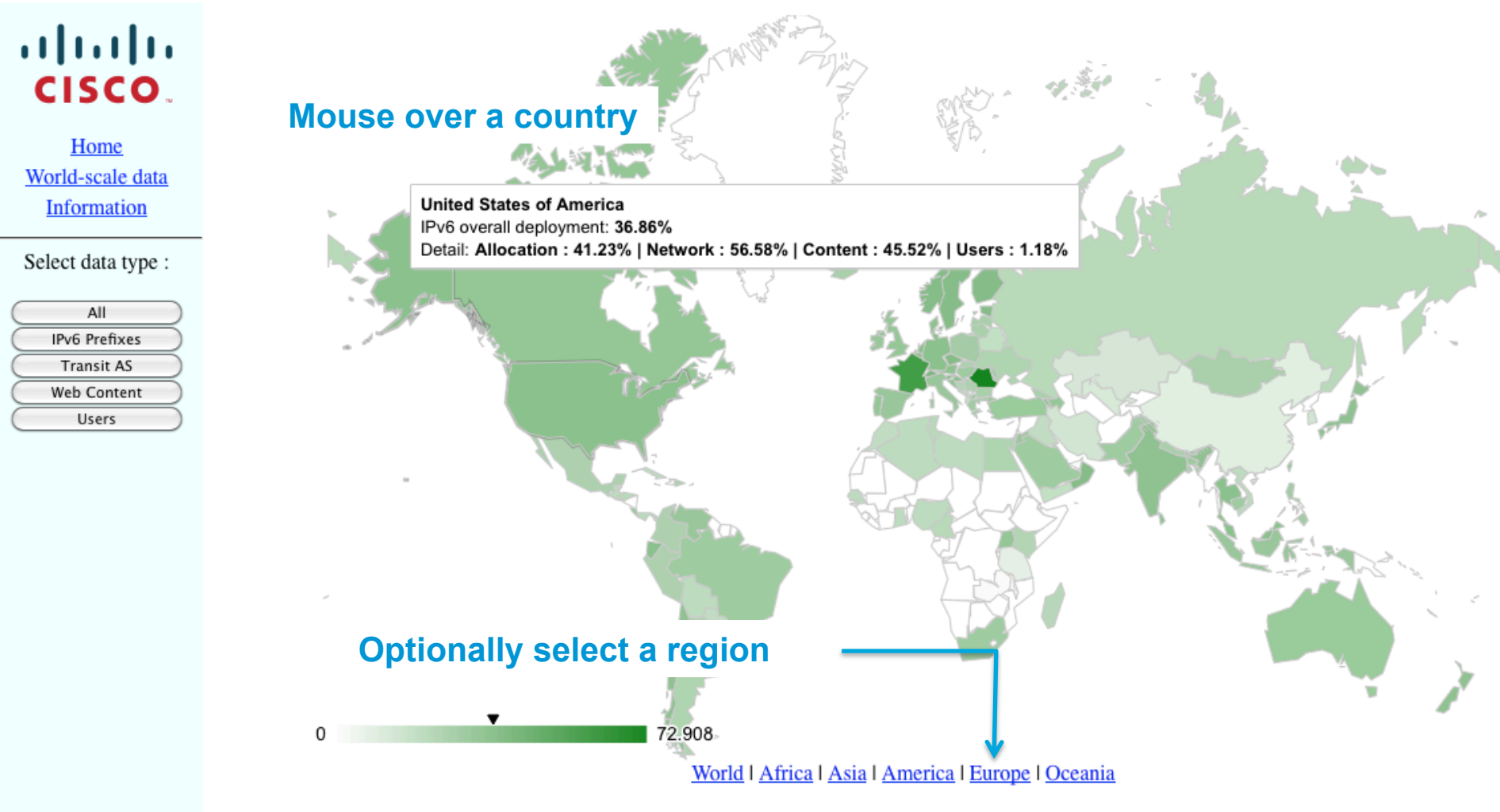
© 2010 Cisco and/or its affiliates. All rights reserved.

IPv6 adoption Statistics, at a glance



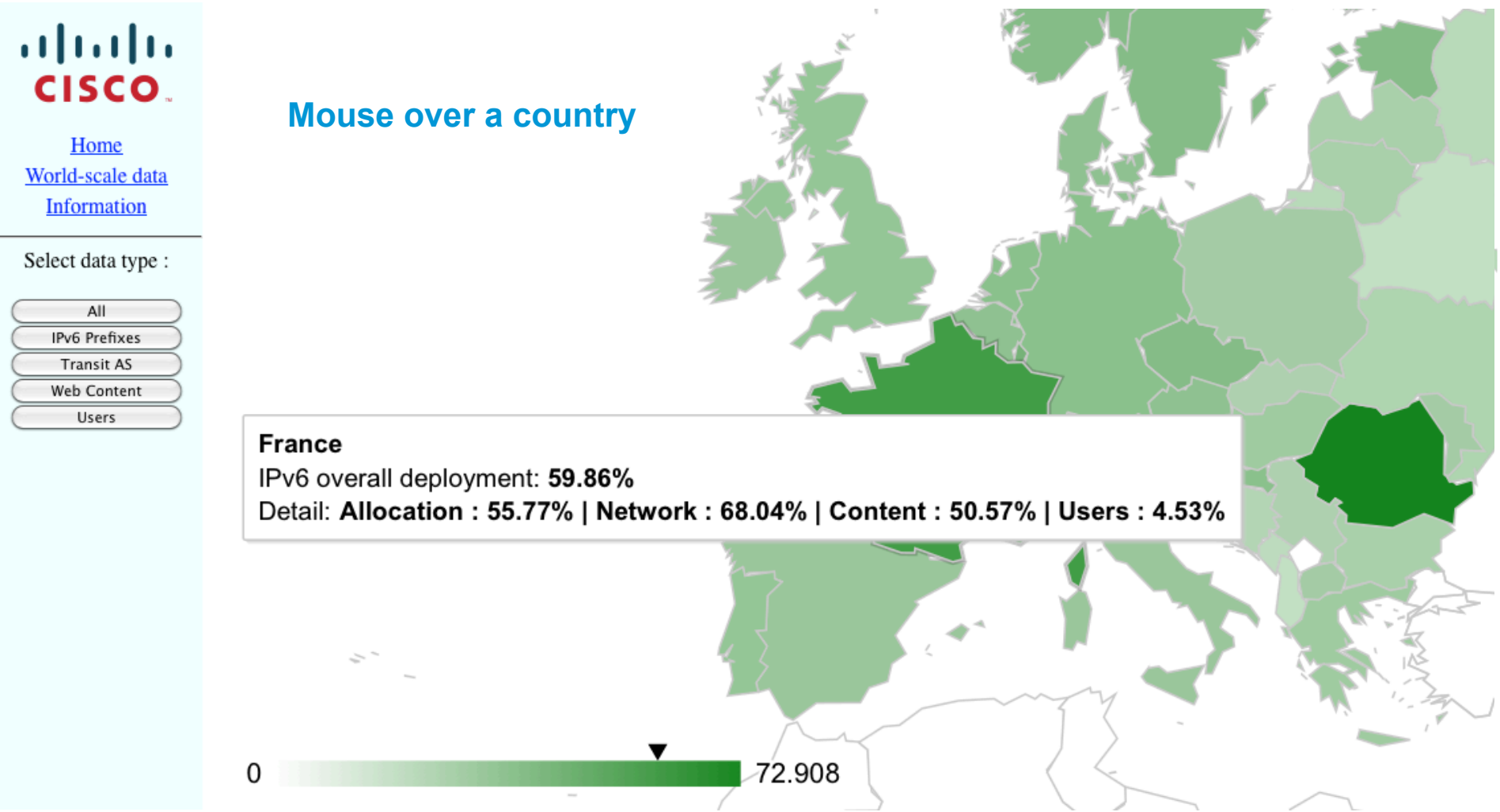
© 2010 Cisco and/or its affiliates. All rights reserved.

IPv6 adoption Statistics, at a glance



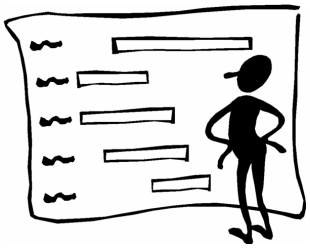
© 2010 Cisco and/or its affiliates. All rights reserved.

IPv6 adoption Statistics, at a glance



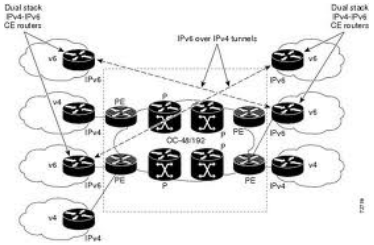
© 2010 Cisco and/or its affiliates. All rights reserved.

Measuring IPv6 adoption lifecycle: Network



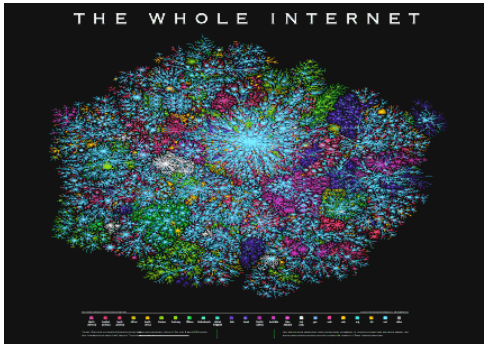
IPv6 Prefix allocation

- # of /32 prefix allocated by country



Is IPv6 configured ?
% of active networks?

- % IPv6 prefix in BGP ?
- % active prefixes ?
- (sending & receiving packets)

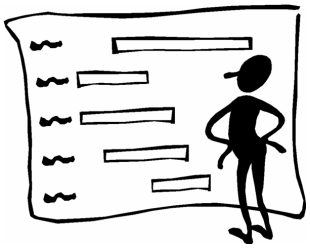


Is Internet Core ready?

- % of IPv6 enabled Transit AS
- % of Transit IPv6 AS

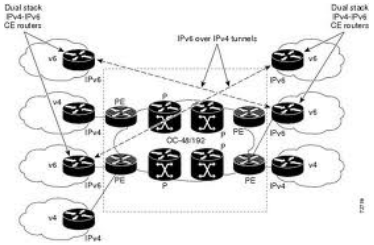
© 2010 Cisco and/or its affiliates. All rights reserved.

Measuring IPv6 adoption lifecycle: Network



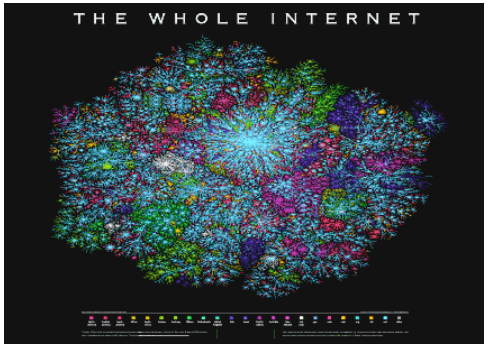
IPv6 Prefix allocation

of /32 prefix allocated by country



Is IPv6 configured ?
% of active networks?

% IPv6 prefix in BGP ?
% active prefixes ?
(sending & receiving packets)



Is Internet Core ready?

% of IPv6 enabled Transit AS

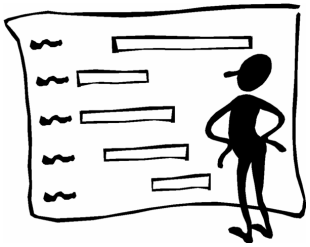
% of Transit IPv6 AS

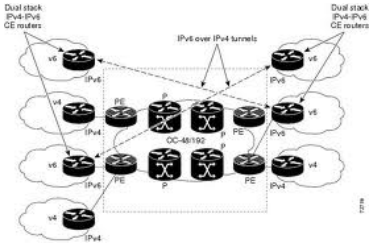
Sources :

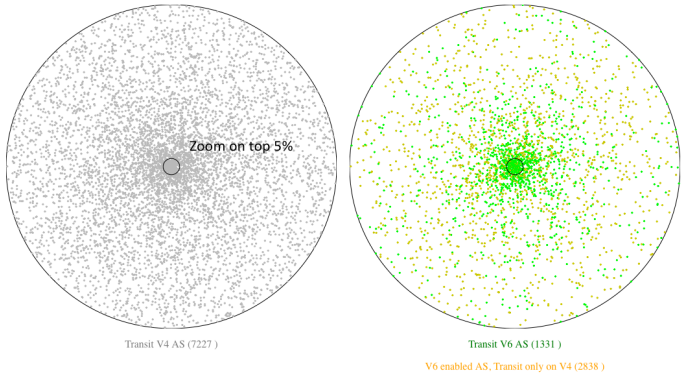
- Whois from RIPE, ARIN, APNIC, AFRINIC, LACNIC
- http://archive.routeviews.org/ (Internet, BGP tables)
- http://www.team-cymru.org/Services/ip-to-asn.html (AS# - Country)

© 2010 Cisco and/or its affiliates. All rights reserved.

Measuring IPv6 adoption lifecycle: Network







IPv6 Prefix allocation

of /32 prefix allocated by country

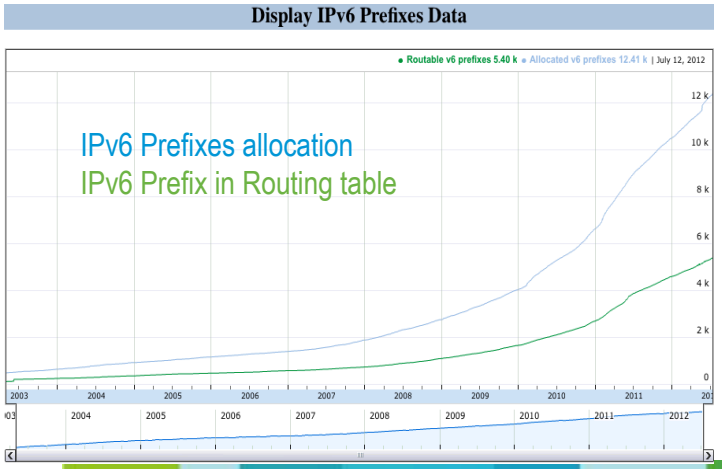
Is IPv6 configured ? % of active networks?

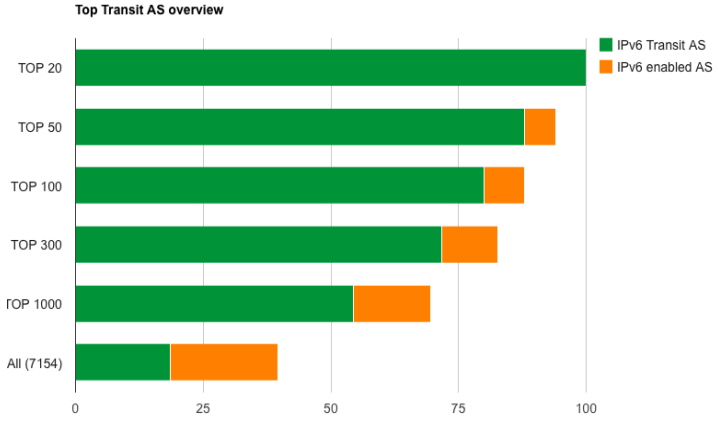
% IPv6 prefix in BGP ?
% active prefixes ?
(sending & receiving packets)

Is Internet Core ready?

% of IPv6 enabled Transit AS

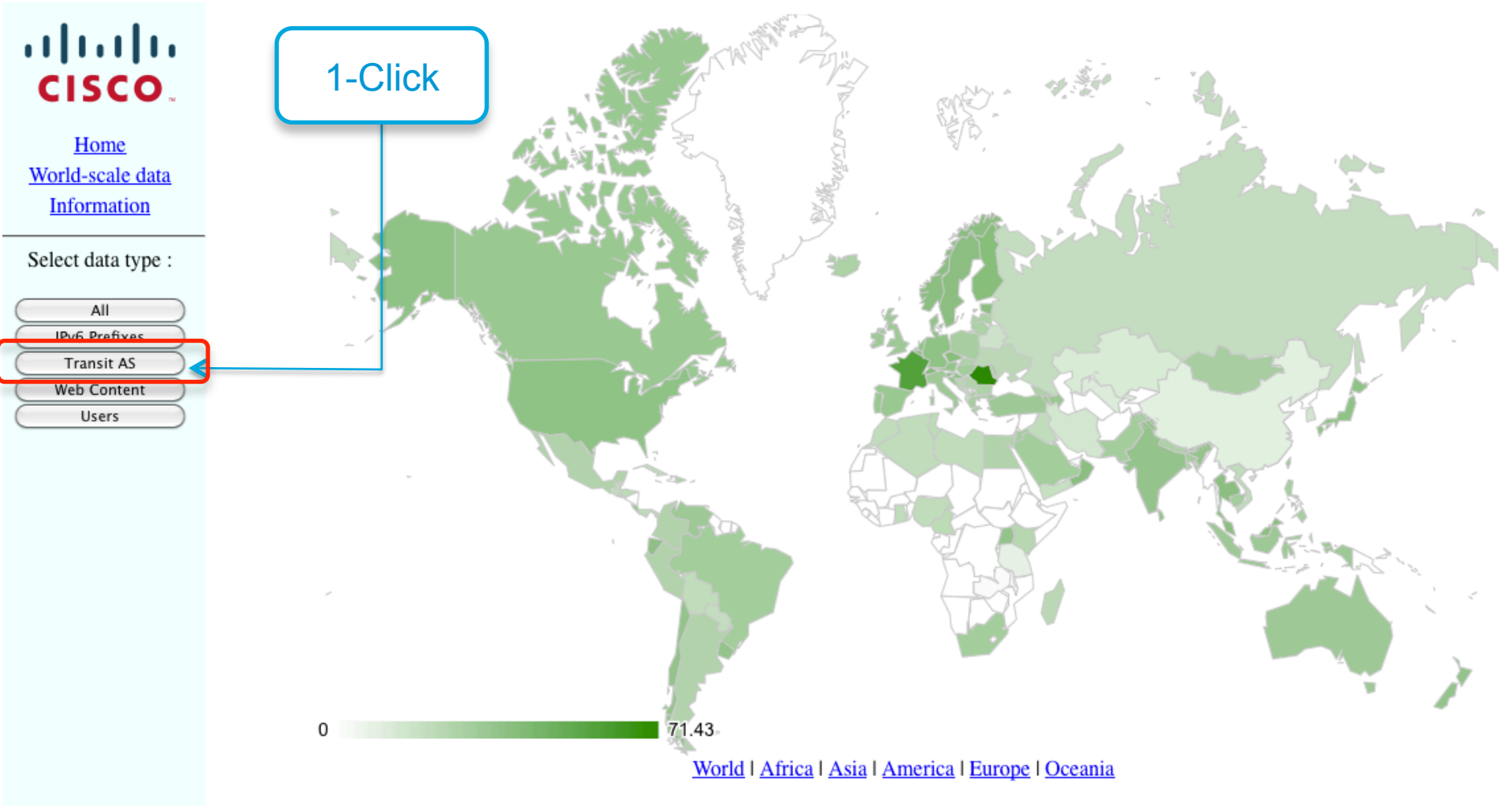
% of Transit IPv6 AS





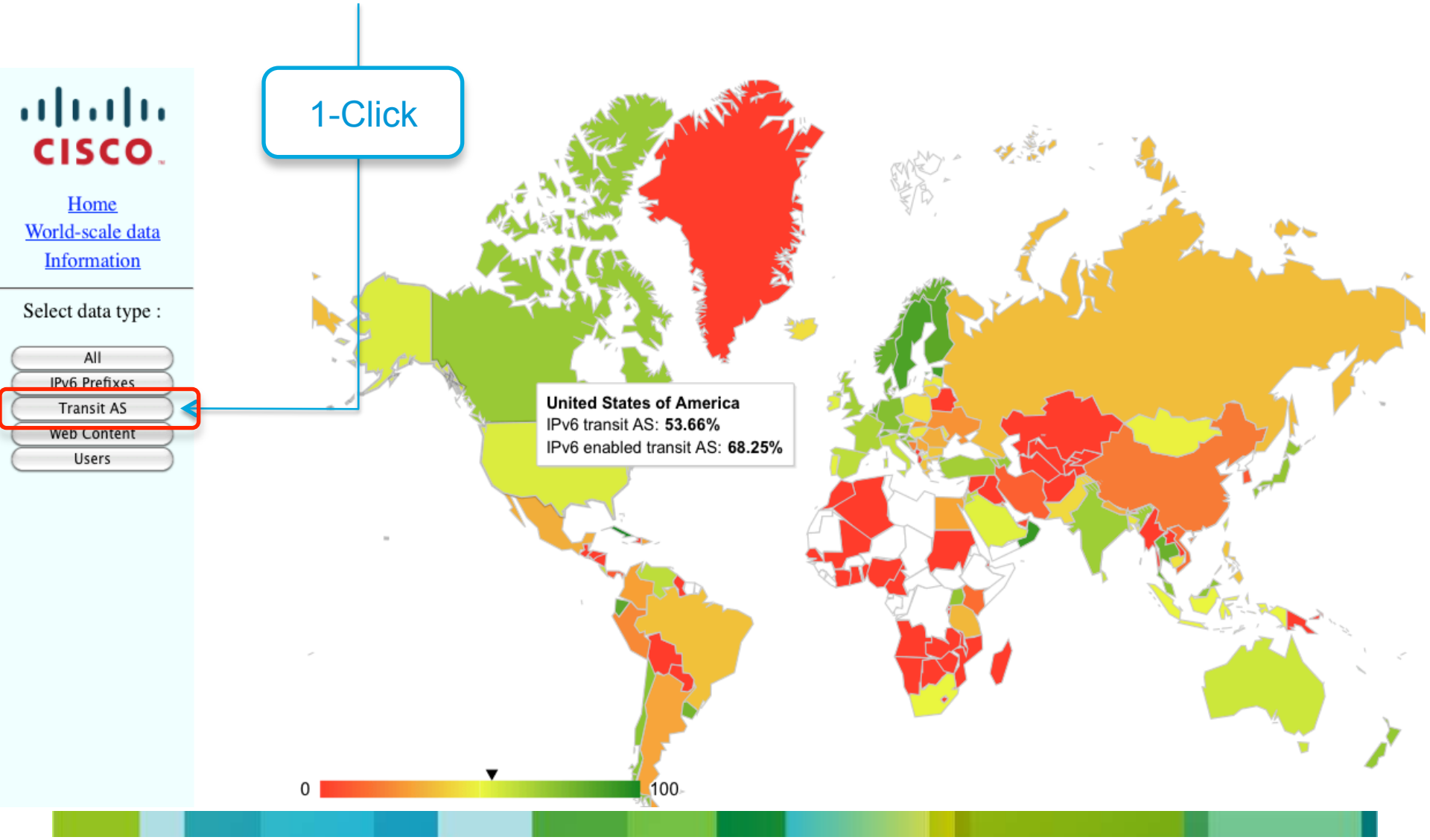
© 2010 Cisco and/or its affiliates. All rights reserved.

6lab.cisco.com/stats – home page



© 2010 Cisco and/or its affiliates. All rights reserved.

% of IPv6 Transit AS

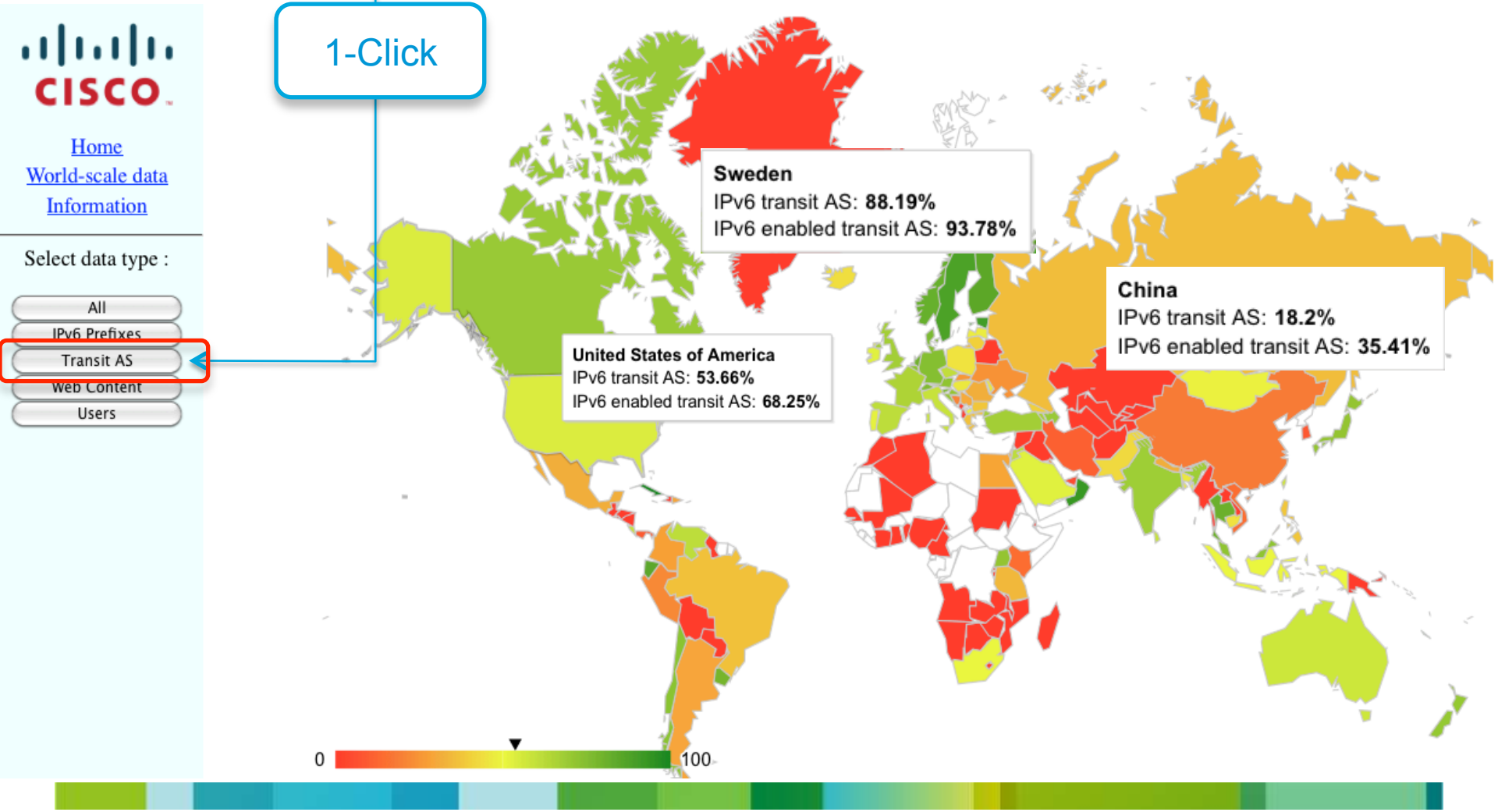


© 2010 Cisco and/or its affiliates. All rights reserved.

% of IPv6 Transit AS

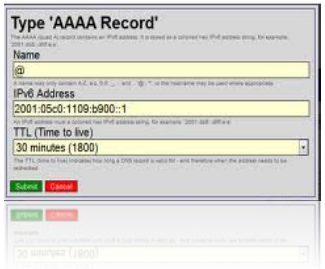
2-Mouse over countries

1-Click



© 2010 Cisco and/or its affiliates. All rights reserved.

Measuring IPv6 adoption lifecycle: Content



TOP500 Sites:

- Alexa's TOP500 list
- Computed weight based on Alexa % of pages viewed statistics

DNS: Seek Production & test domain name

- # AAAA
- Ns lookup

Production domain

- HTTP get over IPv6
- # of success
- # of Failure

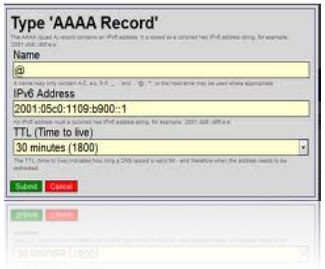
Testing domain?

- HTTP get over IPv6
- # of success
- # of Failure

© 2010 Cisco and/or its affiliates. All rights reserved.

Source: http://www.alexa.com/topsites

Measuring IPv6 adoption lifecycle: Content



TOP500 Sites:

- Alexa's TOP500 list
- Computed weight based on Alexa % of pages viewed statistics

DNS: Seek Production & test domain name

- # AAAA
- Ns lookup

Production domain

- HTTP get over IPv6
- # of success
- # of Failure

Testing domain?

- HTTP get over IPv6
- # of success
- # of Failure

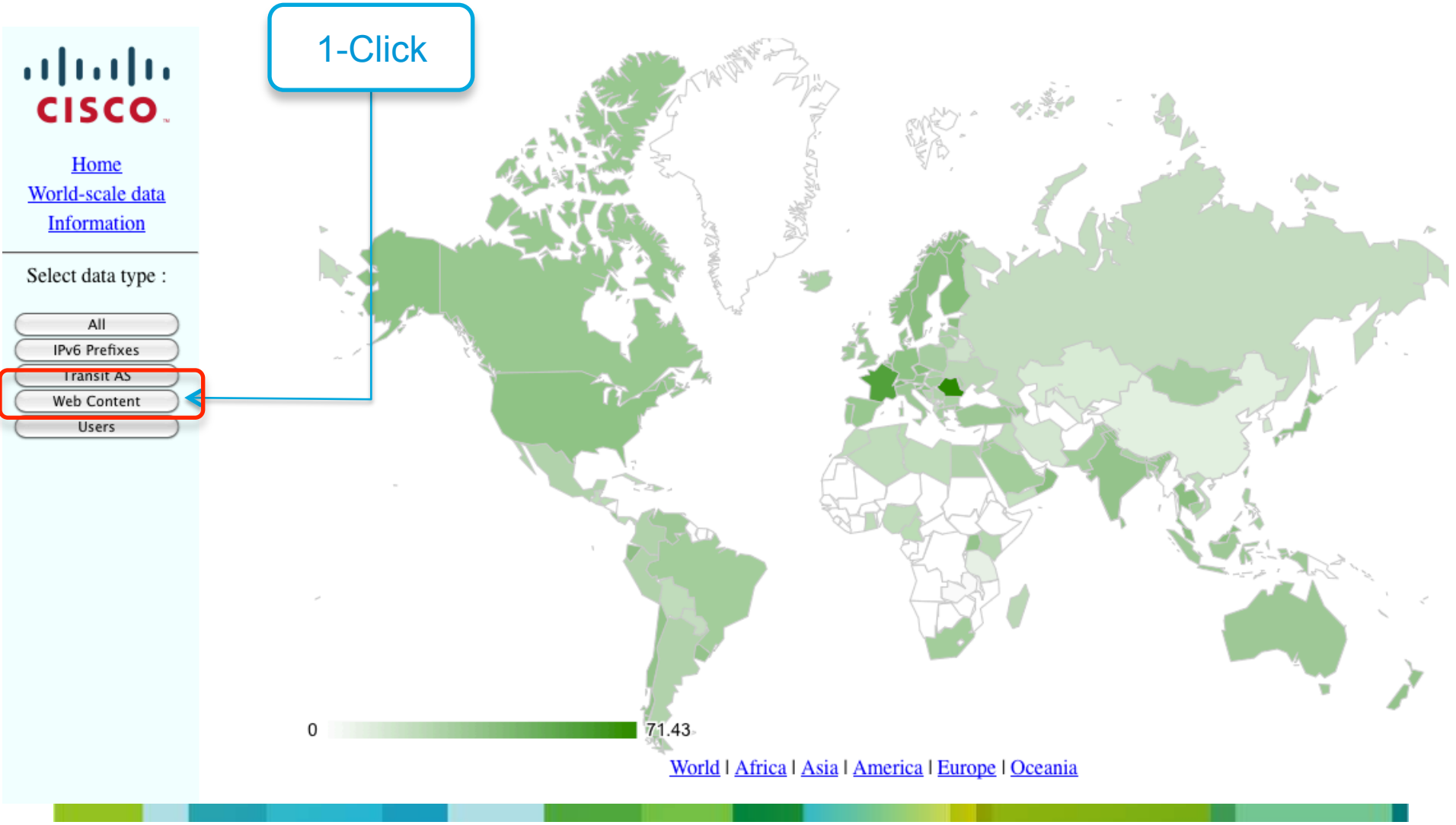
∑((computed weight for rank)*(IPv6 enabled WEB sites)) = **% of Web pages reachable over IPv6**

Computed by country as content is mainly locally significant

Source: http://www.alexa.com/topsites

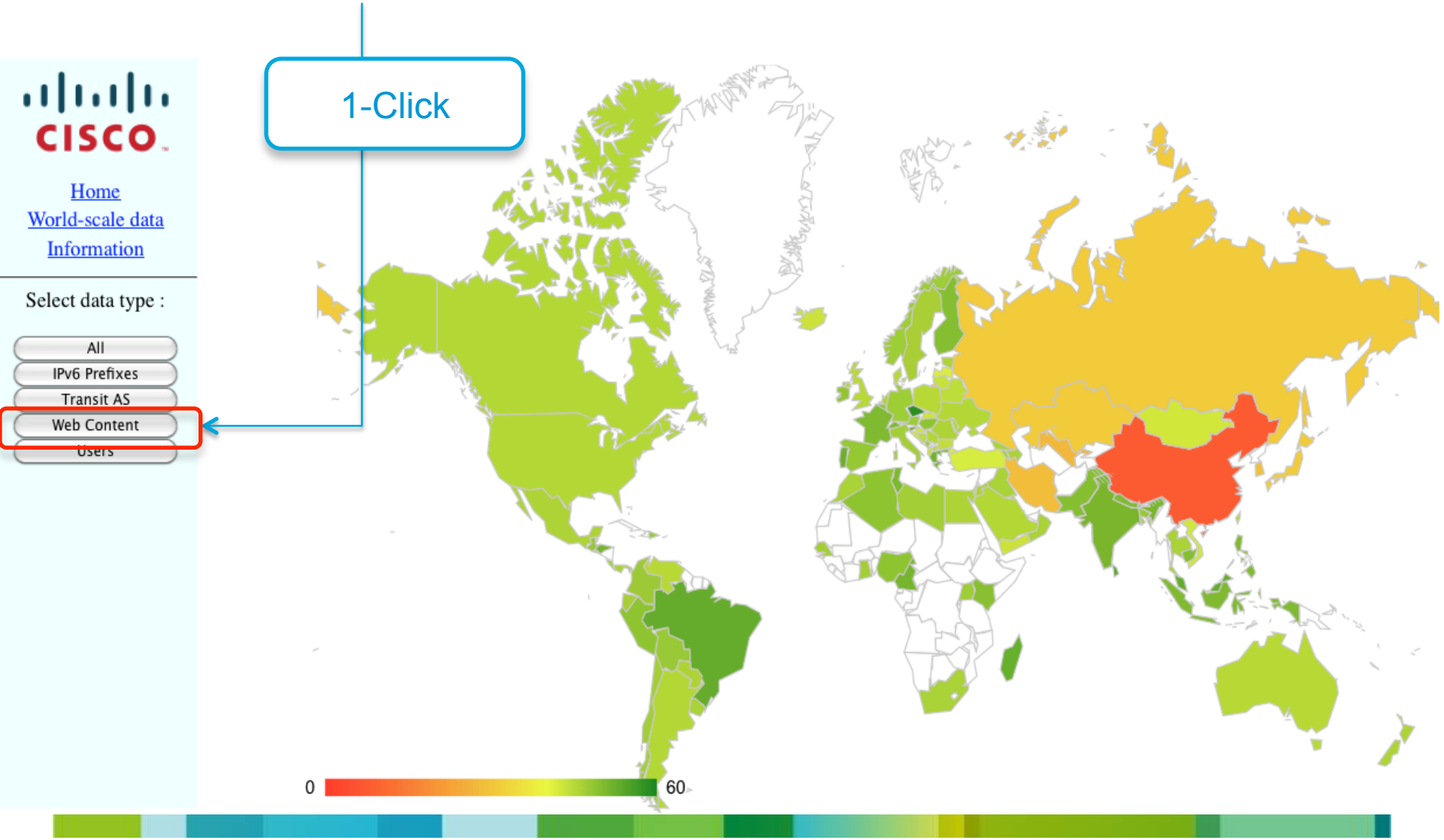
© 2010 Cisco and/or its affiliates. All rights reserved.

6lab.cisco.com/stats – home page



© 2010 Cisco and/or its affiliates. All rights reserved.

% of IPv6 Content / WEB sites

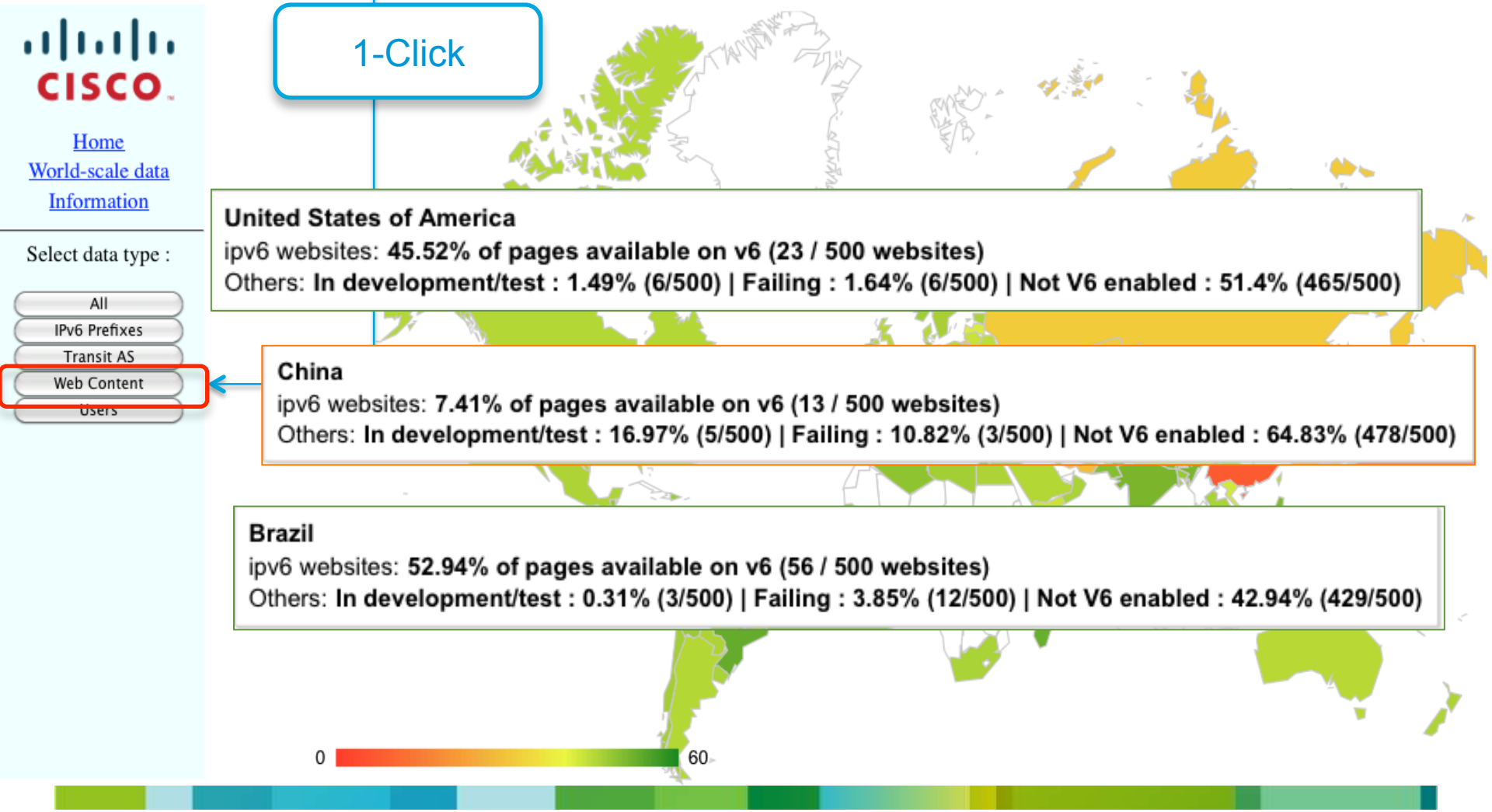


© 2010 Cisco and/or its affiliates. All rights reserved.

% of IPv6 Content / WEB sites

2-Mouse over countries

1-Click



© 2010 Cisco and/or its affiliates. All rights reserved.

Measuring IPv6 adoption lifecycle: Users

- Google and APNIC lab are doing an excellent job at measuring end-user IPv6 adoption
  - They do so by embedding java code in Google Search home page (in case of Google) or Ad's Network (in case of APNIC)
  - This java code, test both IPv4, IPv6 and Dual-stack on a sample of users in order to measure % of users who are successfully using IPv6.
  - Results can differ slightly between Google and APNIC, as the sample is different. However apart from countries where Google is not #1 search engine, numbers are very consistent. APNIC is probably more representative in theses countries (ex: China)
  - Both are measuring additional data such as connectivity type (tunnel, native…) or Browser type
- We are _*shamelessly*_ publishing both Google and APNIC results (% of IPv6 enabled users only):
  - http://6lab.cisco.com/stats , select "Users" on the Data type TAB

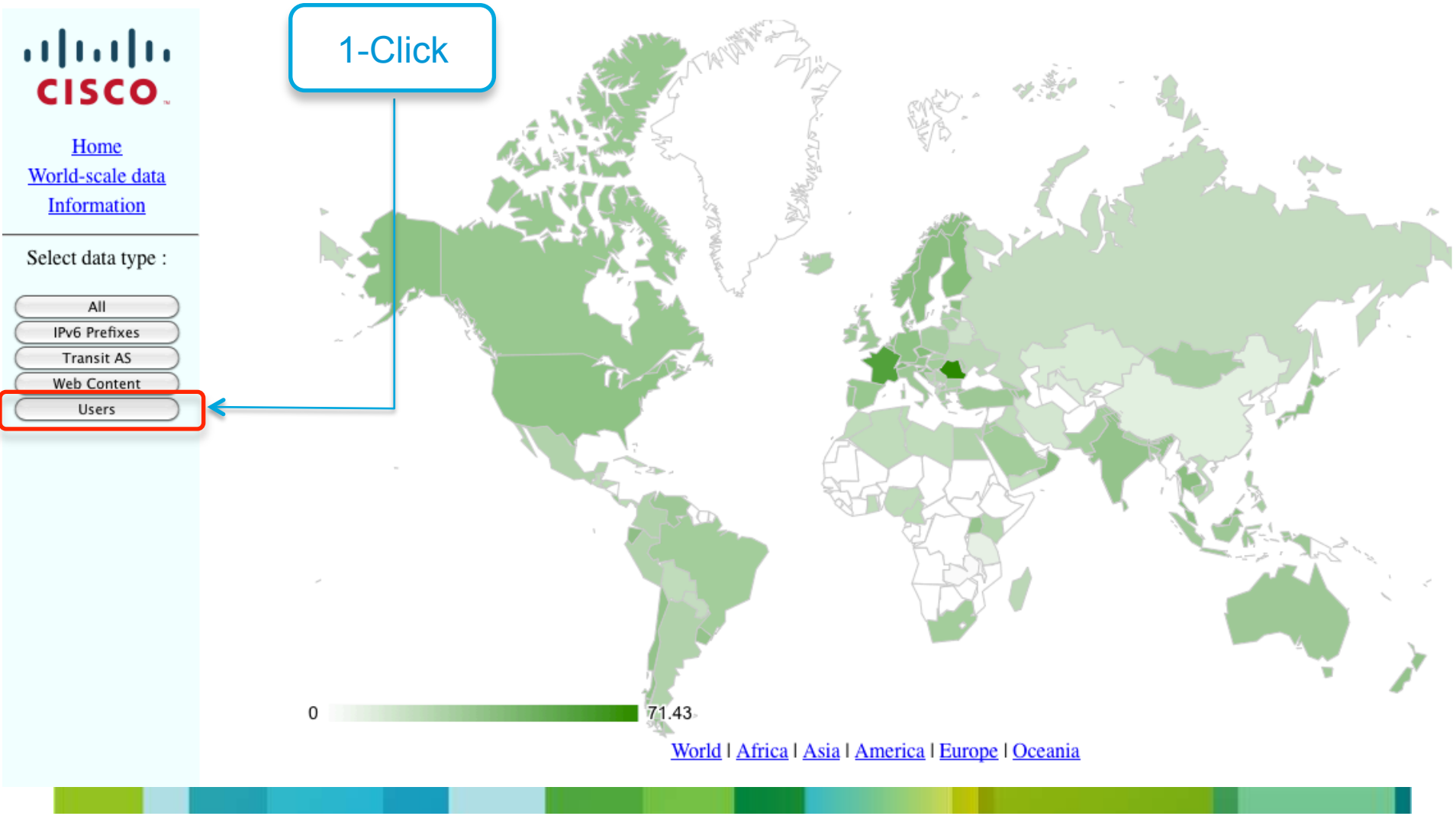
  Sources:

  Google - http://www.google.com/intl/en/ipv6/statistics.html

  APNIC - http://labs.apnic.net/dists/v6dcc.html

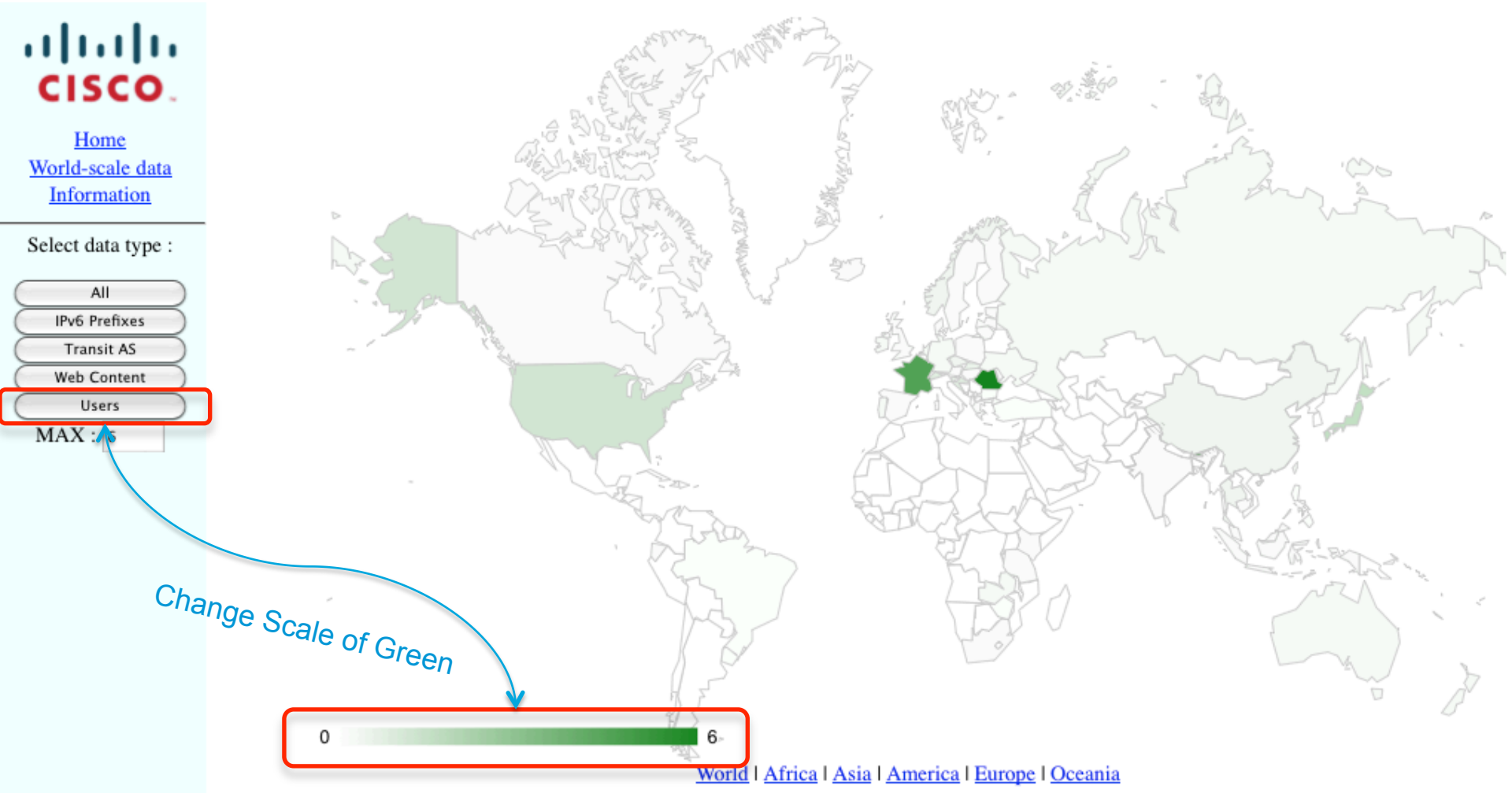
© 2010 Cisco and/or its affiliates. All rights reserved.

6lab.cisco.com/stats – home page



© 2010 Cisco and/or its affiliates. All rights reserved.

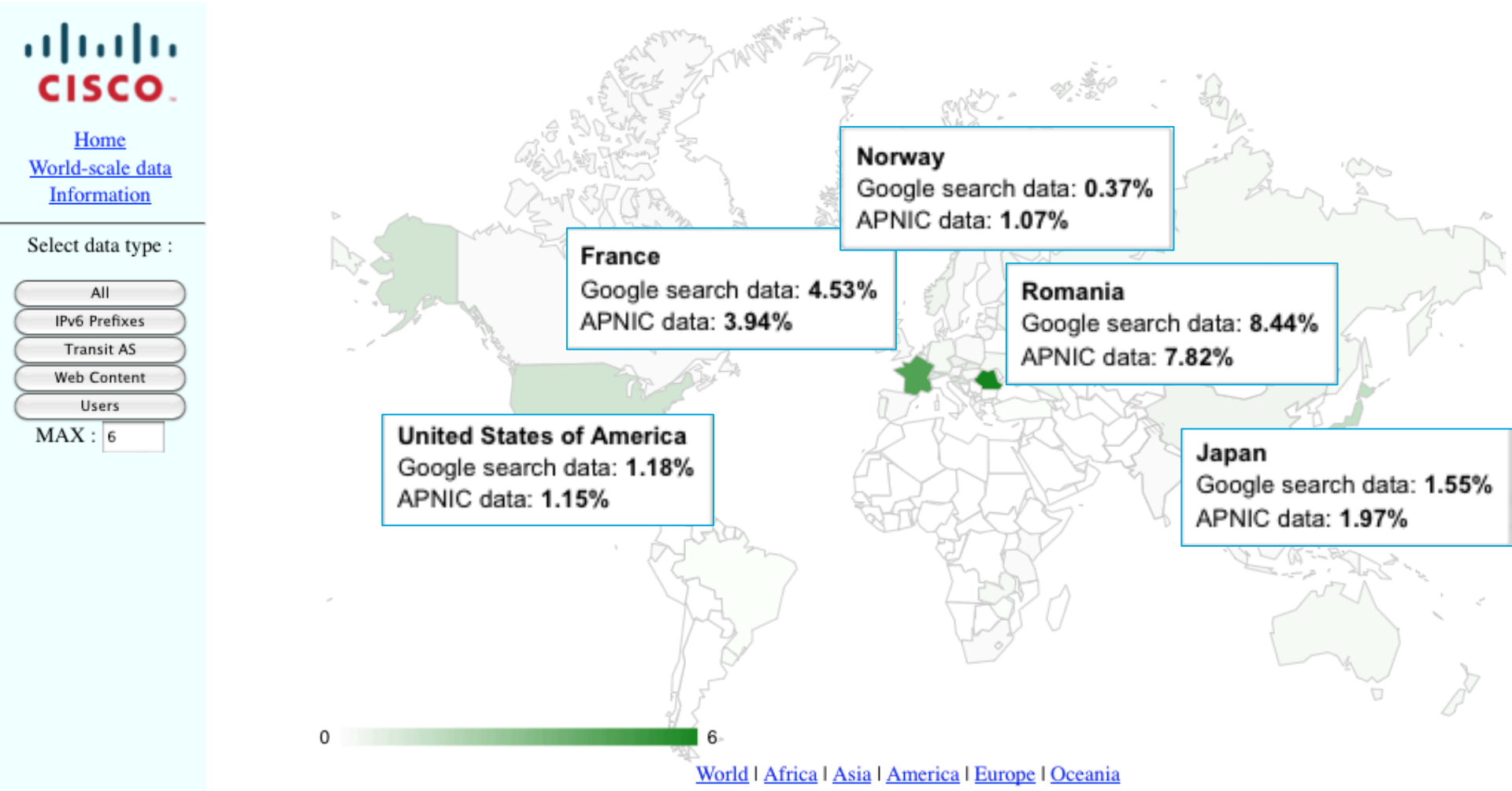
% of IPv6 enabled Users



© 2010 Cisco and/or its affiliates. All rights reserved.

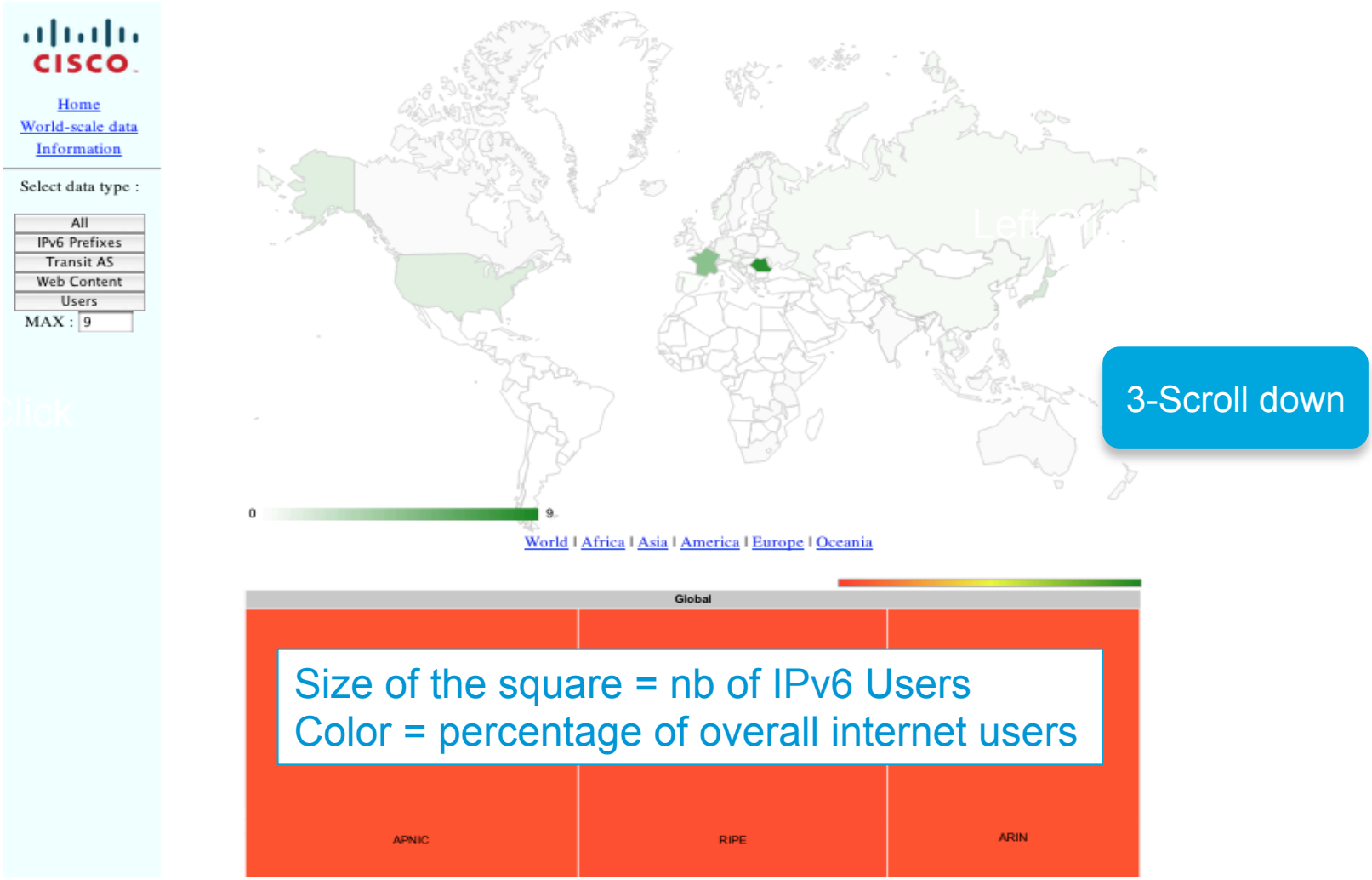
% of IPv6 enabled Users

2-Mouse over countries



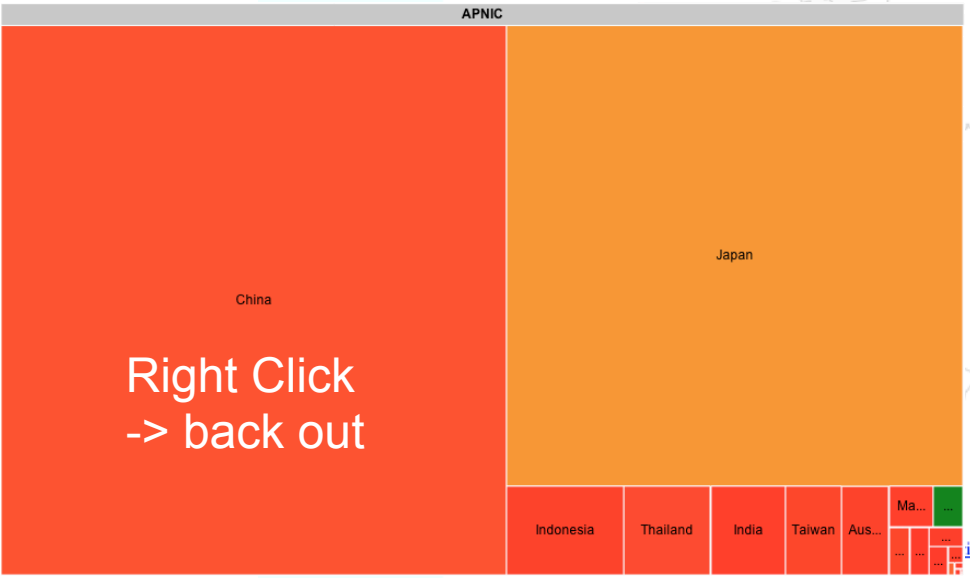
© 2010 Cisco and/or its affiliates. All rights reserved.

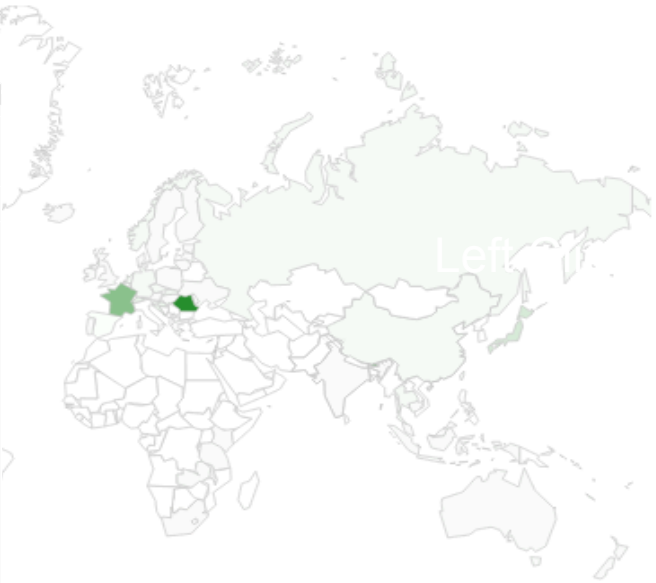
% of IPv6 enabled Users (Google Tree map)

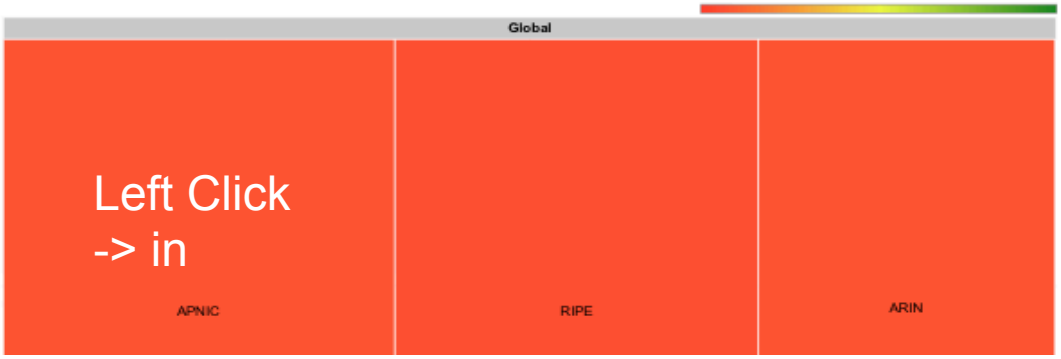


© 2010 Cisco and/or its affiliates. All rights reserved.

% of IPv6 enabled Users (Google Tree map)



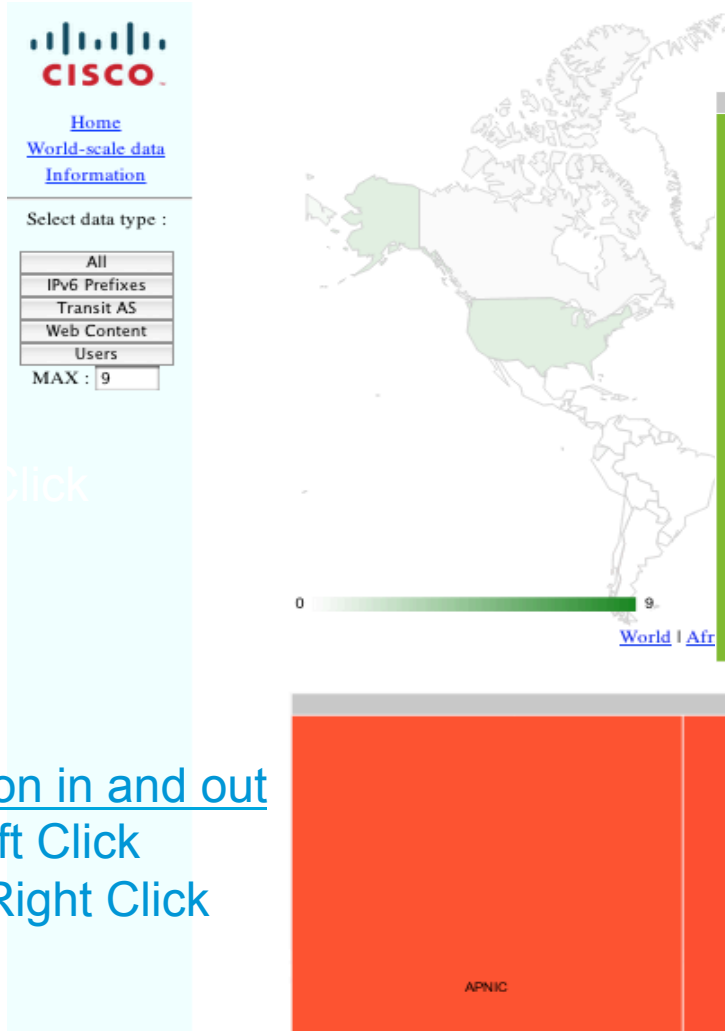


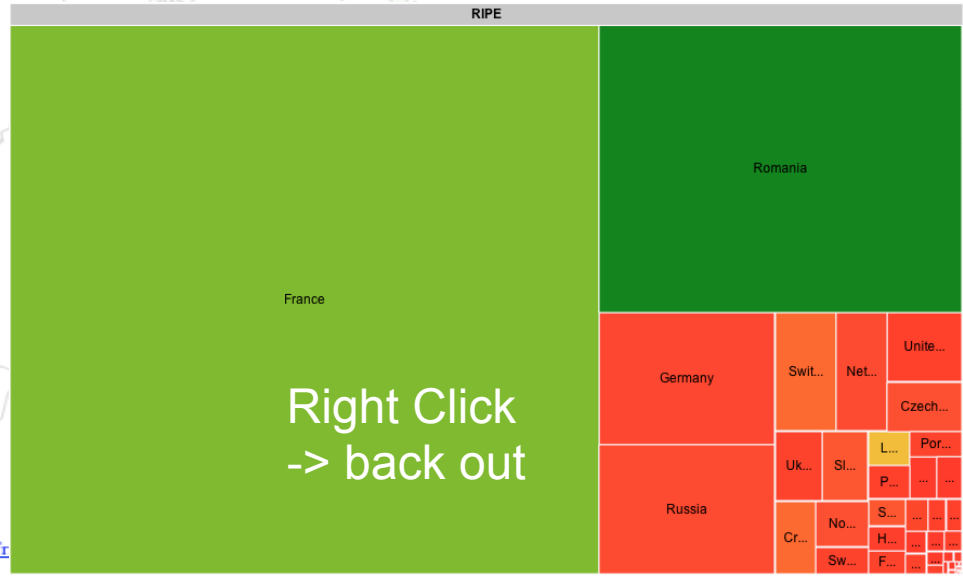


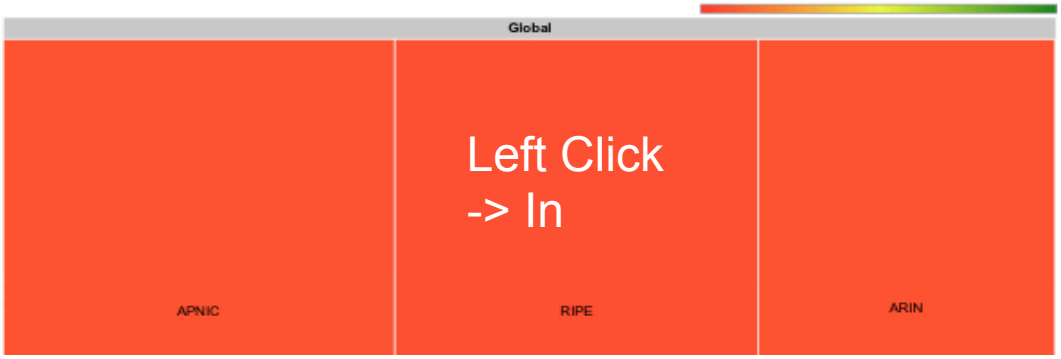
[Navigation in and out]
- In: Left Click
- Out: Right Click

© 2010 Cisco and/or its affiliates. All rights reserved.

% of IPv6 enabled Users (Google Tree map)





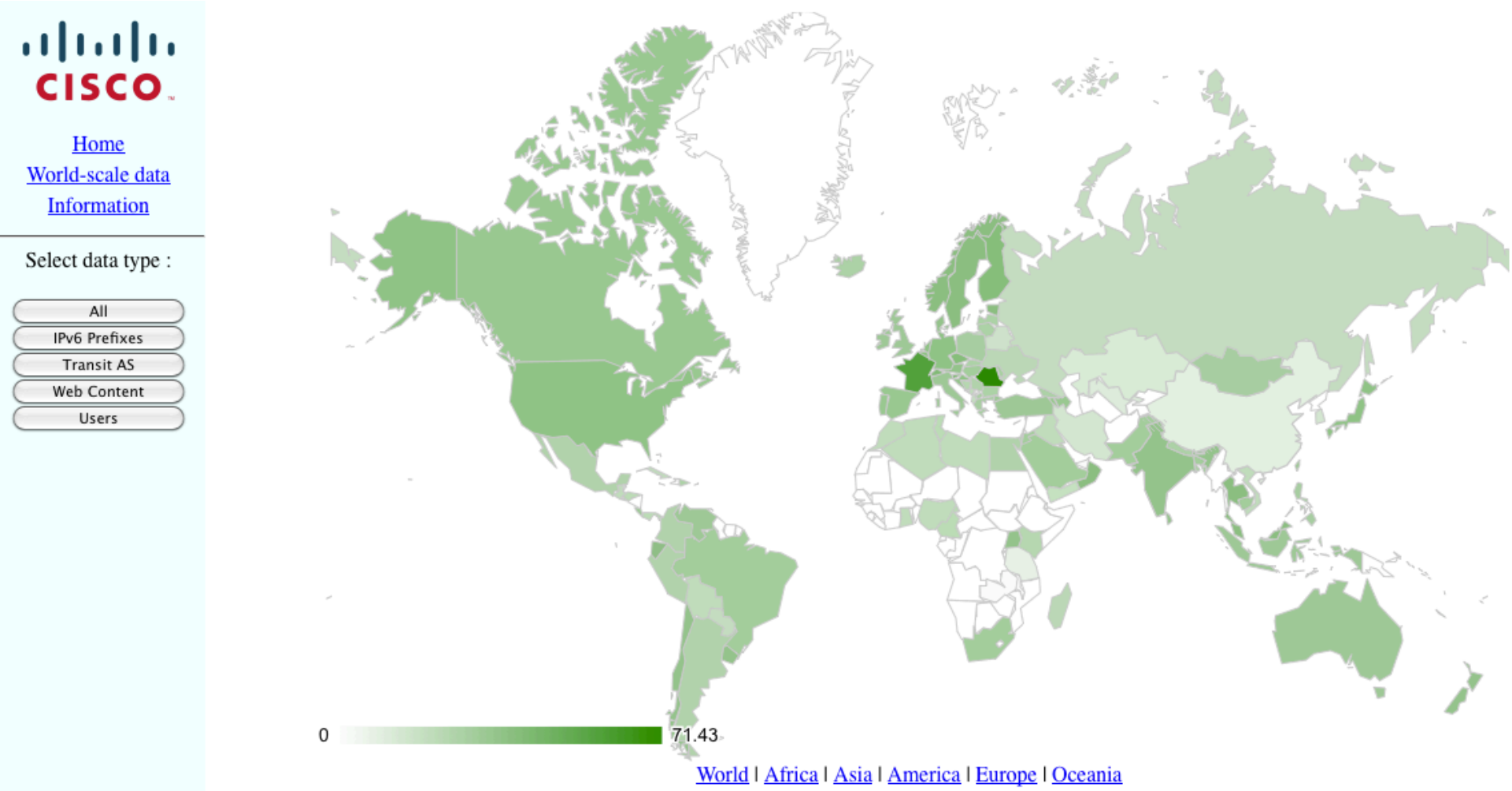


[Navigation in and out]

- In: Left Click
- Out: Right Click

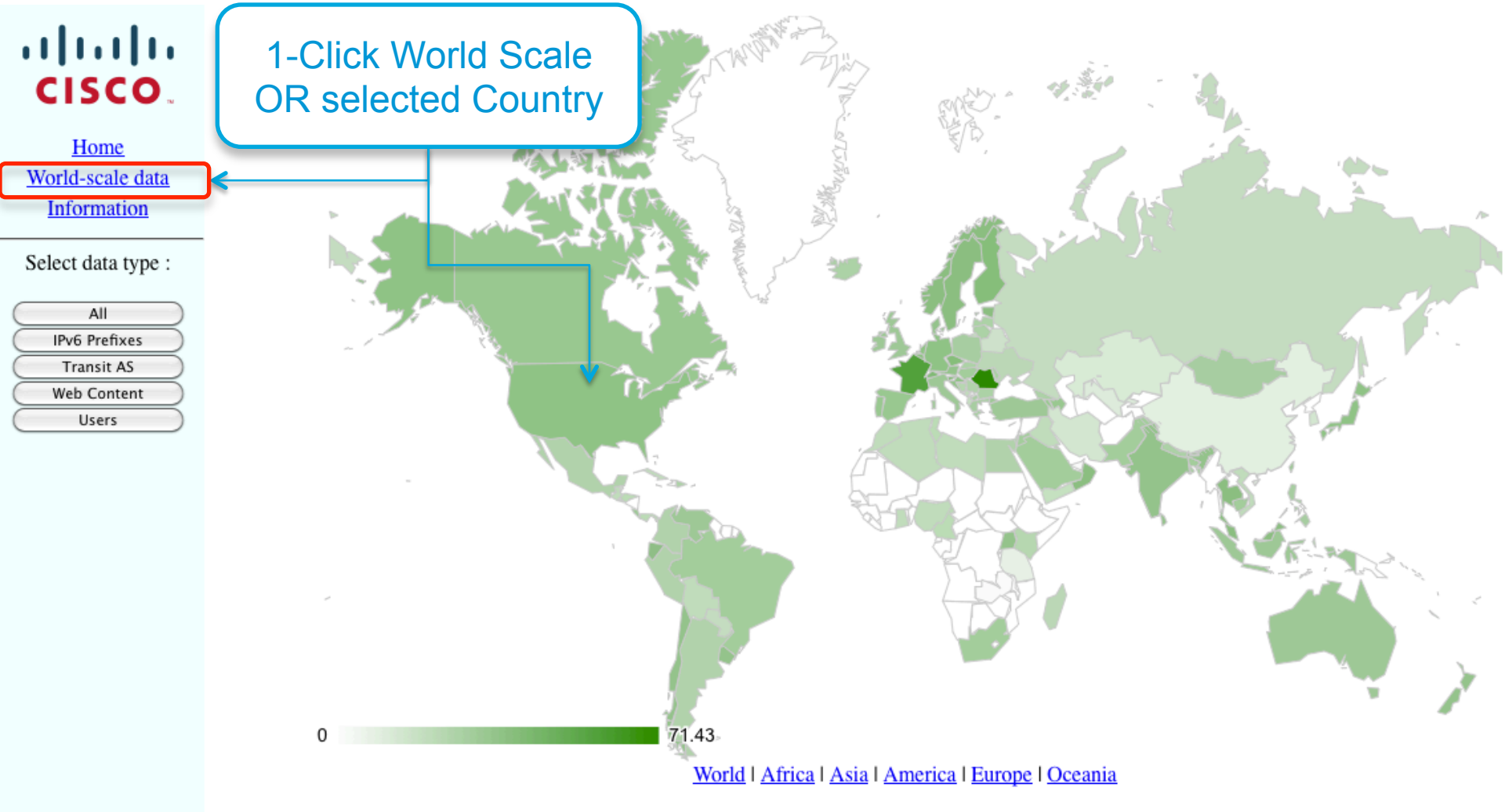
© 2010 Cisco and/or its affiliates. All rights reserved.

More details: World/Country historical data



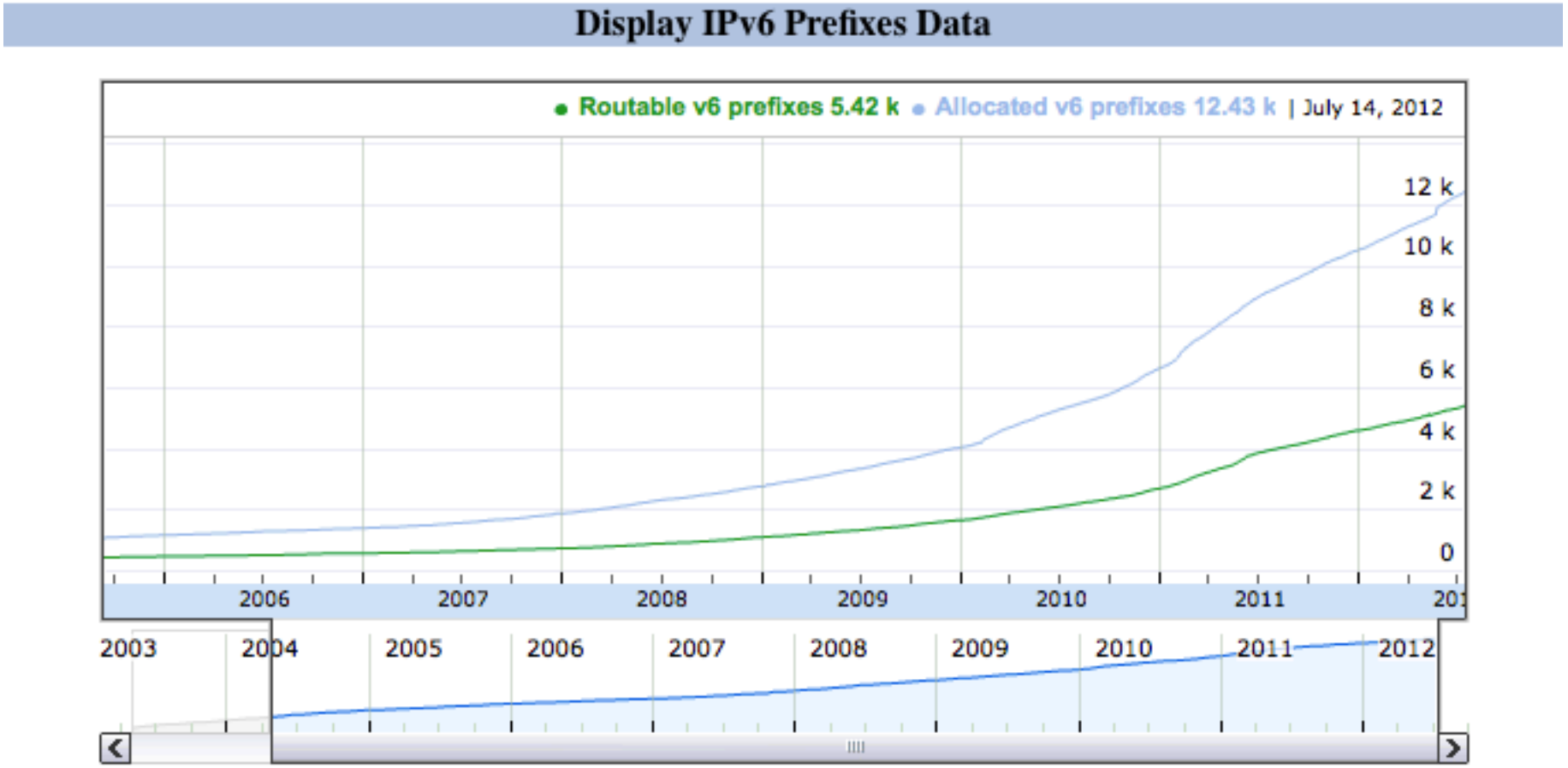
© 2010 Cisco and/or its affiliates. All rights reserved.

More details: World/Country historical data



© 2010 Cisco and/or its affiliates. All rights reserved.

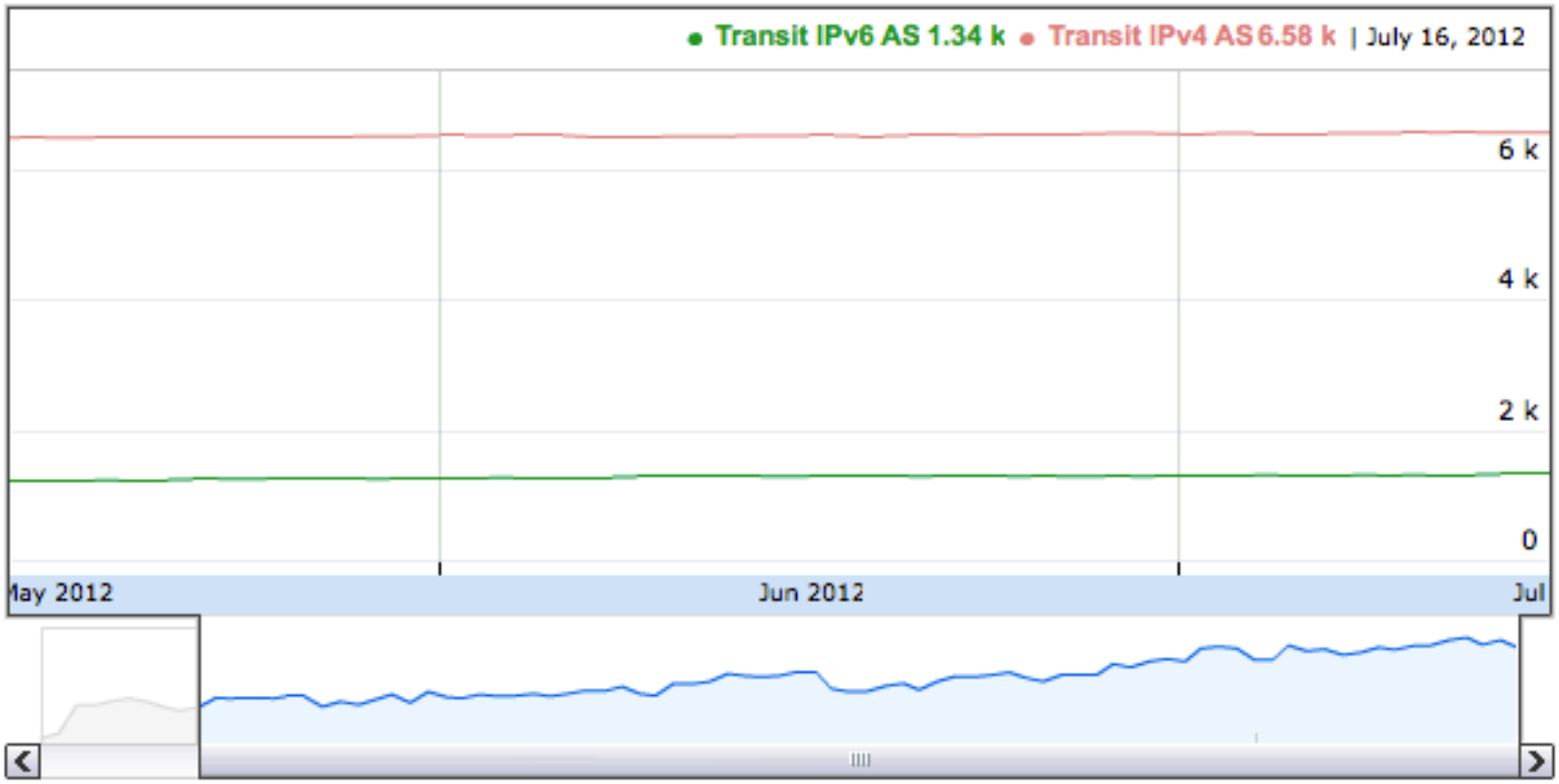
World / Country historical data
IPv6 Prefixes: allocation, routing, alive



© 2010 Cisco and/or its affiliates. All rights reserved.

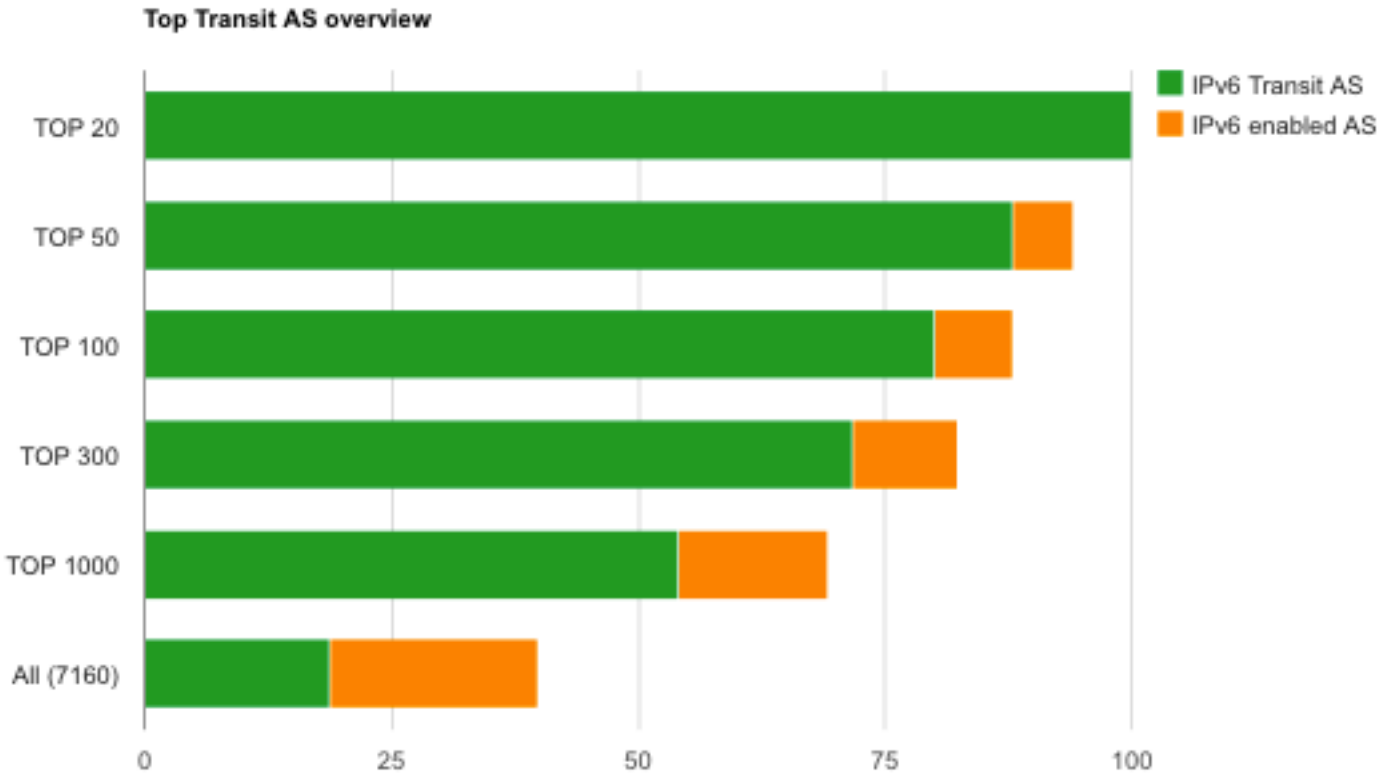
World / Country historical data
Transit Autonomous Systems

Display Transit AS Data



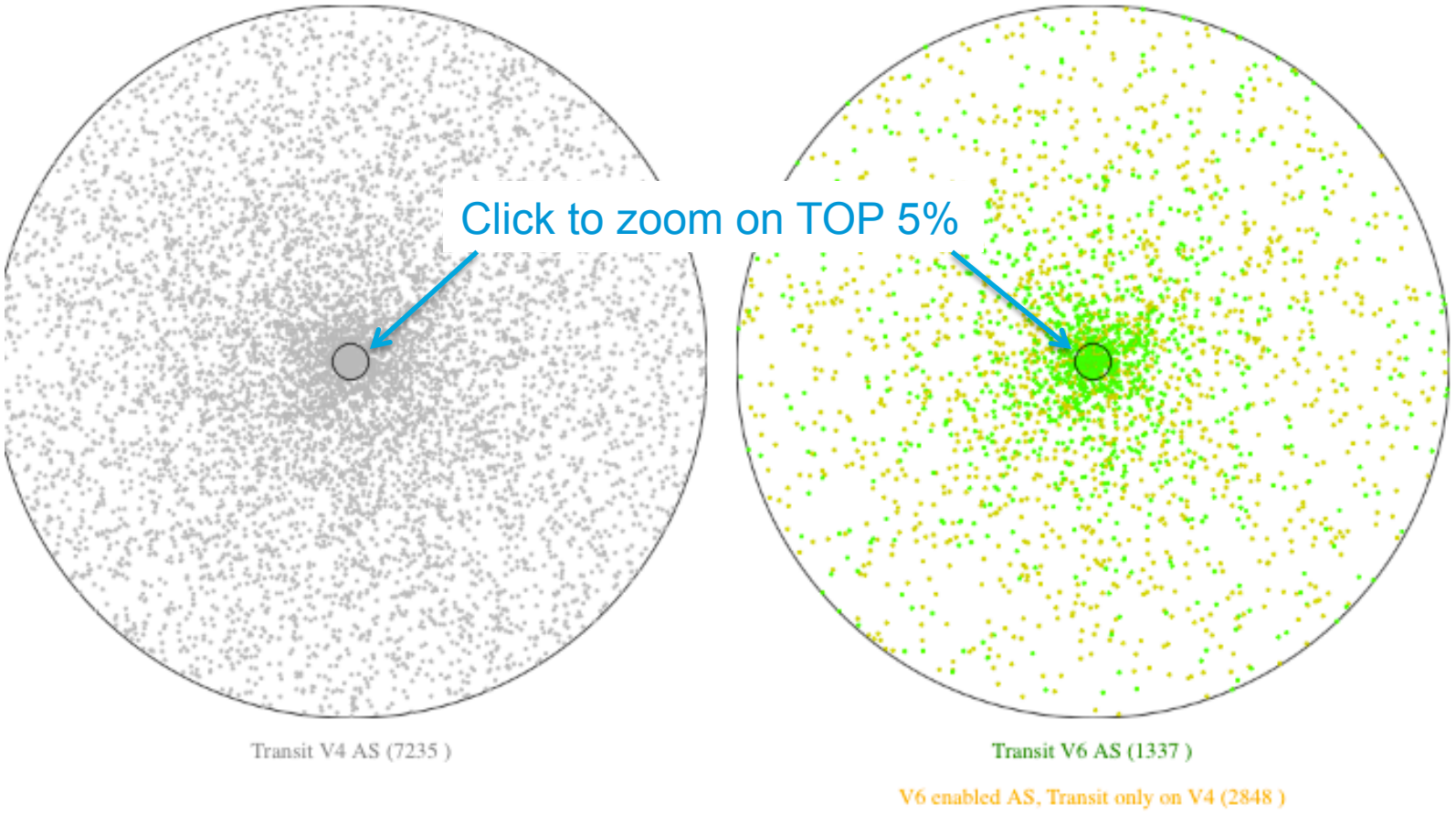
© 2010 Cisco and/or its affiliates. All rights reserved.

World / Country historical data
IPv6 Transit Autonomous Systems



© 2010 Cisco and/or its affiliates. All rights reserved.

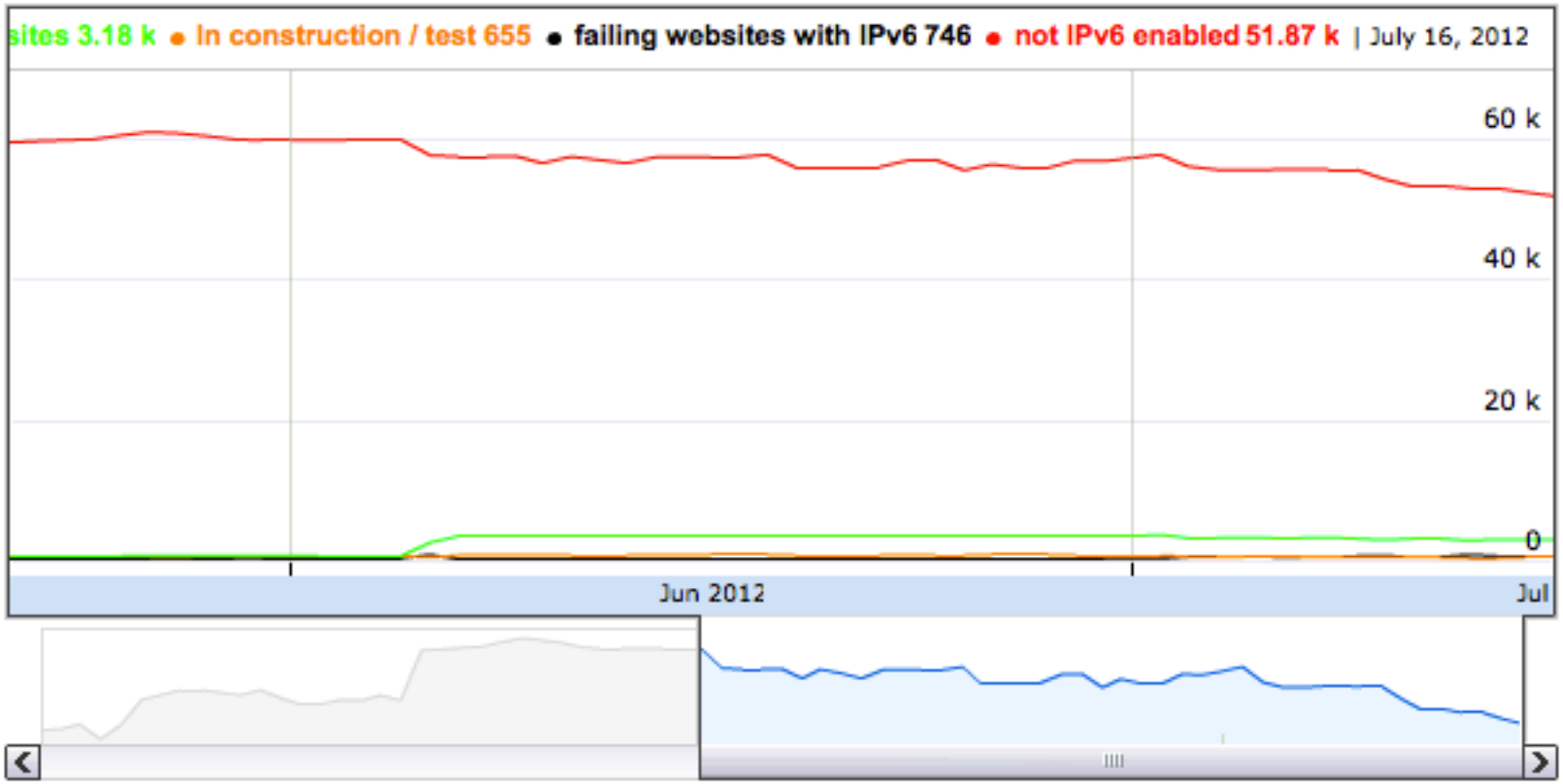
World and Country historical data
IPv6 Transit Autonomous Systems



© 2010 Cisco and/or its affiliates. All rights reserved.

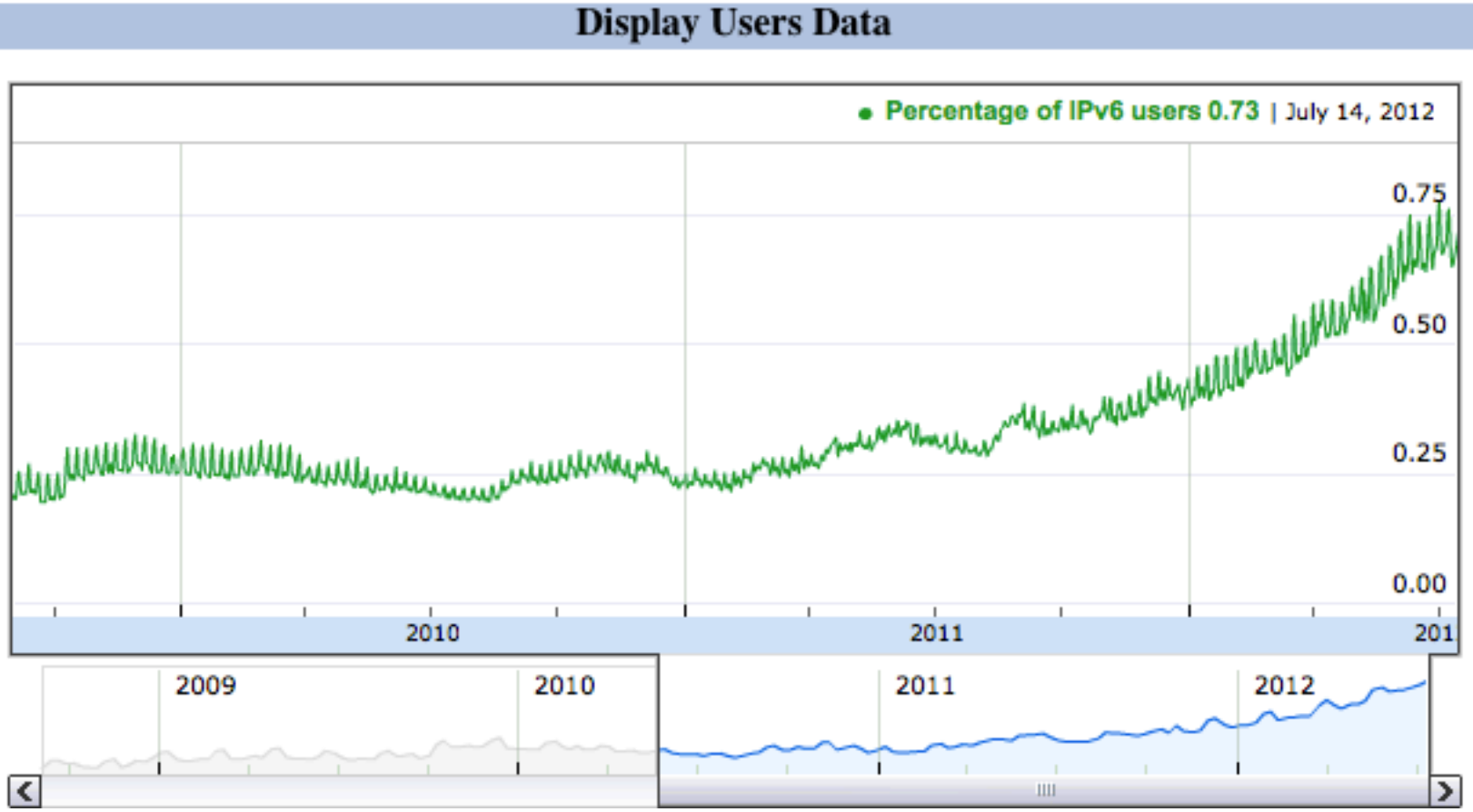
World and Country historical data
IPv6 enabled Content-WEB Sites

Display Content Data



© 2010 Cisco and/or its affiliates. All rights reserved.

World and Country historical data
IPv6 enabled users



© 2010 Cisco and/or its affiliates. All rights reserved.

Sources

- 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

© 2010 Cisco and/or its affiliates. All rights reserved.

Thank you.

6lab.cisco.com/stats