The IPv6 Matrix
Measuring IPv6 Deployment

Tim Chown, James Cotterell, Daniel Martinho-Corbishley, Jack Tench
Electronics and Computer Science
University of Southampton
tjc@ecs.soton.ac.uk

Measuring IPv6 deployment

- Some good examples out there already

- Includes a couple of nice catalogues of measurements
  - http://www.worldipv6launch.org/measurements/
  - https://labs.ripe.net/Members/mirjam/content-ipv6-measurement-compilation

- Good stats, and great resources, but generally
  - Presented in a 'matter of fact' style
  - Not very interactive, if you want to explore the stats
  - Underlying raw data is not available

The IPv6 Matrix

- A tool that measures IPv6 deployment by looking for and testing DNS entries in the Alexa top 1,000,000 domain list (a free download)
  - http://s3.amazonaws.com/alexa-static/top-1m.csv.zip

- Initial 'crawler' code was developed by ISOC England in conjunction with Nile University in 2009/10
  - Started crawling the data, with basic display mechanisms

- Due to Arab Spring, the crawler moved to Telehouse
  - The project now has three+ years of data

Improving the IPv6 Matrix

- ISOC England acted as the 'customer' for a group of 4th year MEng students in Electronics and Computer Science at the University of Southampton
  - Group Design Project (3/8ths of students' final year)
  - Around 30 such projects run each year
  - Very popular module with both students and industry

- The ISOC customer brief was to improve the presentation of the crawler data
  - And as a secondary priority to harden the crawler
  - Included Open Data principles (see http://theodi.org)
  - As part of project, crawler moved to Southampton
  - Students had 10 weeks in total to solicit requirements, design and build a prototype to the customer's satisfaction

The result

- A completely new visualisation interface was built
  - Uses data from past three years
  - Gives global view, allows you to zoom in by country
  - Can view any measured stats, and filter on various properties
  - Can export stats in a variety of non-proprietary formats
- See http://www.ipv6matrix.org

- Crawls are continuing to run, and more frequently given the good IPv6 connectivity at Southampton
- Some examples follow…

IPv6Matrix

IPv6 Hosts | Dual Stack | Ping | Path | Reachability | IPv6 Domains | Domain Search

IPv6 adoption around the Globe

Date
January 2013

Info
Welcome to IPv6Matrix.org.

The IPv6Matrix is a tool to gather and visualise data on IPv6 (Internet Protocol v6) deployment and accessibility from the top one million domain names around the world, since 2010.

More about the IPv6Matrix »

The globe displays every countries' overall IPv6 adoption over time.

- Drag the globe to rotate.
- Drag the red slider to control the
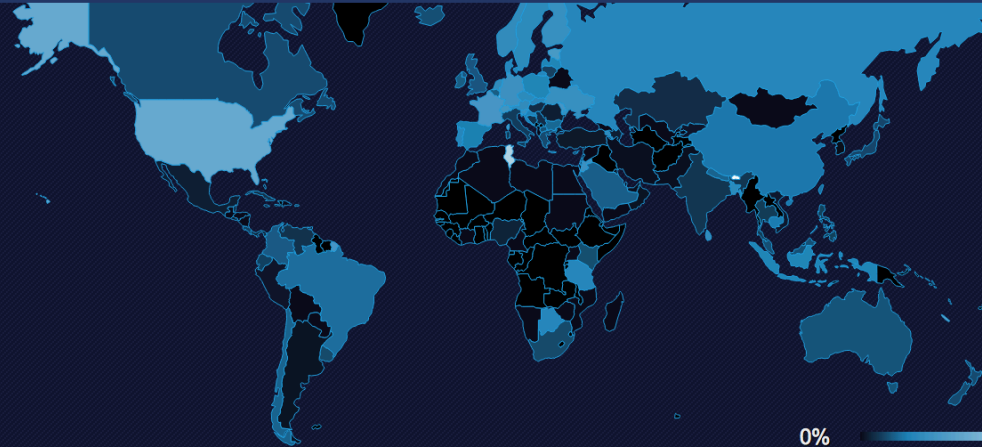
0%   77%
IPv6 enabled Hosts

August 2010   ◄ **January 2013** ►   ecember 2013

IPv6 Matrix - UKNOF27

IPv6Matrix

matrix   about   api   credits

IPv6 Hosts | Dual Stack | Ping | Path | Reachability | **IPv6 Domains** | Domain Search

IPv6 Domains

Country
Global

Date
December 2013

Info
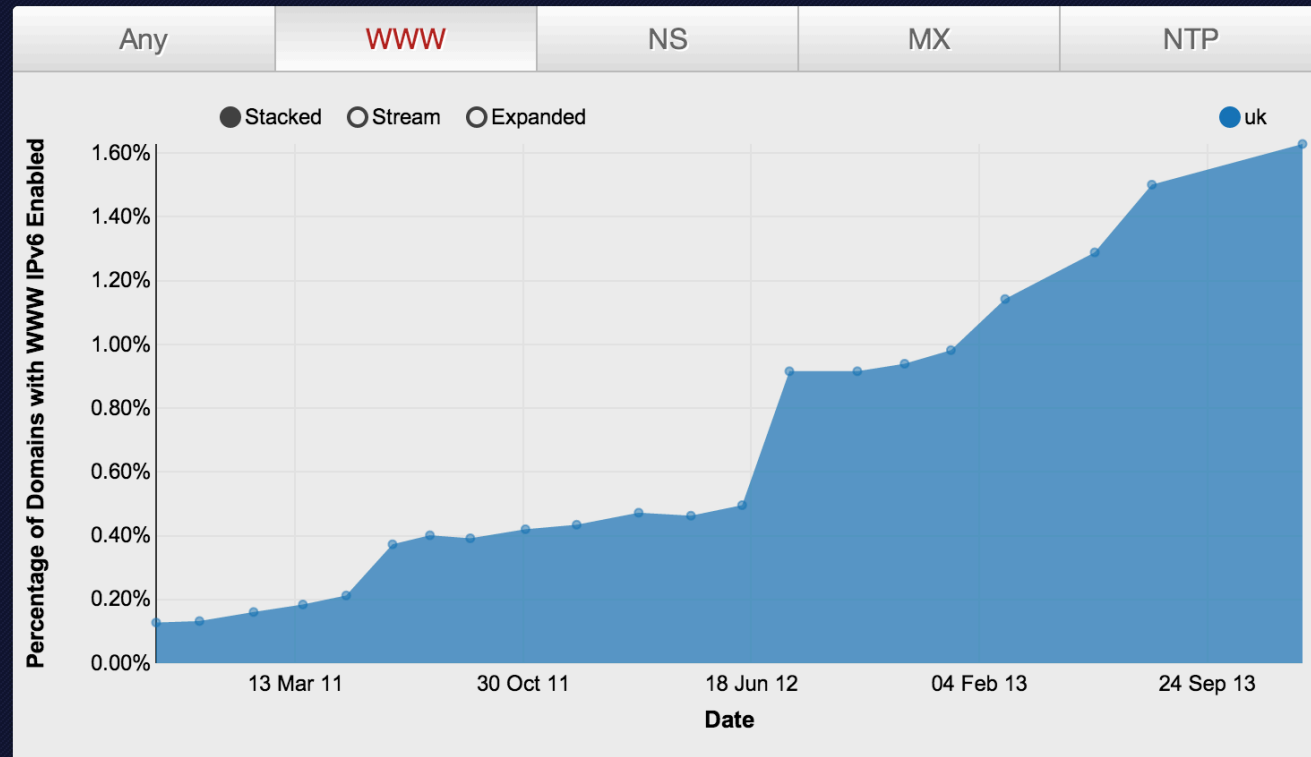This page displays an overview of IPv6 enabled domains.

A domain name may have many different hosts for a particular server type, for example email (MX) but only one needs to have an IPv6 address for that domain to be able to send and recieve email over the IPv6 internet.

Here, a domain name is considered to have implemented IPv6 if it has one or more IPv6 (AAAA) entries in any of its DNS records, this includes web, name, mail and time servers.

IPv6 enabled Domains by TLD over time ❓

| Any | **WWW** | NS | MX | NTP |

● Stacked ○ Stream ○ Expanded   ● uk

Percentage of Domains with WWW IPv6 Enabled

1.60%
1.40%
1.20%
1.00%
0.80%
0.60%
0.40%
0.20%
0.00%

13 Mar 11   30 Oct 11   18 Jun 12   04 Feb 13   24 Sep 13
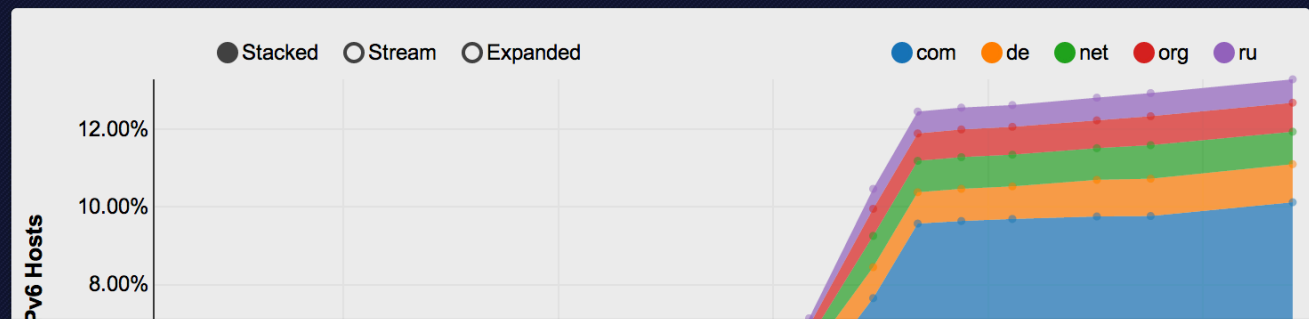
Date

October 2010   ❮ December 2013 ❯   Group by TLD ▲   ⚙

{"Sat Oct 23 2010 01:00:00 GMT+0100 (BST)":{"AT":{"hosts":70,"hosts6":2},"AU":{"hosts":320,"hosts6":0},"BE":
{"hosts":61,"hosts6":0},"BG":{"hosts":50,"hosts6":0},"CA":{"hosts":1188,"hosts6":0},"CH":{"hosts":110,"hosts6":11},"CZ":
{"hosts":114,"hosts6":1},"DE":{"hosts":11069,"hosts6":18},"DK":{"hosts":894,"hosts6":2},"ES":{"hosts":84,"hosts6":1},"EU":
{"hosts":463,"hosts6":125},"FR":{"hosts":953,"hosts6":88},"GB":{"hosts":78001,"hosts6":941},"HK":{"hosts":62,"hosts6":0},"IE":
{"hosts":856,"hosts6":6},"IN":{"hosts":68,"hosts6":0},"IT":{"hosts":154,"hosts6":0},"JP":{"hosts":76,"hosts6":6},"LU":
{"hosts":130,"hosts6":0},"NL":{"hosts":1511,"hosts6":40},"NO":{"hosts":106,"hosts6":2},"PL":{"hosts":85,"hosts6":0},"SE":
{"hosts":205,"hosts6":0},"SG":{"hosts":174,"hosts6":74},"US":{"hosts":32741,"hosts6":531},"ZZ":{"hosts":3040,"hosts6":5}},"Mon Dec 06
2010 00:00:00 GMT+0000 (GMT)":{"AT":{"hosts":69,"hosts6":2},"AU":{"hosts":308,"hosts6":0},"BE":{"hosts":69,"hosts6":0},"CA":
{"hosts":1214,"hosts6":0},"CH":{"hosts":116,"hosts6":11},"CZ":{"hosts":114,"hosts6":4},"DE":{"hosts":11359,"hosts6":30},"DK":
{"hosts":860,"hosts6":2},"ES":{"hosts":97,"hosts6":1},"EU":{"hosts":466,"hosts6":125},"FR":{"hosts":939,"hosts6":114},"GB":
{"hosts":76318,"hosts6":960},"GG":{"hosts":50,"hosts6":0},"HK":{"hosts":62,"hosts6":0},"IE":{"hosts":860,"hosts6":4},"IN":
{"hosts":68,"hosts6":0},"IT":{"hosts":158,"hosts6":0},"JP":{"hosts":92,"hosts6":6},"LU":{"hosts":150,"hosts6":0},"NL":
{"hosts":1751,"hosts6":57},"NO":{"hosts":106,"hosts6":2},"PL":{"hosts":84,"hosts6":1},"RU":{"hosts":72,"hosts6":0},"SE":
{"hosts":204,"hosts6":0},"SG":{"hosts":176,"hosts6":74},"US":{"hosts":33852,"hosts6":692},"ZZ":{"hosts":3276,"hosts6":6}},"Sun Jan 30
2011 00:00:00 GMT+0000 (GMT)":{"AT":{"hosts":69,"hosts6":2},"AU":{"hosts":302,"hosts6":0},"BE":{"hosts":70,"hosts6":0},"BG":
{"hosts":53,"hosts6":0},"CA":{"hosts":1248,"hosts6":0},"CH":{"hosts":115,"hosts6":11},"CZ":{"hosts":104,"hosts6":4},"DE":
{"hosts":11320,"hosts6":38},"DK":{"hosts":848,"hosts6":2},"ES":{"hosts":93,"hosts6":1},"EU":{"hosts":475,"hosts6":128},"FR":
{"hosts":937,"hosts6":119},"GB":{"hosts":76990,"hosts6":1010},"HK":{"hosts":62,"hosts6":0},"IE":{"hosts":844,"hosts6":4},"IN":
{"hosts":69,"hosts6":0},"IT":{"hosts":158,"hosts6":0},"JP":{"hosts":97,"hosts6":6},"LU":{"hosts":158,"hosts6":0},"NL":
{"hosts":1726,"hosts6":63},"NO":{"hosts":111,"hosts6":2},"PL":{"hosts":84,"hosts6":1},"RU":{"hosts":71,"hosts6":0},"SE":
{"hosts":221,"hosts6":0},"SG":{"hosts":180,"hosts6":73},"US":{"hosts":32911,"hosts6":776},"ZZ":{"hosts":3685,"hosts6":18}},"Mon Mar 21
2011 00:00:00 GMT+0000 (GMT)":{"AT":{"hosts":69,"hosts6":2},"AU":{"hosts":309,"hosts6":0},"BE":{"hosts":60,"hosts6":0},"CA":
{"hosts":1262,"hosts6":0},"CH":{"hosts":114,"hosts6":11},"CZ":{"hosts":84,"hosts6":4},"DE":{"hosts":11266,"hosts6":41},"DK":
{"hosts":854,"hosts6":2},"ES":{"hosts":95,"hosts6":1},"EU":{"hosts":476,"hosts6":128},"FR":{"hosts":942,"hosts6":125},"GB":
{"hosts":75889,"hosts6":1032},"HK":{"hosts":64,"hosts6":0},"IE":{"hosts":850,"hosts6":4},"IN":{"hosts":68,"hosts6":0},"IT":
{"hosts":157,"hosts6":0},"JP":{"hosts":97,"hosts6":6},"LU":{"hosts":158,"hosts6":0},"NL":{"hosts":1810,"hosts6":63},"NO":
{"hosts":117,"hosts6":2},"PL":{"hosts":92,"hosts6":1},"RU":{"hosts":59,"hosts6":0},"SE":{"hosts":216,"hosts6":0},"SG":
{"hosts":180,"hosts6":73},"UA":{"hosts":56,"hosts6":0},"US":{"hosts":33927,"hosts6":786},"ZZ":{"hosts":3824,"hosts6":20}},"Wed May 04
2011 01:00:00 GMT+0100 (BST)":{"AT":{"hosts":56,"hosts6":2},"AU":{"hosts":312,"hosts6":0},"BE":{"hosts":68,"hosts6":0},"CA":
{"hosts":1338,"hosts6":12},"CH":{"hosts":108,"hosts6":11},"CZ":{"hosts":86,"hosts6":5},"DE":{"hosts":11229,"hosts6":56},"DK":
{"hosts":832,"hosts6":4},"ES":{"hosts":99,"hosts6":1},"EU":{"hosts":499,"hosts6":138},"FR":{"hosts":946,"hosts6":163},"GB":
{"hosts":75030,"hosts6":1195},"HK":{"hosts":65,"hosts6":0},"IE":{"hosts":930,"hosts6":8},"IN":{"hosts":68,"hosts6":0},"IT":
{"hosts":153,"hosts6":0},"JP":{"hosts":96,"hosts6":6},"LU":{"hosts":147,"hosts6":0},"NL":{"hosts":1833,"hosts6":62},"NO":
{"hosts":104,"hosts6":2},"PL":{"hosts":88,"hosts6":2},"RU":{"hosts":62,"hosts6":0},"SE":{"hosts":220,"hosts6":3},"SG":

Summary

- A new version of the IPv6 Matrix is now available
  - Significant improvements to interactivity
- Shows potential for organisations/companies to work with universities to prototype ideas
  - There are lots of very good students out there!
- Promotes use of Open Data
  - We urge other measurement projects to publish their data
  - Goal is to enable interesting data mash-ups

- We need your feedback
  - Send to feedback@ipv6matrix.org