Belgian IPv6 Council meeting, Brussels

26 June 2019

UK IPv6 Council: IPv6 Deployment Update

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UK IPv6 Council

About us

- Created in April 2014, to promote IPv6 and share best practices
  - Formally a chapter of the IPv6 Forum
  - A core team of 10-12 people, with regular calls to discuss issues, plan events, etc.
  - A wide range of organisations on the core team – ISPs, content providers, enterprises, R&E, etc.
  - All volunteers, no legal entity behind the Council
  - We rely on sponsorship and meeting hosts to deliver (free) events

- Events:
  - One main annual event, held every year since 2014, with ~100 attendees
  - One “themed” event each year, e.g., applications, security, transition, ~30-40 attendees
  - And two or three roundtable events a year, discussing topical issues, ~20 attendees
  - Jim Bound awards – first to Sky in 2016 then multiple every year (for 20% deployment)

Online tools

What we use…

- Mail list for core team
- LinkedIn “membership” at https://www.linkedin.com/groups/8128401/ - 629 members
- Web site - https://www.ipv6.org.uk/
  - Has an extensive set of slide decks and (thanks to the IET and BT) videos
- Twitter - @UKIPv6Council
- Eventbrite for events

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https://www.ipv6.org.uk
UK IPV6 COUNCIL
Promoting and sharing best practices on IPv6 deployment
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UK IPv6 Council web site

Running IPv6-only

- Council web site is hosted on a VPS provided by Mythic Beasts (free of charge)
  - See https://www.mythic-beasts.com/sales/ipv6
- No IPv4 configured on the server (would be £1 pcm less if paid for)
  - Web proxy sits in front of server for IPv4 access. SSL/TLS secured via https://letsencrypt.org/
  - Access via ssh using keys over IPv6 only.

```
tjc@v6council:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: ens3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 52:54:00:80:ba:f1 brd ff:ff:ff:ff:ff:ff
    inet6 2a00:1098:86:4::1:1/64 scope global
       valid_lft forever preferred_lft forever
    inet6 fe80::5054:ff:fe80:baf1/64 scope link
       valid_lft forever preferred_lft forever
```


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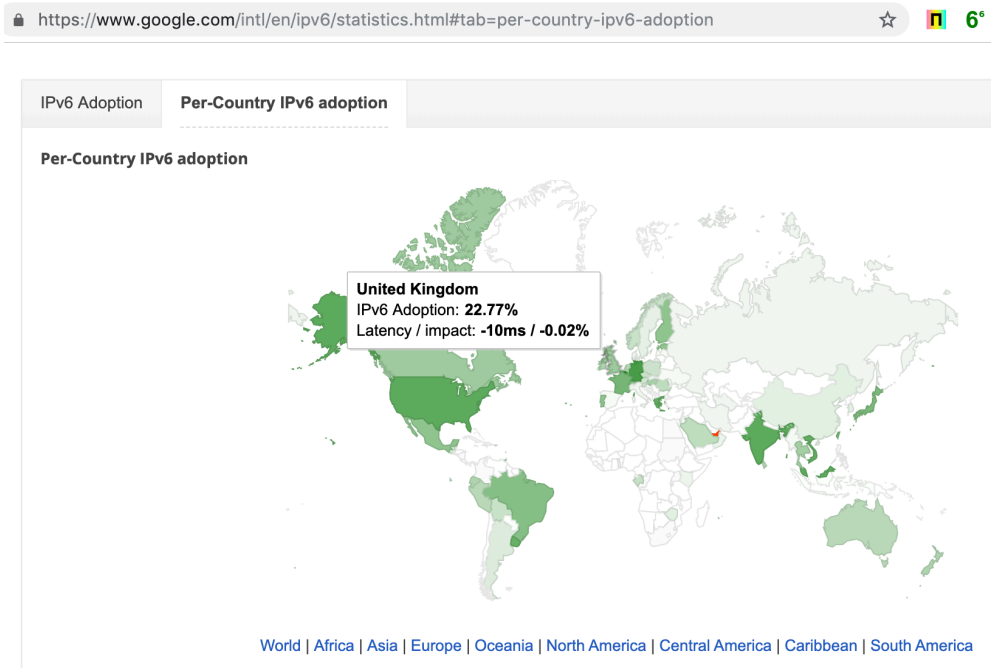
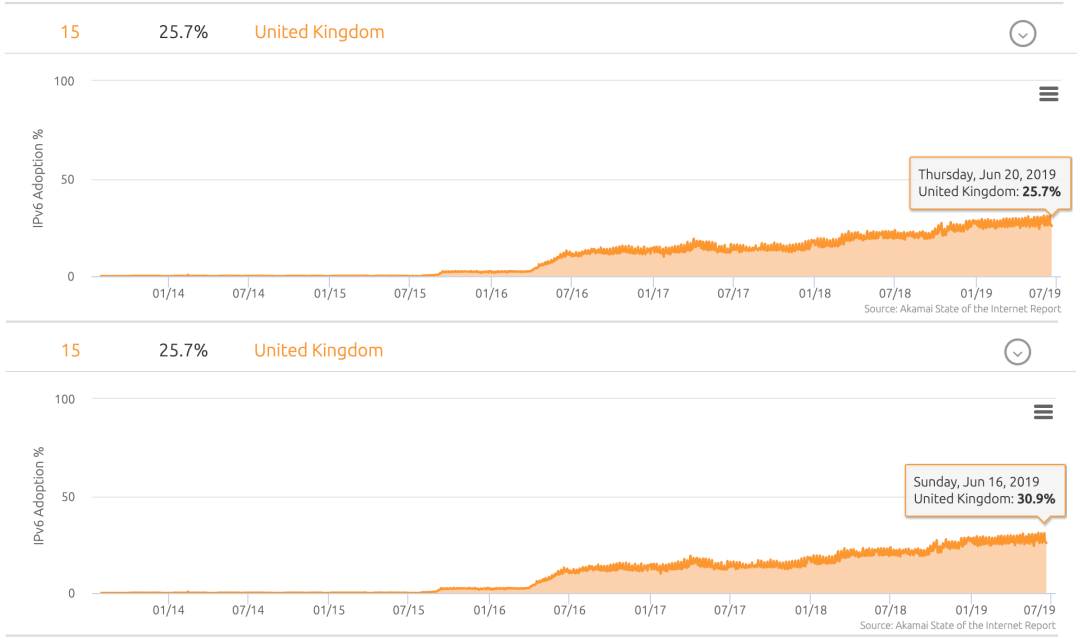
UK IPv6 deployment?

Google suggests nearly 23%



UK IPv6 Deployment, another view

Akamai stats, 25.7% - 30.9% depending on the day of the week



The weekend effect:

25.7% vs 30.9% is a difference of over three million users

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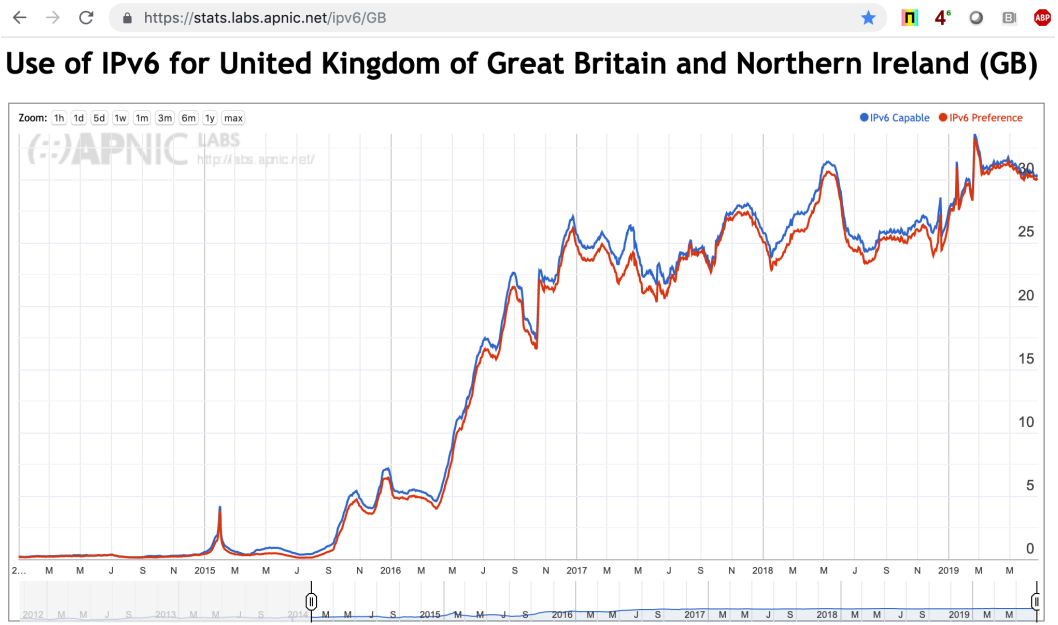
UK IPv6 deployment, a third view

APNIC suggests just over 30%



How has UK IPv6 deployment grown?

Mainly commercial ISPs

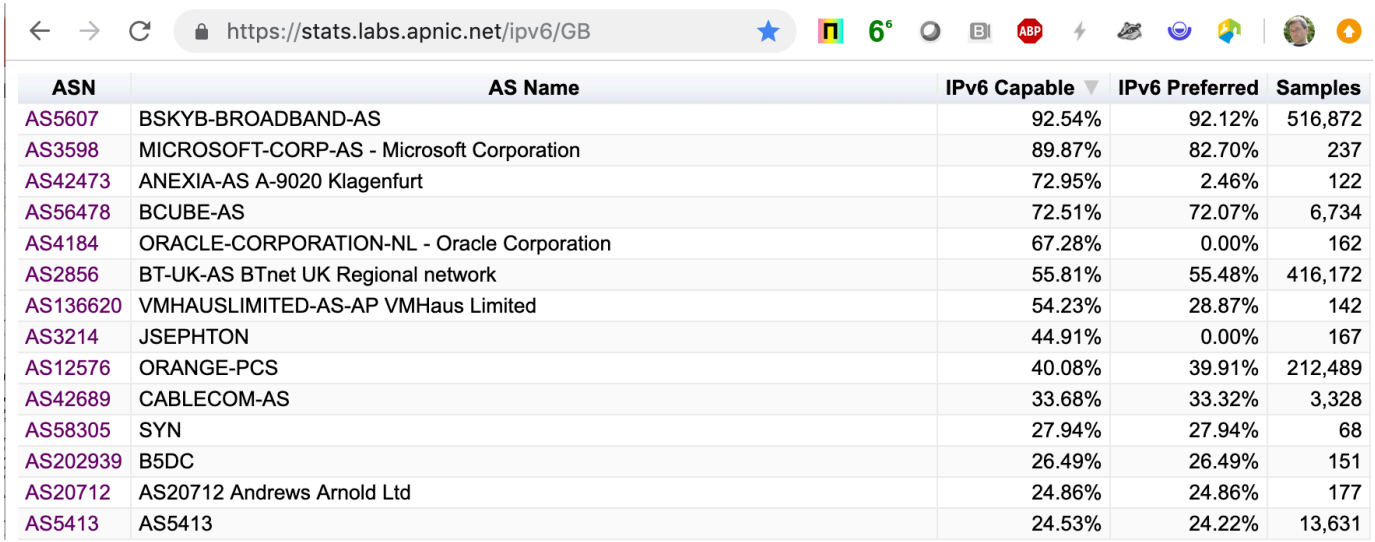
- Initial deployment in the UK was in R&E networks, i.e., Janet, in around 2002/03
- A handful of smaller ISPs were the first commercial deployers, e.g., Andrews and Arnold

- Biggest IPv6 growth has been in the last three years
- Sky deployed to ~5M residential users, mainly in 2016, dual-stack
- BT is in progress, covering several million residential users, dual-stack
- EE has multiple millions of mobile users with IPv6-only to the handset, using 464XLAT
- Remainder of ISPs are currently lagging behind

- Where R&E networks led in 2011/12 at the World IPv6 Launch, they have now fallen behind

UK ISPs with > 20% IPv6 capability for users

Based on APNIC measurements



ASN	AS Name	IPv6 Capable	IPv6 Preferred	Samples
AS5607	BSKYB-BROADBAND-AS	92.54%	92.12%	516,872
AS3598	MICROSOFT-CORP-AS - Microsoft Corporation	89.87%	82.70%	237
AS42473	ANEXIA-AS A-9020 Klagenfurt	72.95%	2.46%	122
AS56478	BCUBE-AS	72.51%	72.07%	6,734
AS4184	ORACLE-CORPORATION-NL - Oracle Corporation	67.28%	0.00%	162
AS2856	BT-UK-AS BTnet UK Regional network	55.81%	55.48%	416,172
AS136620	VMHAUSLIMITED-AS-AP VMHaus Limited	54.23%	28.87%	142
AS3214	JSEPHTON	44.91%	0.00%	167
AS12576	ORANGE-PCS	40.08%	39.91%	212,489
AS42689	CABLECOM-AS	33.68%	33.32%	3,328
AS58305	SYN	27.94%	27.94%	68
AS202939	B5DC	26.49%	26.49%	151
AS20712	AS20712 Andrews Arnold Ltd	24.86%	24.86%	177
AS5413	AS5413	24.53%	24.22%	13,631

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IPv6 deployment in R&E networks

Janet has run dual-stack since 2002/03

- Janet, as the UK NREN, has supported IPv6 on its backbone for over 15 years
- IPv6 is available to all our connected organisations, including ~160 universities, hundreds of colleges, and many other research organisations
- To date, only about 10 organisations have a significant deployment
  - Janet IPv6 traffic sits at around 6-7%, vs 22-30% for the UK as a whole
- Imperial College London is the most advanced
  - Connected to Janet at 100G, have previously run CERN transfers over IPv6 up to ~40Gbit/s.
- How can we help those organisations make their business case and assist deployment?
  - They have many priorities and limited resources to support those
- When I deliver Jisc IPv6 training events, attendees are generally very positive
  - Some issues are frequently raised, e.g., DHCPv6 vs SLAAC, and address accountability

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R&E deployment drivers?

Include…

- Supporting teaching and research
- University students, esp. in computer science, are graduating into an IPv6 world
- Some research projects / communities are beginning to require IPv6 (more on the WLCG next)
- Simplifying access to public-facing services (web, dns, …)
- Protecting against IPv6 security issues (rogue RAs, …)
- Gaining experience to inform future procurements
- Supporting deployment of new IPv6 (only) devices, including IoT
- Allowing innovation at the edge
- Providing IPv6 on campus given more and more users have it at home

- What other drivers might we put forward?

Some other personal IPv6 interests

A random selection

- End-to-end network performance
  - Includes measuring IPv4 and IPv6 performance with perfSONAR
  - An open source package, jointly developed in Europe (GÉANT project) and the US
  - https://www.perfsonar.net/
  - More on this in my WLCG talk
- Contributing to IETF standards
  - Most recently RFC8504, IPv6 Node Requirements - https://tools.ietf.org/html/rfc8504
  - Still many “religious” debates there, but on the whole very good outputs
  - Some important current topics, such as the Provisioning Domain work
- Deploying IPv6 on WiFi networks
  - I was one of the original eduroam design team (TERENA TF-Mobility WG)
  - Encouraging IPv6 deployment on eduroam networks is a realistic, practical goal

How can IPv6 Councils help each other?

The UK IPv6 Council would welcome collaboration

- Are there specific common areas of interest?
- IPv6 security topics draw the biggest audience for us
- Measuring IPv6 deployment Is an interesting topic
- One opportunity: IPv6 Cloud Workshop, Imperial College London, 3 Sep 2019

- Very happy to talk to R&E / universities about business cases and approaches there

- Thoughts welcome!

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Thank you – any questions?

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