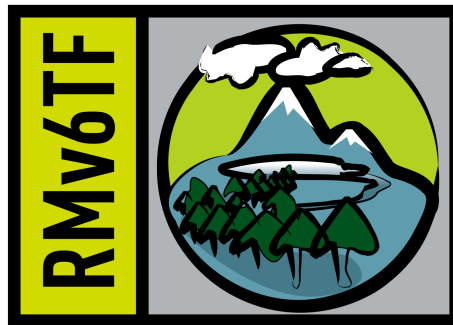


Celebrating the 10th Anniversary of World IPv6 Launch

2022:6:6::

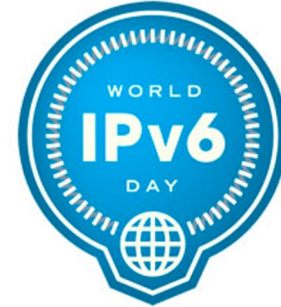
Now get back to work!

North American IPv6 Task Forces



History

- June 8th, 2011: World IPv6 Day
 - Organized by the Internet Society
 - Participants enabled IPv6 for one day to test, evaluate, and learn.
- June 6th, 2012: World IPv6 Launch
 - Organized by the Internet Society
 - Major ISPs, equipment manufacturers, and web companies permanently enabled IPv6 for their products and services.
- June 6th, 2022: Ten years since World IPv6 Launch
 - Let's take stock of the roses and the thorns.



A Celebration!



- Commemorating the 10th anniversary of World IPv6 Launch (2012:6:6) <https://www.worldipv6launch.org/>
- We are honoring the success, giving our appreciation, and expressing gratitude to all the work that has gone into IPv6 advancement over the last 10 years.
- The industry should be proud of how far it has come in the most recent 10 years.
- We are not taking credit for the progress that has been made, but rather recognizing those who have worked tirelessly to further IPv6 adoption.

Product Manufacturers

- Thanks to those companies, and open-source projects, that make products with IPv6 features. Without the tools to build we couldn't deploy IPv6.
- Routers, firewalls, wireless controllers, ADCs, CMTSSs, CPE devices, printers, host OSs, hypervisors, DDI, consumer electronics, CDNs, Clouds, etc.
- Much thanks to the product testing organizations.
 - <https://www.iol.unh.edu/registry/usgv6>
 - <https://www.ipv6ready.org/db/index.php/public/>

Tier 1 ISPs and Internet Exchanges

- Thanks to those that have worked so hard to establish IPv6 connectivity in the fabric of the Internet.
- Thanks to the IXs and NAPs, meet-me points, and data centers that have facilitated connecting carriers with IPv6.
- Special recognition of those ISPs that have gone with an IPv6-only core and are using v4aaS techniques to preserve subscriber's legacy IPv4 connectivity.

Root Name Servers

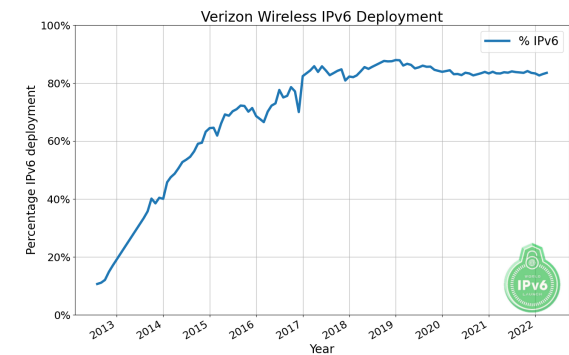
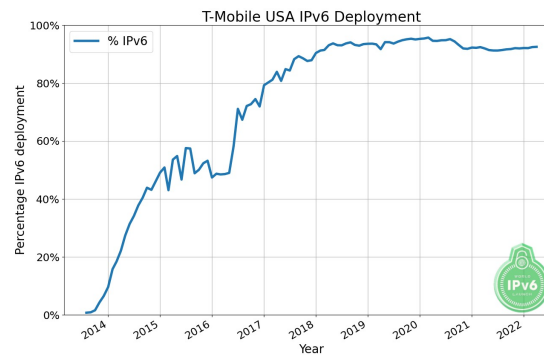
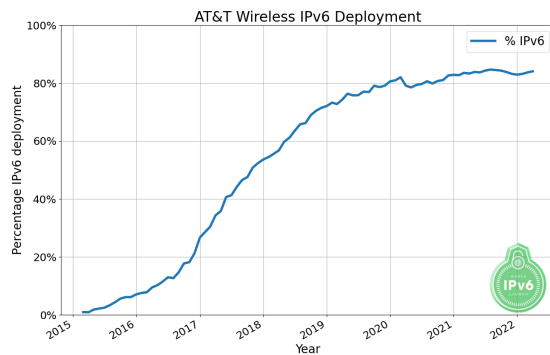
- Thanks to all those who have worked to IPv6-enabled the root name servers.
- Thanks to those who enabled IPv6 on their authoritative name servers.

```
; This file holds the information on root name servers needed to F.ROOT-SERVERS.NET. 3600000 A 192.5.5.241
; initialize cache of Internet domain name servers F.ROOT-SERVERS.NET. 3600000 AAAA 2001:500:2f::f
; (e.g. reference this file in the "cache . <file>" ;
; configuration file of BIND domain name servers). ; FORMERLY NS.NIC.DDN.MIL
; ;
; This file is made available by InterNIC ;
; under anonymous FTP as ; 3600000 NS G.ROOT-SERVERS.NET.
; file /domain/named.cache G.ROOT-SERVERS.NET. 3600000 A 192.112.36.4
; on server FTP.INTERNIC.NET G.ROOT-SERVERS.NET. 3600000 AAAA 2001:500:12::d0d
; -OR- RS.INTERNIC.NET ; FORMERLY AOS.ARL.ARMY.MIL
; ;
; last update: April 21, 2022 ; 3600000 NS H.ROOT-SERVERS.NET.
; related version of root zone: 2022042101 H.ROOT-SERVERS.NET. 3600000 A 198.97.190.53
; H.ROOT-SERVERS.NET. 3600000 AAAA 2001:500:1::53
; ;
; FORMERLY NS.INTERNIC.NET ; FORMERLY NIC.NORDU.NET
; ;
; 3600000 NS A.ROOT-SERVERS.NET. ;
A.ROOT-SERVERS.NET. 3600000 A 198.41.0.4 ; 3600000 NS I.ROOT-SERVERS.NET.
A.ROOT-SERVERS.NET. 3600000 AAAA 2001:503:ba3e::2:30 I.ROOT-SERVERS.NET. 3600000 A 192.36.148.17
; I.ROOT-SERVERS.NET. 3600000 AAAA 2001:7fe::53
; FORMERLY NS1.ISI.EDU ;
; ;
; 3600000 NS B.ROOT-SERVERS.NET. ; OPERATED BY VERISIGN, INC.
B.ROOT-SERVERS.NET. 3600000 A 199.9.14.201 ; 3600000 NS J.ROOT-SERVERS.NET.
B.ROOT-SERVERS.NET. 3600000 AAAA 2001:500:200::b J.ROOT-SERVERS.NET. 3600000 A 192.58.128.30
; J.ROOT-SERVERS.NET. 3600000 AAAA 2001:503:c27::2:30
; FORMERLY C.PSI.NET ;
; ;
; 3600000 NS C.ROOT-SERVERS.NET. ; OPERATED BY RIPE NCC
C.ROOT-SERVERS.NET. 3600000 A 192.33.4.12 ; 3600000 NS K.ROOT-SERVERS.NET.
C.ROOT-SERVERS.NET. 3600000 AAAA 2001:500:2::c K.ROOT-SERVERS.NET. 3600000 A 193.0.14.129
; K.ROOT-SERVERS.NET. 3600000 AAAA 2001:7fd::1
; FORMERLY TERP.UMD.EDU ;
; ;
; 3600000 NS D.ROOT-SERVERS.NET. ; OPERATED BY ICANN
D.ROOT-SERVERS.NET. 3600000 A 199.7.91.13 ; 3600000 NS L.ROOT-SERVERS.NET.
D.ROOT-SERVERS.NET. 3600000 AAAA 2001:500:2d::d L.ROOT-SERVERS.NET. 3600000 A 199.7.83.42
; L.ROOT-SERVERS.NET. 3600000 AAAA 2001:500:9f::42
; FORMERLY NS.NASA.GOV ;
; ;
; 3600000 NS E.ROOT-SERVERS.NET. ; OPERATED BY WIDE
E.ROOT-SERVERS.NET. 3600000 A 192.203.230.10 ; 3600000 NS M.ROOT-SERVERS.NET.
E.ROOT-SERVERS.NET. 3600000 AAAA 2001:500:a8::e M.ROOT-SERVERS.NET. 3600000 A 202.12.27.33
; M.ROOT-SERVERS.NET. 3600000 AAAA 2001:dc3::35
; FORMERLY NS.ISC.ORG ;
; ;
; 3600000 NS F.ROOT-SERVERS.NET. ; End of file
```

<http://www.internic.net/domain/named.cache>

Mobile Service Providers

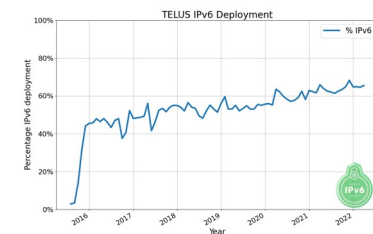
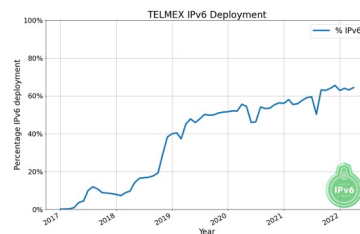
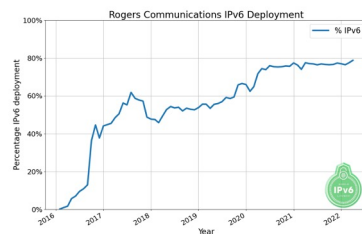
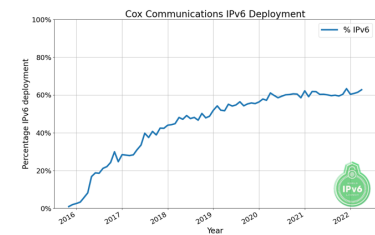
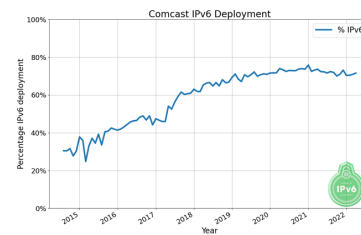
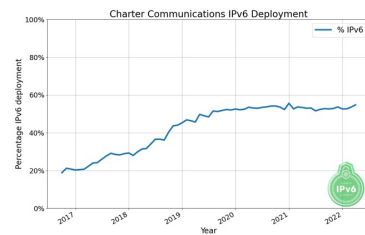
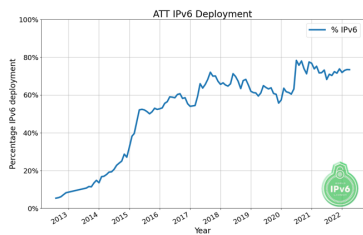
- Thanks to the carriers that have IPv6-enabled our mobile devices.
- **AT&T**, T-Mobile/Sprint, Verizon, Among many others ...



Bold = Original World IPv6 Launch Participants

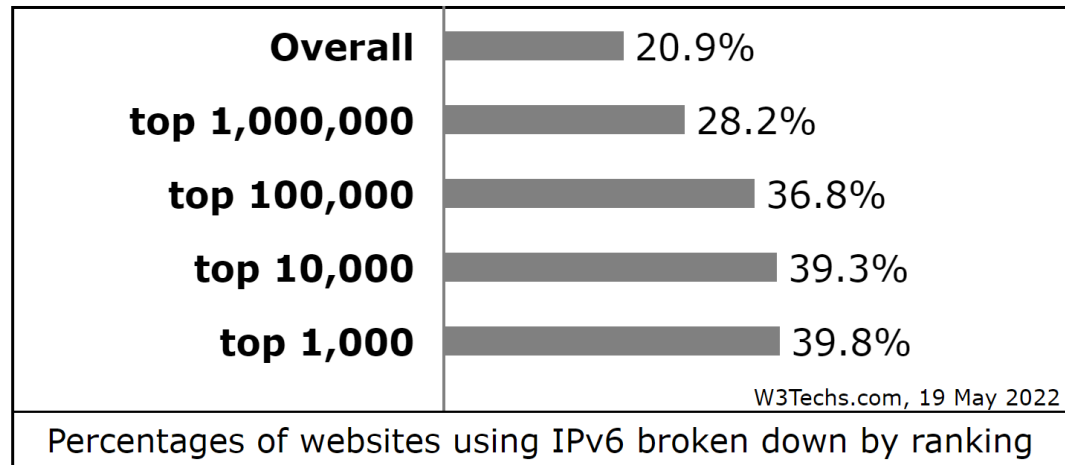
Residential Broadband ISPs

- Thanks to those ISPs that have provided us IPv6 connectivity to our homes and businesses.
- **AT&T, Charter/Spectrum, Comcast/Xfinity, Cox Communications, Rogers, Telmex, Telus, and others ...**



Content

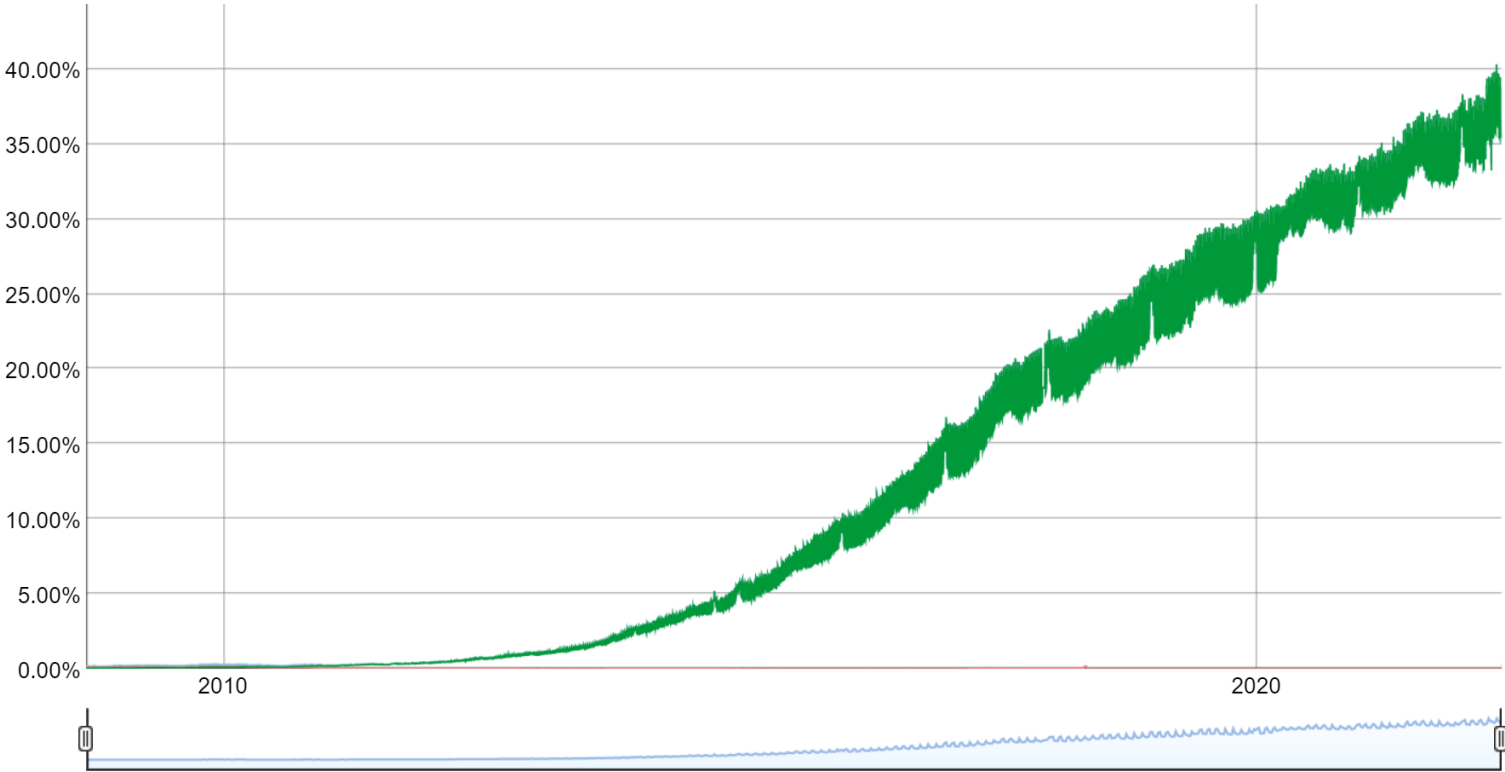
- Many of the largest websites now have AAAA records and IPv6 connectivity.
 - **Google.com**
 - YouTube.com
 - **Facebook.com**
 - Instagram.com
 - Wikipedia.com
 - **Yahoo.com**
 - Whatsapp.com
 - Live.com
 - Netflix.com
 - Reddit.com
 - Office.com
 - LinkedIn.com



Source: <https://w3techs.com/technologies/breakdown/ce-ipv6/ranking>

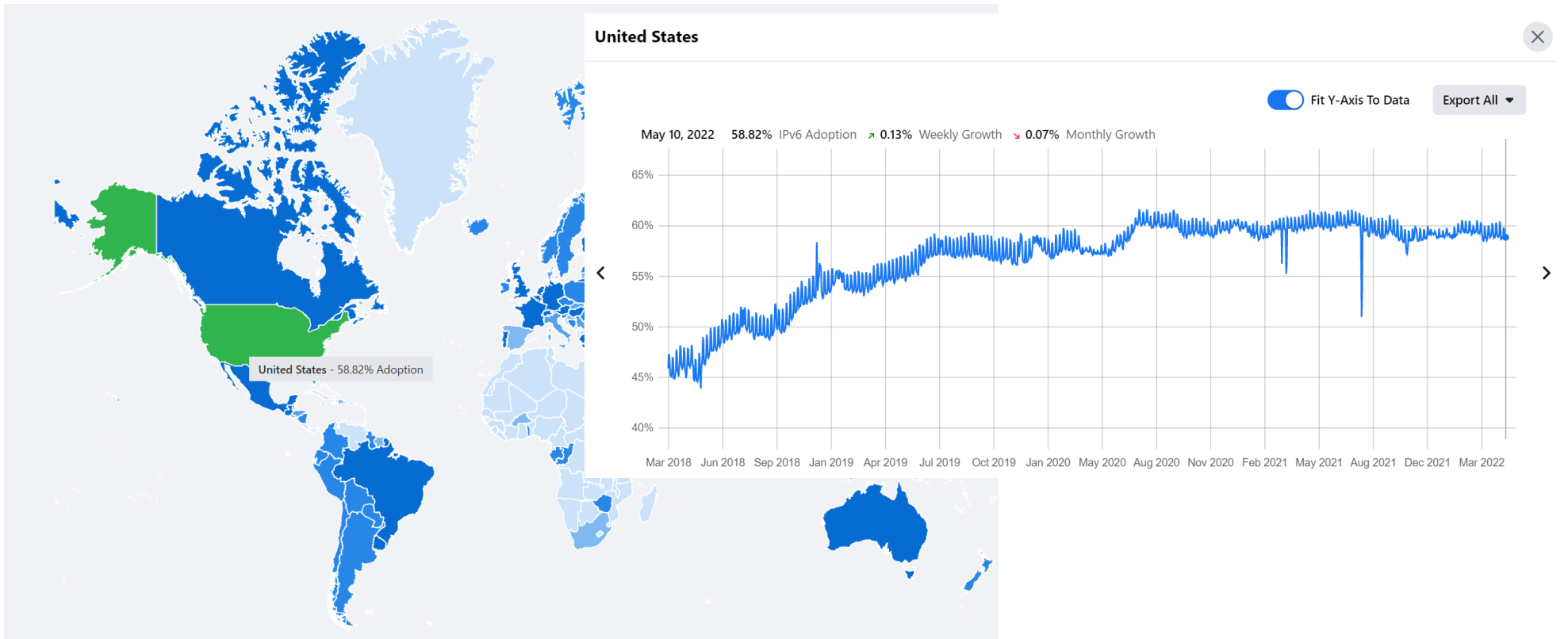
Google IPv6 Statistics

Native: 35.43% 6to4/Teredo: 0.00% Total IPv6: 35.43% | May 17, 2022



Source: <http://www.google.com/ipv6/statistics.html#>

Facebook IPv6 Statistics



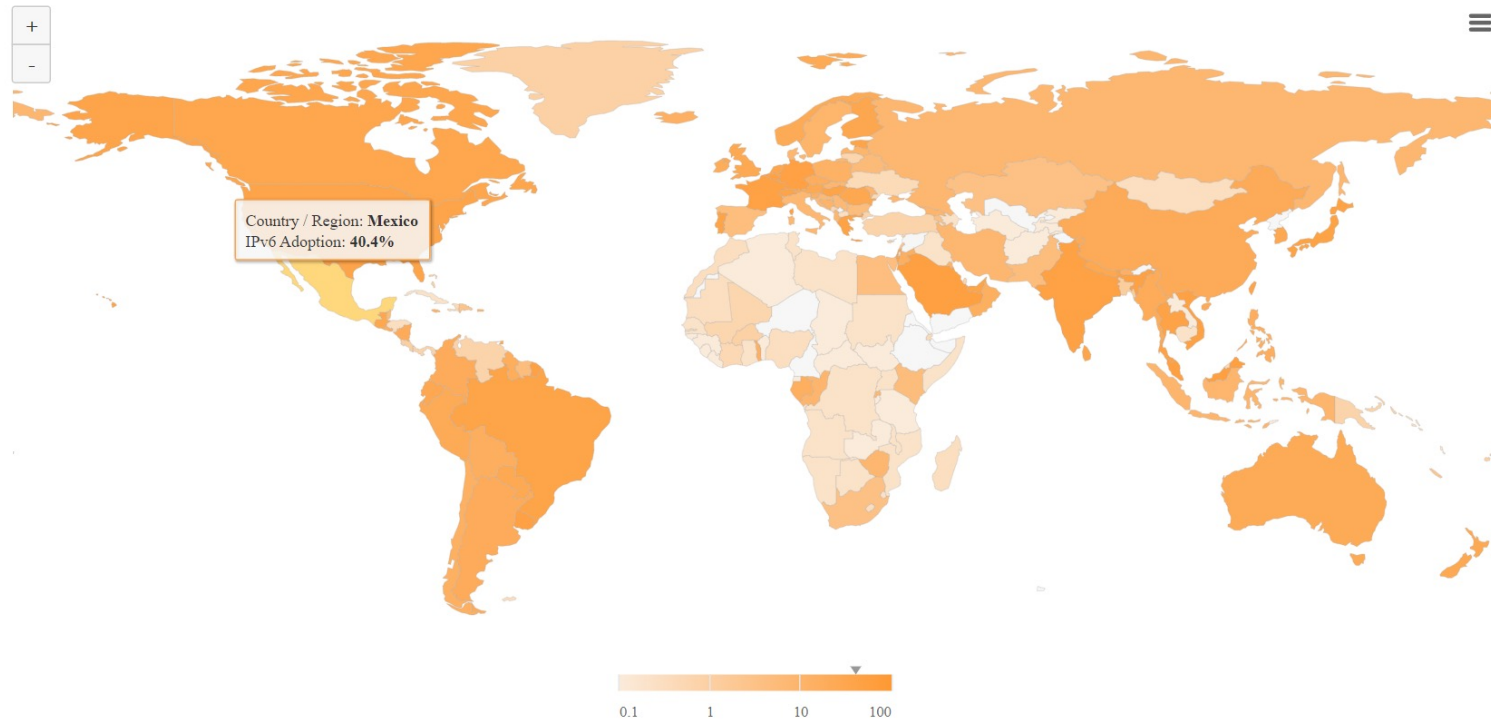
Source: <https://www.facebook.com/ipv6/?tab=ipv6>

Content Delivery Networks

- Thanks to the CDN providers that are helping to make many websites accessible over IPv6.
- Special thanks to those enabling IPv6 by default.
 - **Akamai**
 - **Amazon CloudFront**
 - **Cloudflare**
 - Fastly
 - Imperva/Incapsula
 - **Limelight Networks**
 - **Microsoft Azure CDN**
 - Among many others ...

Akamai IPv6 Adoption Visualization

IPv6 Adoption By Country / Region



Source: <https://www.akamai.com/visualizations/state-of-the-internet-report/ipv6-adoption-visualization>

Cloud Service Providers

- We appreciate the IPv6 features that are now available in public cloud infrastructure.
 - Amazon Web Services
 - Digital Ocean
 - **Google** Cloud Platform
 - Microsoft Azure
 - Oracle Cloud Infrastructure
- Although, utilization of these IPv6 features remains low.
- IPv6 services are seldom enabled by default.

Evolution of Deployment Recommendations

- IPv6 Industry Best Practice in 2012
 - Dual Stack where you can, tunnel where you must
- IPv6 Industry Best Practice in 2022
 - IPv6-Only Where You Can, Dual-Stack Where You Must
- IPv6-Only is the "vision" and long-term goal.
- Turning off IPv4 may be infeasible for most enterprises.
- Still work to be done in the control-plane and the management-plane to make products function in an entirely IPv6-only environment.

Where Do We Go From Here?

- Enterprise IPv6 adoption still lacking.
 - Lack familiarity and unaware of current IPv6 usage.
 - Dynamic host IID assignment techniques are confusing to enterprises (SLAAC doesn't meet their security compliance requirements).
 - IPv6 VPN breakout occurs unbeknownst to most security administrators.
- Many websites are still not using IPv6.
- Issues with IPv6 extension headers & fragmentation remain.

Thank You All For Your Efforts!

- We truly appreciate all the work that has gone into making significant progress since World IPv6 Launch.
- Give yourself a round of applause.
- Don't let you foot off the gas, keep driving toward greater degrees of IPv6 adoption.

Forget your A game.
Bring your AAAA game!



Contact Us

- @RockyMtn_IPv6 <https://www.rmv6tf.org/>
- @CAv6TF <http://cav6tf.org>
- @TXv6TF <http://txv6tf.org/>
- @NAv6TF
- <http://www.ipv6forum.mx/>
- Scott Hogg scott {@} rmv6tf.org scott {at} hexabuild.io



Thank you

2022:6:6::

