6 Misconceptions About IPv6

Jen Linkova, furry13@gmail.com

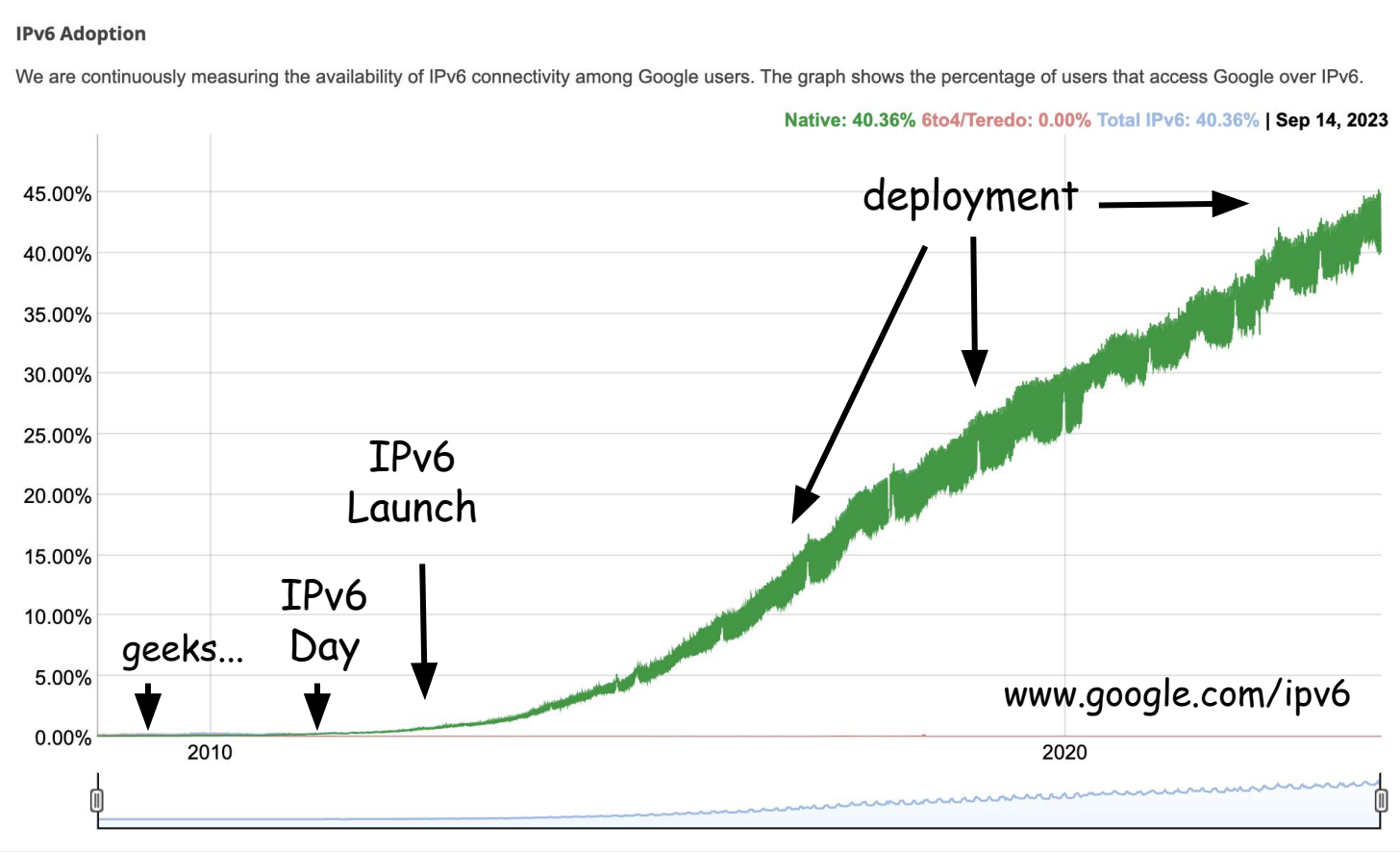
CAPIF 2, Tashkent, Sep 2023

Misconception #1

"It's Been 25 Years,

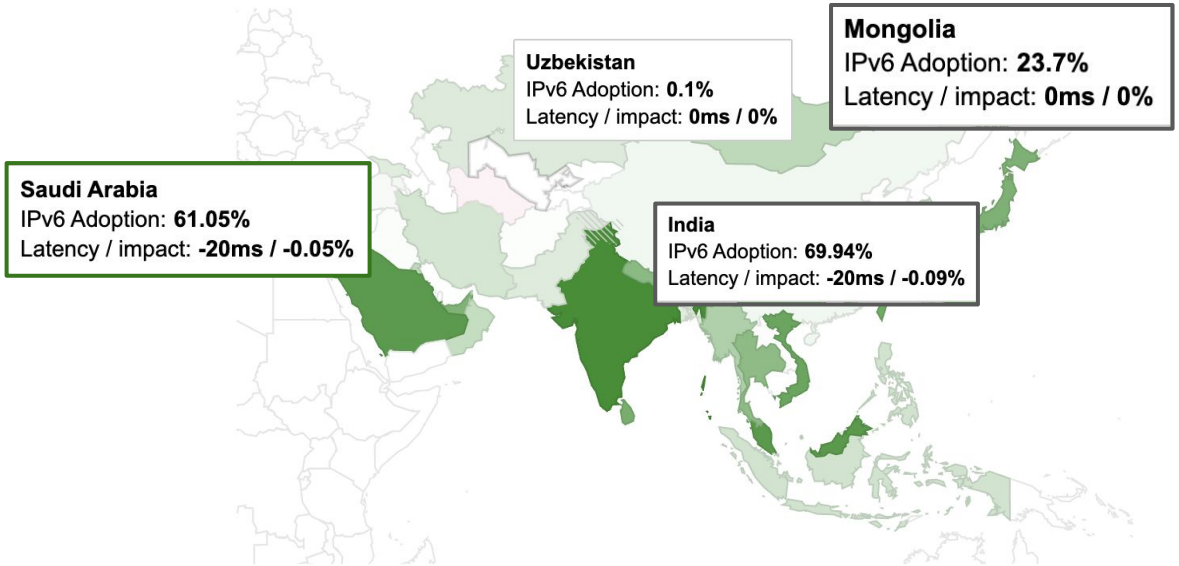
IPv6 Is Not Going to Be Deployed"

Obligatory IPv6 Adoption Graph



IPv6 Adoption | **Per-Country IPv6 adoption**

Per-Country IPv6 adoption



World | Africa | Asia | Europe | Oceania | North America | Central America | Caribbean | South America

The chart above shows the availability of IPv6 connectivity around the world.

- Regions where IPv6 is more widely deployed (the darker the green, the greater the deployment) and users experience infrequent issues connecting to IPv6-enabled websites.
- Regions where IPv6 is more widely deployed but users still experience significant reliability or latency issues connecting to IPv6-enabled websites.
- Regions where IPv6 is not widely deployed and users experience significant reliability or latency issues connecting to IPv6-enabled websites.

Network operator measurements, 8th June 2022

To understand our IPv6 Deployment metric, please read the notes below. Results are ranked by overall traffic volume. Click on Participating Network name to view a longitudinal deployment graph for that network.

Show 10 entries Search:

Rank	Participating Network	ASN(s)	IPv6 deployment
1	RELIANCE JIO INFOCOMM LTD	55836, 64049	92.58%
2	Comcast	7015, 7016, 7725, 7922, 11025, 13367, 13385, 20214, 21508, 22258, 22909, 33287, 33489, 33490, 33491, 33650, 33651, 33652, 33653, 33654, 33655, 33656, 33657, 33659, 33660, 33661, 33662, 33664, 33665, 33666, 33667, 33668, 36732, 36733	73.62%
3	Combined US Mobile Carriers	3651, 6167, 10507, 20057, 21928, 22394	87.74%
4	Charter Communications	7843, 10796, 11351, 11426, 11427, 12271, 20001, 20115, 33363	56.41%
5	ATT	6389, 7018, 7132	72.32%
6	T-Mobile USA	21928	92.31%
7	Deutsche Telekom AG	3320	74.48%
8	Orange Business Services	3215	74.08%
9	Verizon Wireless	6167, 22394	83.58%
10	Claro Brasil	4230, 28573	74.53%

Showing 1 to 10 of 345 entries

First Previous 1 2 3 4 5 Next Last

IPv6 deployment > 75%

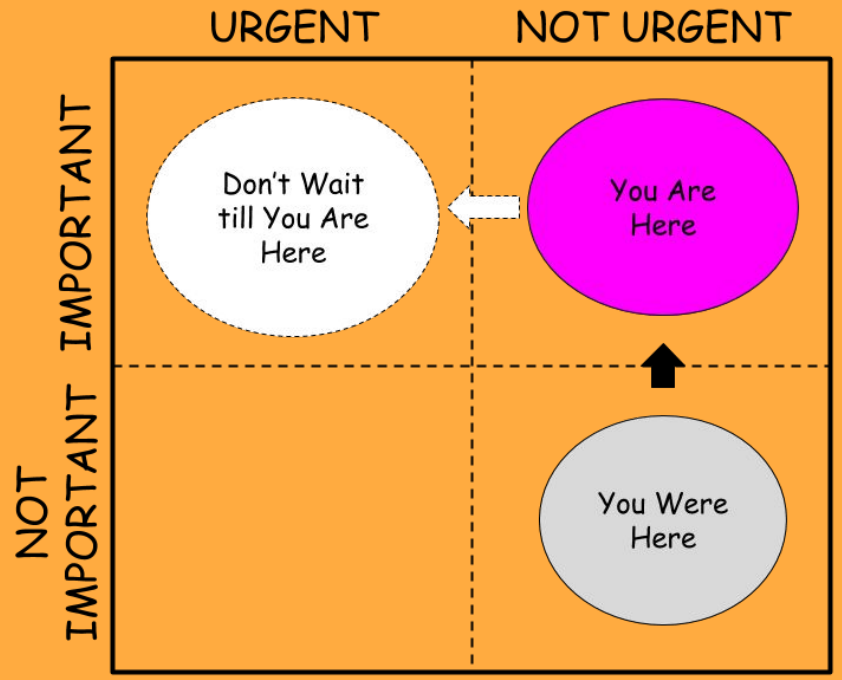
https://www.worldipv6launch.org/measurements/

Misconception #2

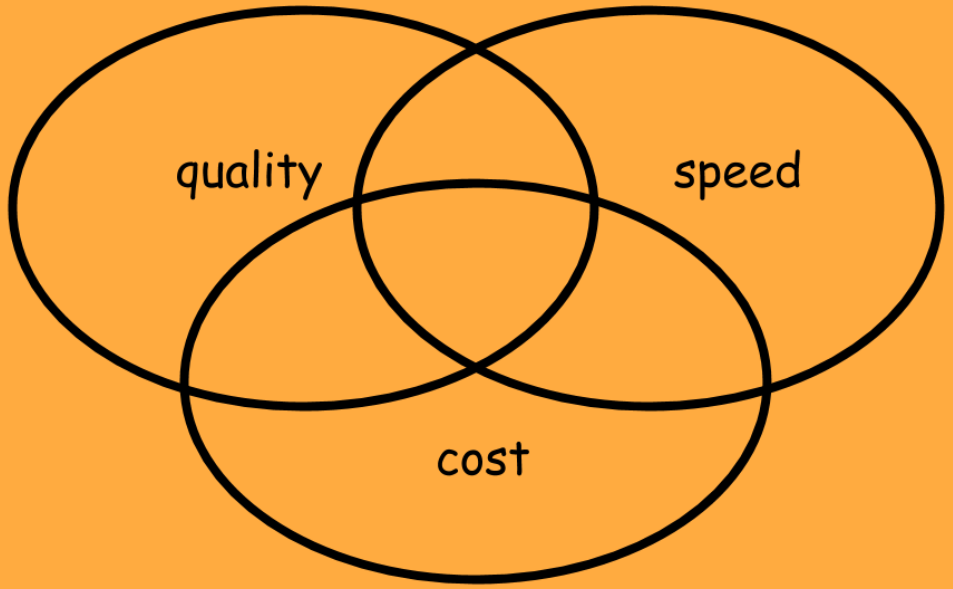
“I'll Think About It Tomorrow”

- Scarlett O’Hara -

The Eisenhower Method & IPv6



If You Have to Deploy IPv6 Tomorrow..



pick up any two

Think About It Today!

Consider:

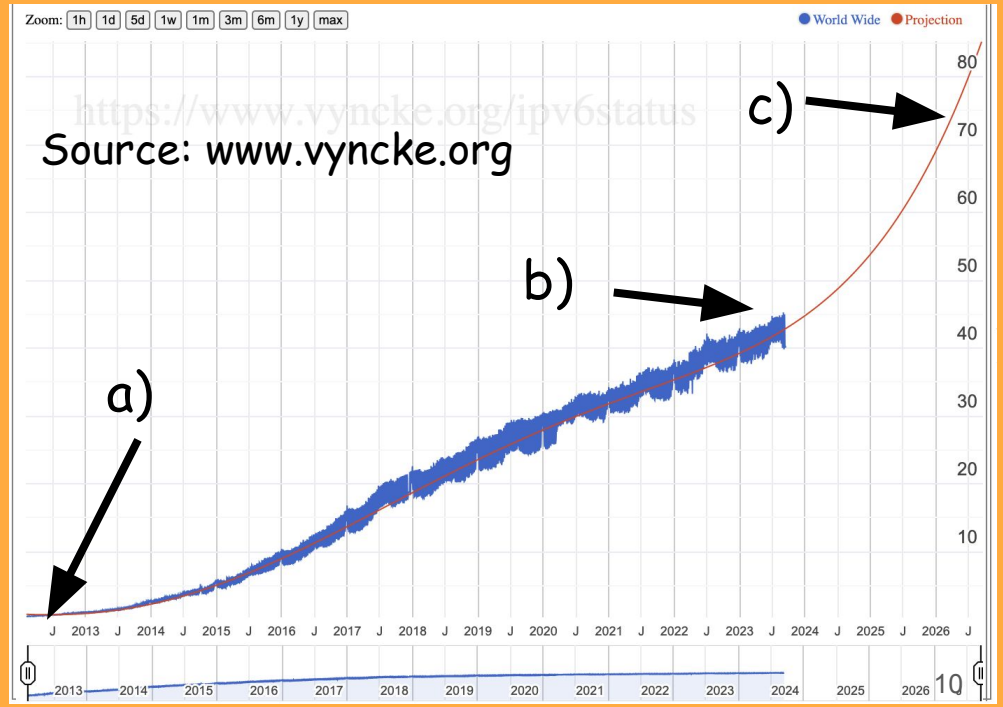
- Mindset changes
- Education/Training
- Software/hardware lifecycle periods
  - How long does it take to get a bug fixed/a feature implemented?
- Workflow changes

DON'T: "Launch Now in IPv4-mode, Enable IPv6 Later"

Quiz Q: What would be the best time to touch production systems?

Answers:

a) Back in 2012 (< 1% adoption)
b) Now (~45% adoption)
c) In 2026 (~70% adoption)

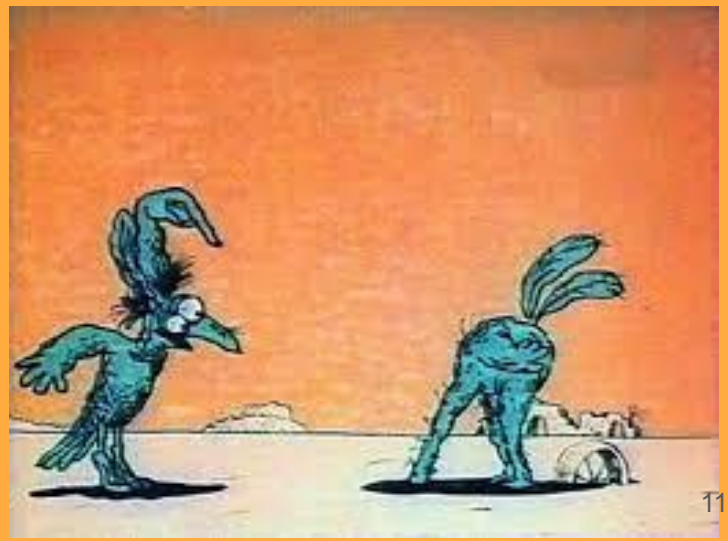


If You Won't Come to IPv6 Then IPv6 Must Come to You!

"IPv4-Only network" might mean "dual-stack"

No controlled IPv6 deployment:

No IPv6 Security



Good News, Everyone!

IPv6 Is Getting Easier to Deploy

Misconception #3

“IPv6 Is Just like IPv4 but with More Addresses”

One Netmask To Rule Them All

Address Plan Simplified:

- /128 for loopback
- /127 for p2p
- **/64 for every segment**
- /56 (or shorter) for customers

Host Configuration Simplified

Router Advertisement contains all network configuration

- IPv6 prefixes
- Router info
- DNS info
- MTU

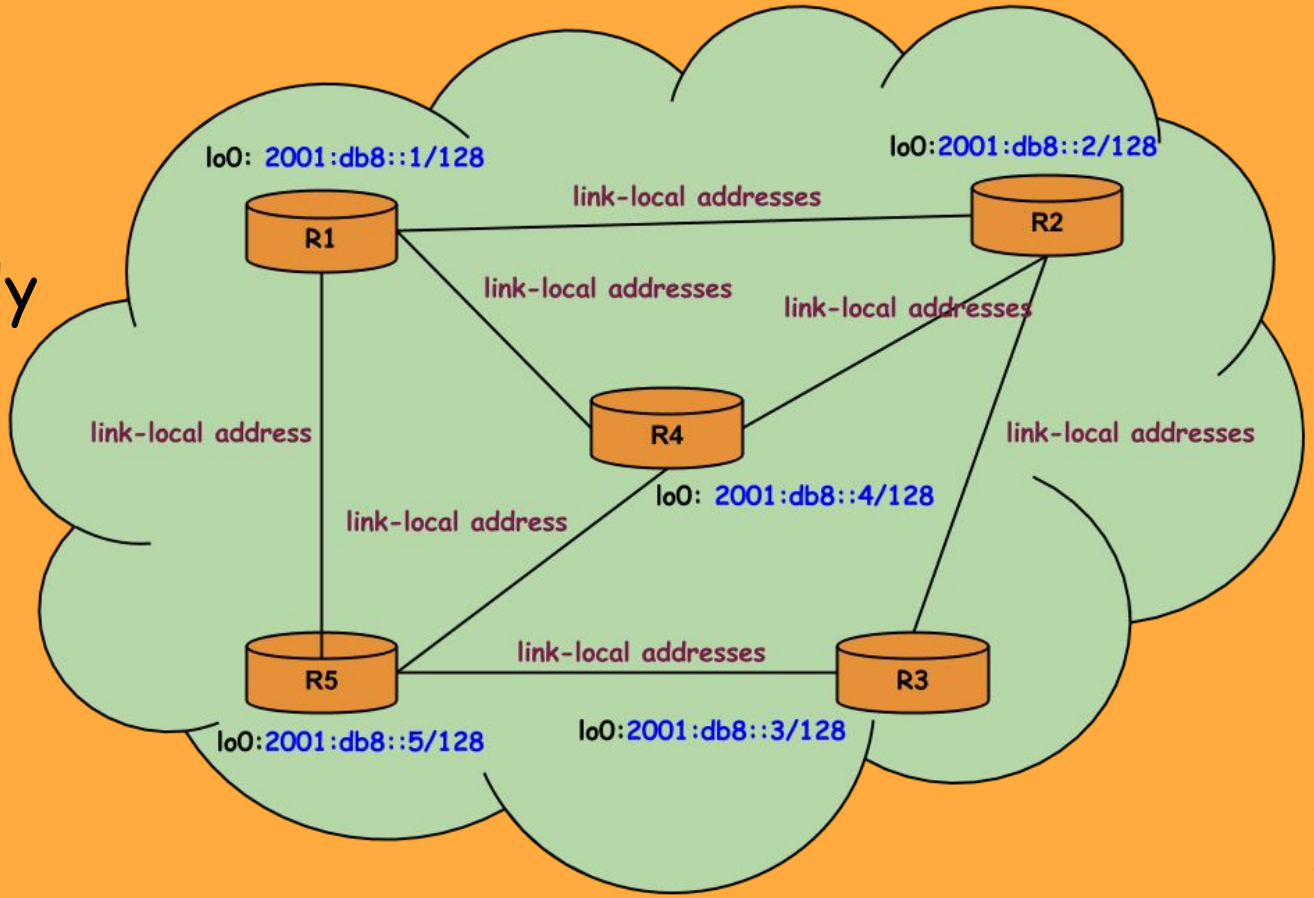
Network changes are signalled back to hosts

Multiple Addresses per host (think per application)

Link-Local Addresses

Use Case:

Link-Local Only Backbone
RFC7404



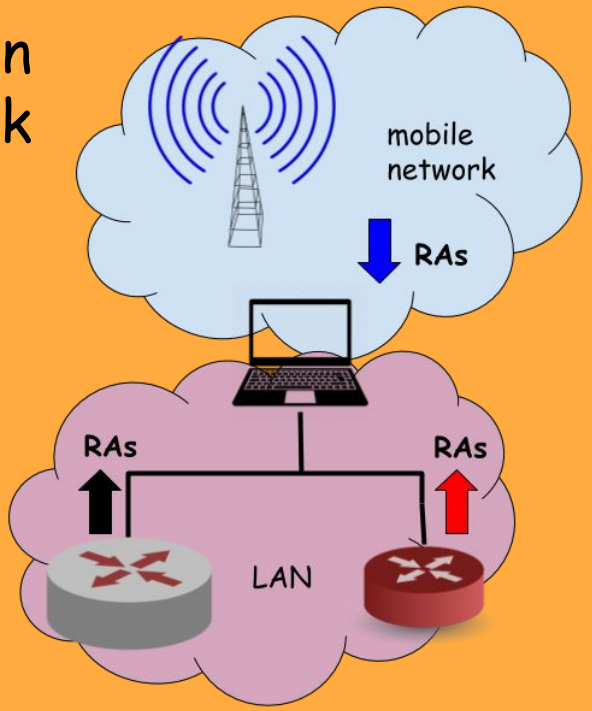
Multiple Provisioning Domains

Provisioning Domain: a set of configuration information specific for the given network

- IP prefixes
- Default routers
- DNS
- Captive Portal presence
- Costs etc

PVD info provided via RAs

Hosts associate configuration with the specific PVD



References: "Provisioning Domains", IETF98

Misconception #4

“IPv6 Is Too Complicated!”

Is It Really? Or Is It Just "Not IPv4"?

IPv6 is quite logical *[disclaimer: IMHO]*

Problem => Solution

Problem might not be so obvious though

We have OSPF, EIGRP, MPLS, BGP and multicast!

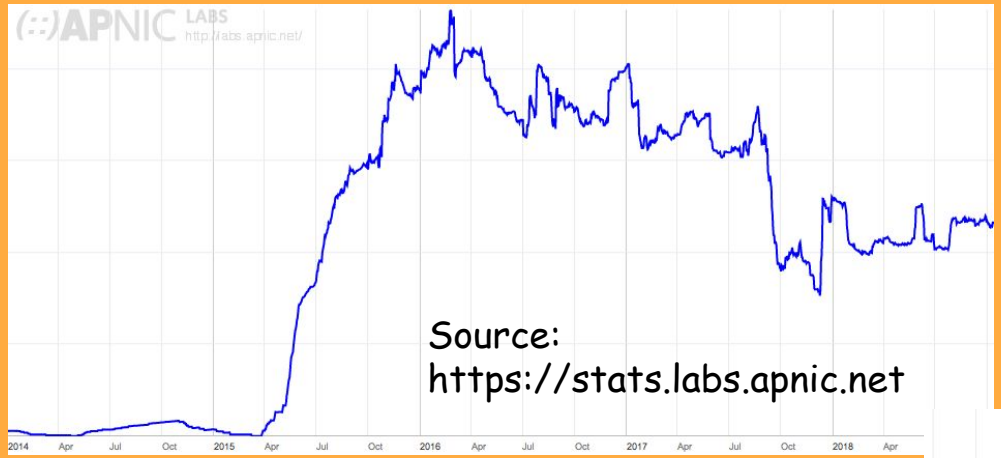
Recommended Reading: "IPv6 for IPv4 Experts" book
https://sites.google.com/site/yartikhiy/home/ipv6book

Misconception #5

"I've Enabled IPv6. I'm DONE!"

Main Question: Is IPv6 Being Used?

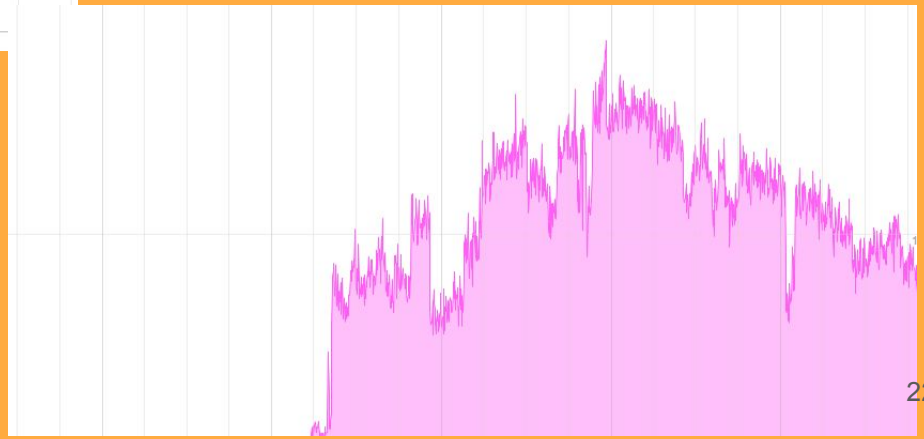
Just A Random ISP…



50% traffic decrease in ~18 months

New CPEs have broken IPv6

Came as a surprise to them…



Questions To Ask Yourself

- Is IPv6 working?
- Is it used? Any Happy Eyeballs failures?
- Bonus Points for:
  - What are IPv4 dependencies?

Solutions

- Monitor
  - IPv6 traffic trends
  - end2end connectivity
    - Both protocols
- Consider disabling IPv4 whenever possible

Misconception #6

“I still need IPv4 everywhere”

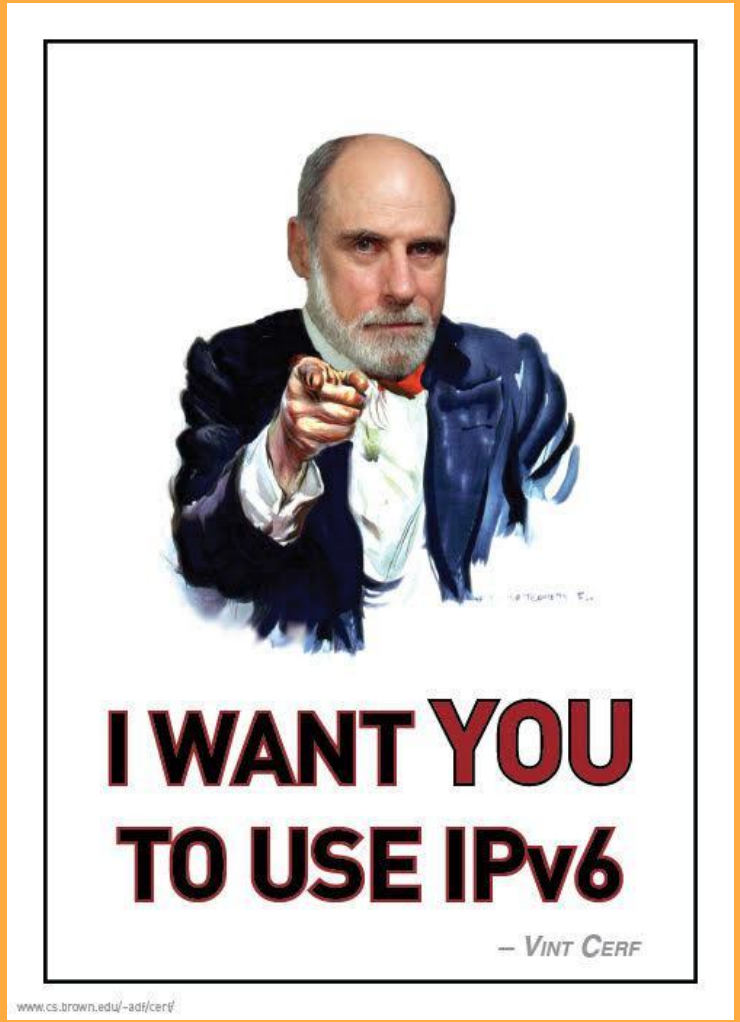
Dualstack: Not a Long-Term Option

- Doesn't solve IPv4 exhaustion problem
- Increases OpEx
  - Configure
  - Maintain
  - Troubleshoot

Endgame: IPv6-only!

Is IPv6-Only Even Possible???

- Access networks: MAP-T, MAP-E, DS-Lite
- Mobile and user-facing networks (e.g. enterprise):
  - NAT64, 464XLAT
- Datacenters: SIIT (rfc7755)
  - Success story: Mythic Beast IPv6-only hosting (video)


I WANT YOU
TO USE IPv6
– VINT CERF
www.cs.brown.edu/~adf/cerf/