# IPv6 in Enterprise Networks

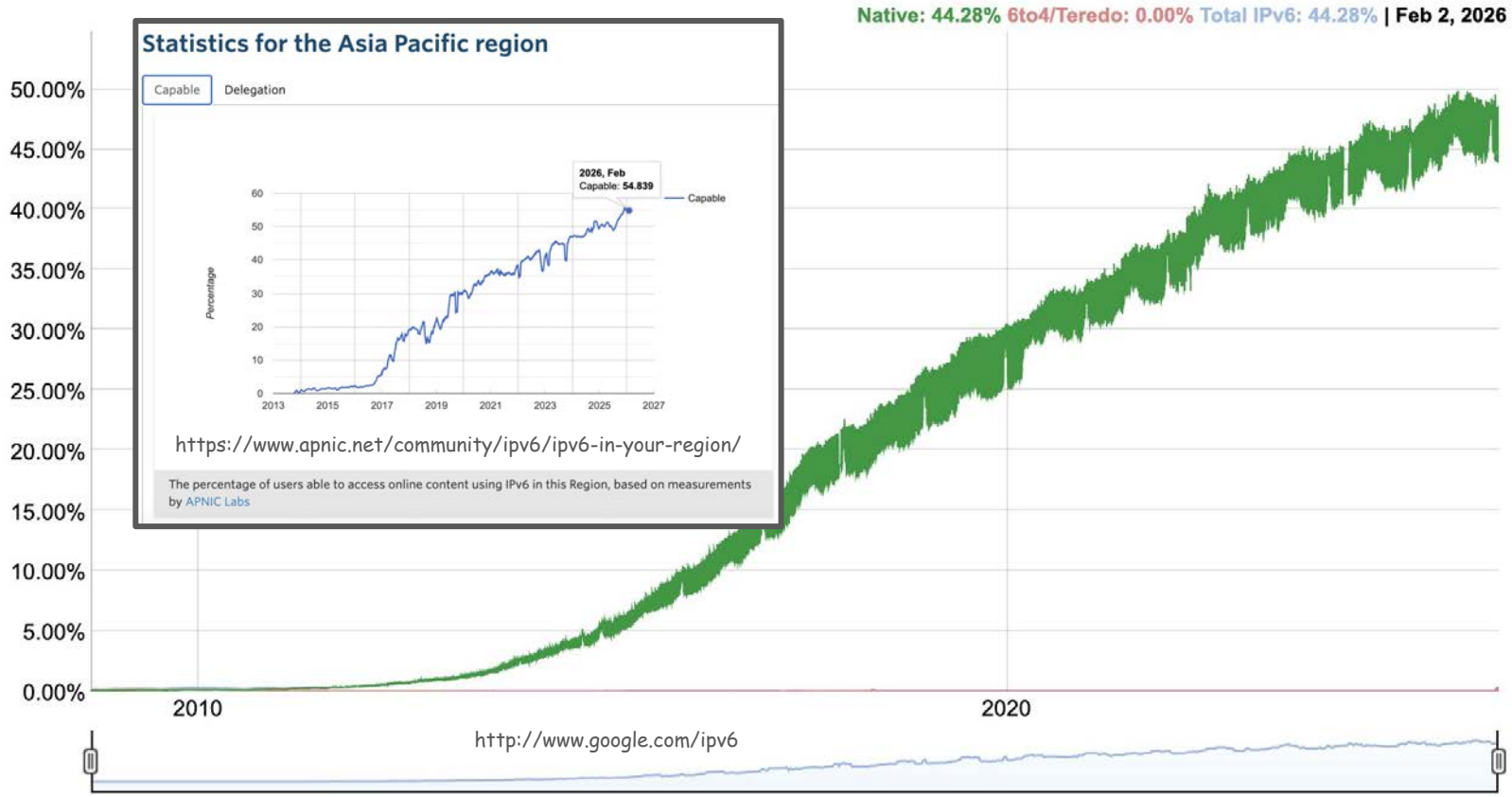
APRICOT2026 Edition
Illustrated, AI-Assisted

Jen Linkova, furry13@gmail.com

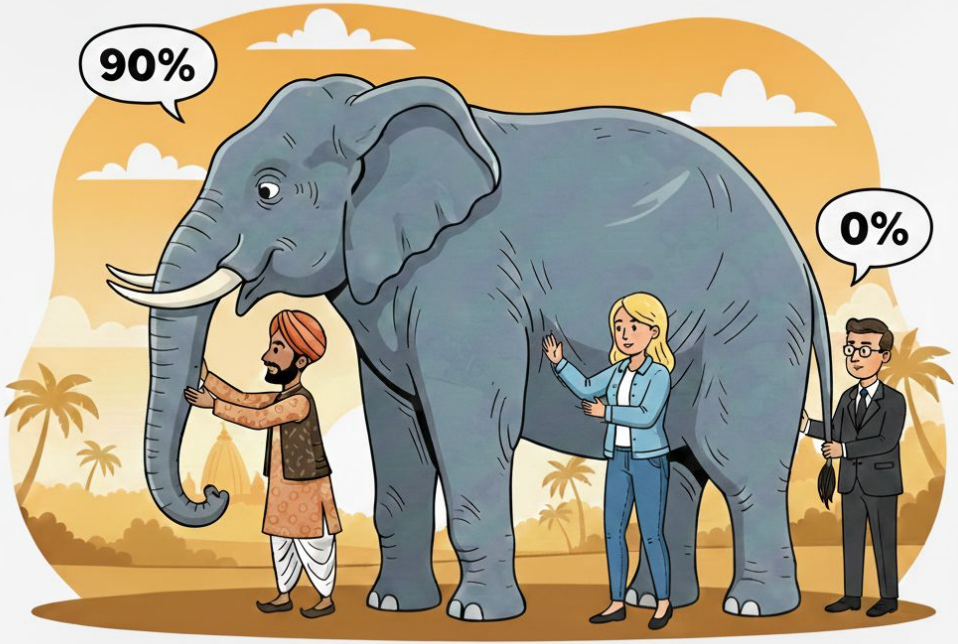
IPv6 Adoption | Per-Country IPv6 adoption

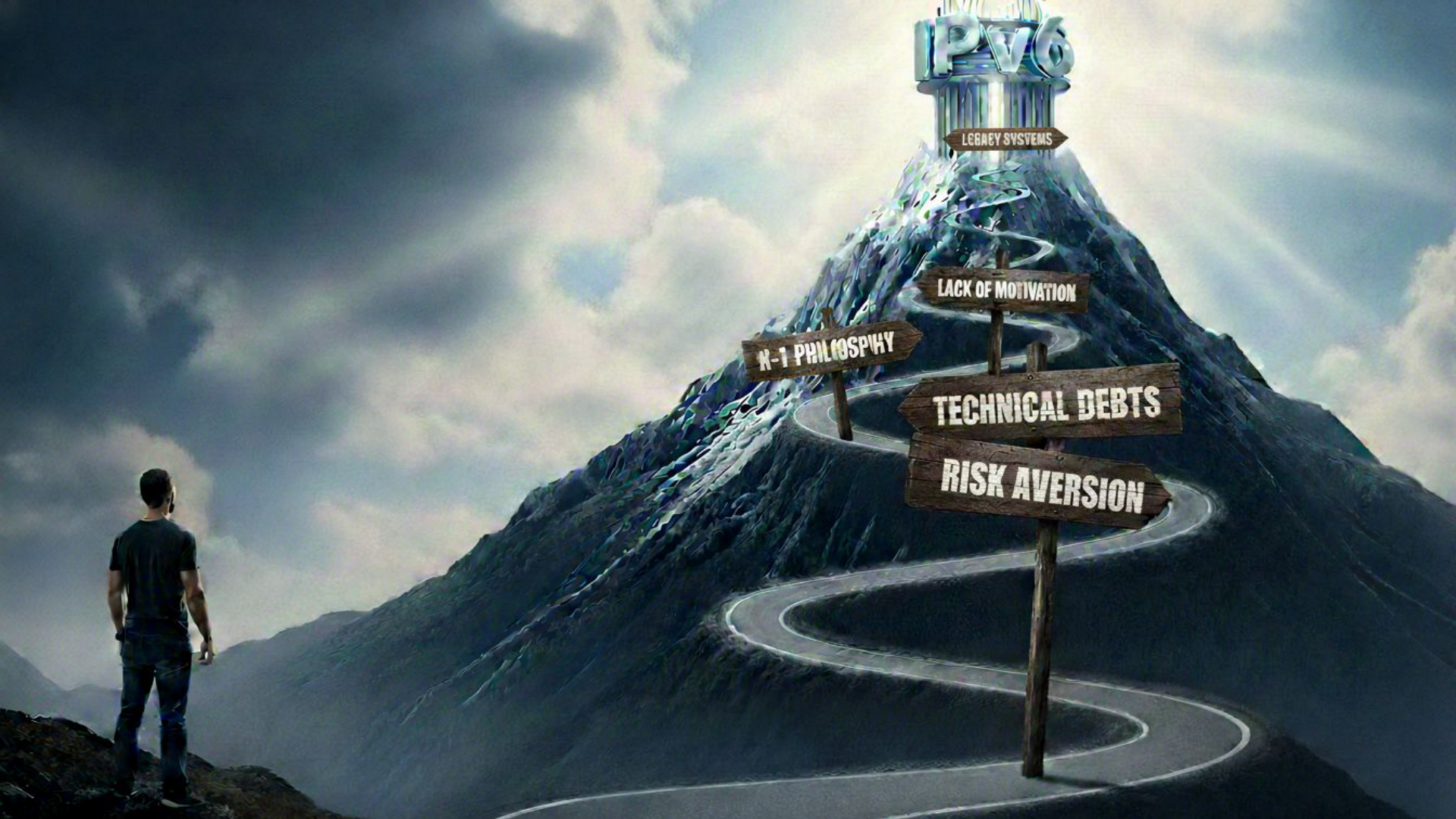
## IPv6 Adoption

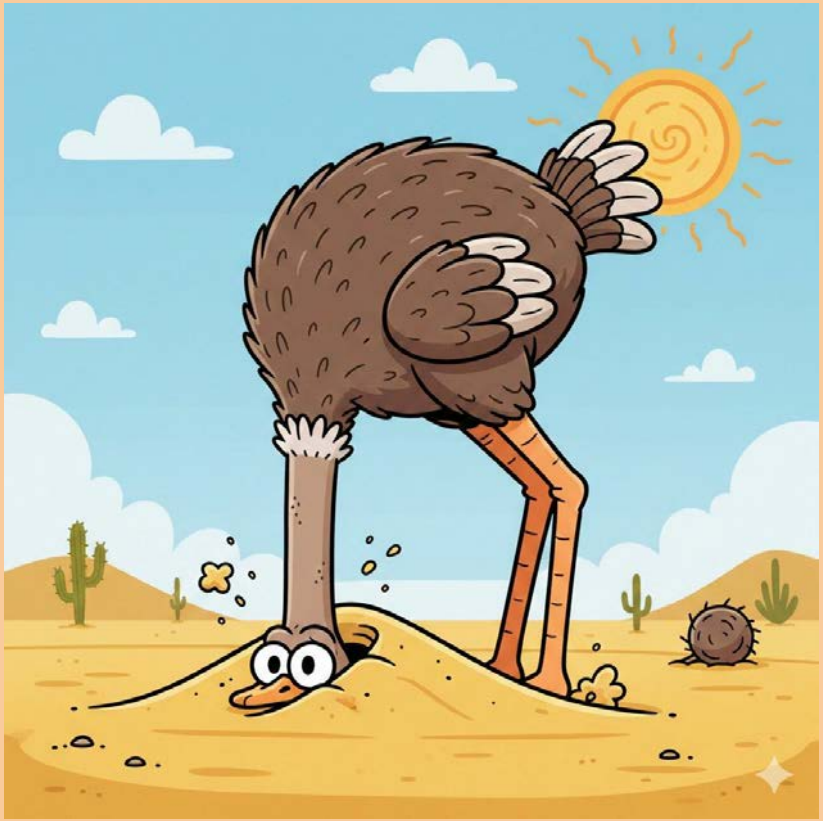
We are continuously measuring the availability of IPv6 connectivity among Google users. The graph shows the percentage of users that access Google over IPv6.



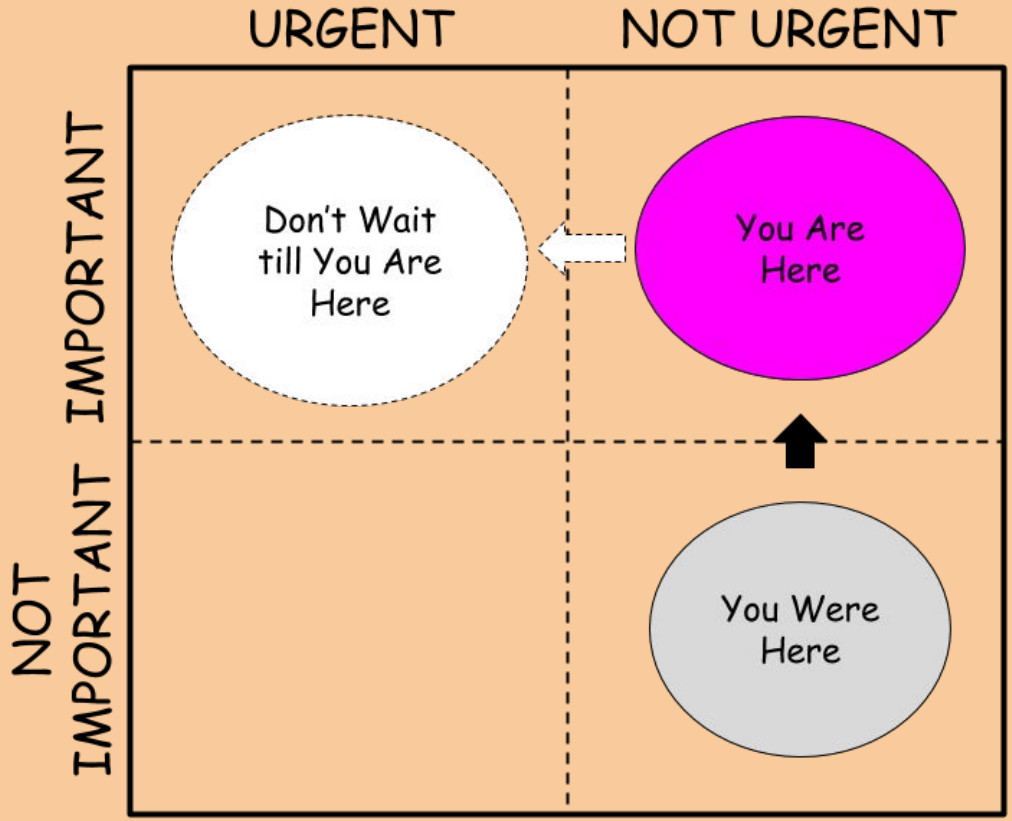
# IPV6 Adoption Elephant




IPV6
LEGACY SYSTEMS
LACK OF MOTIVATION
K-1 PHILOSPHY
TECHNICAL DEBTS
RISK AVERSION



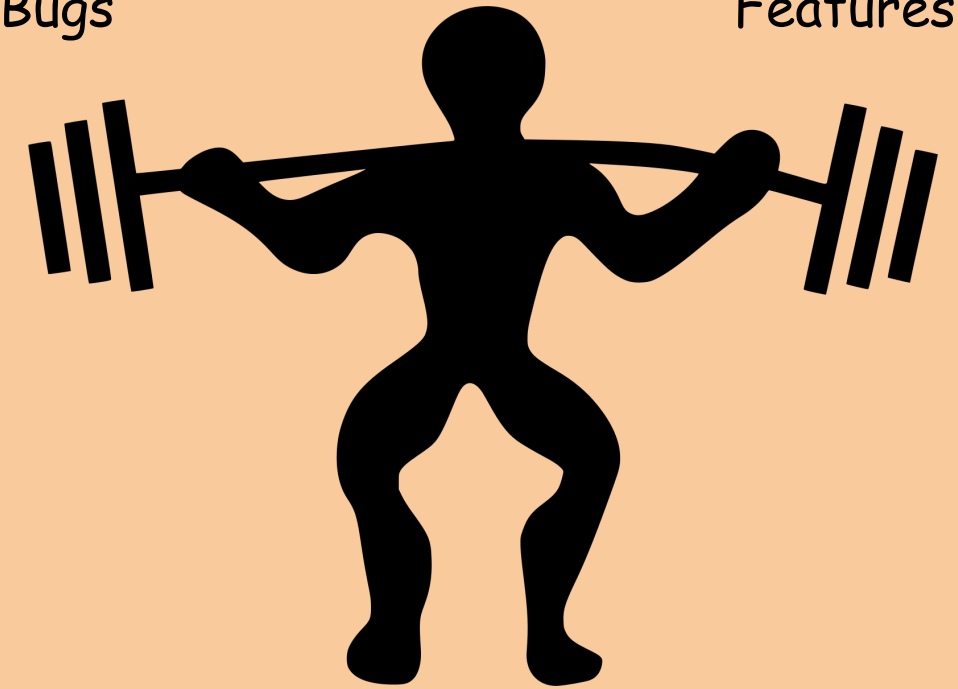
```
en0: flags=88e3<UP,BROADCAST,SMART,RUNNING,NOARP,SIMPLEX,MULTICAST> mtu 1500
        options=6460<TSO4,TSO6,CHANNEL_IO,PARTIAL_CSUM,ZEROINVERT_CSUM>
        ether 006:53:00:2c:ef:66
        inet6 fe80::146a:1802:9a94:e5a4%en0 prefixlen 64 secured scopeid 0xb
        inet6 2001:df9:0:1:c20:f250:9b91:2b9e prefixlen 64 autoconf secured
        inet6 2001:df9:0:1:dd4b:e782:c109:f120 prefixlen 64 autoconf temporary
        inet 192.0.0.2 netmask 0xffffffff broadcast 192.0.0.2
        inet6 2001:df9:0:1:865:2056:7822:dee1 prefixlen 64 clat46
        nat64 prefix 64:ff9b:: prefixlen 96
        nd6 options=201<PERFORMNUD,DAD>
        media: autoselect
        status: active
[furry@Wintermute ~]$
```

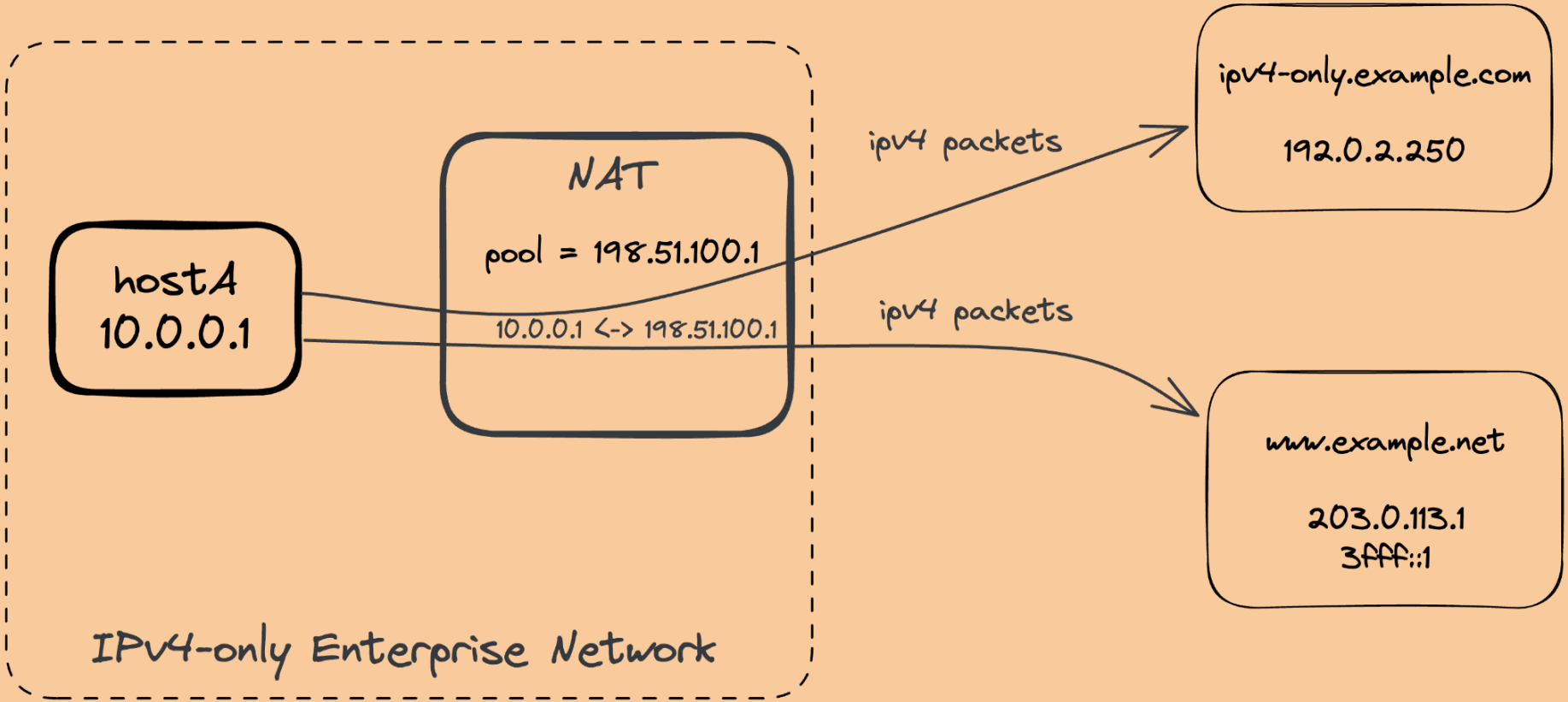

URGENT
NOT URGENT
IMPORTANT
NOT IMPORTANT
Don't Wait till You Are Here
You Are Here
You Were Here

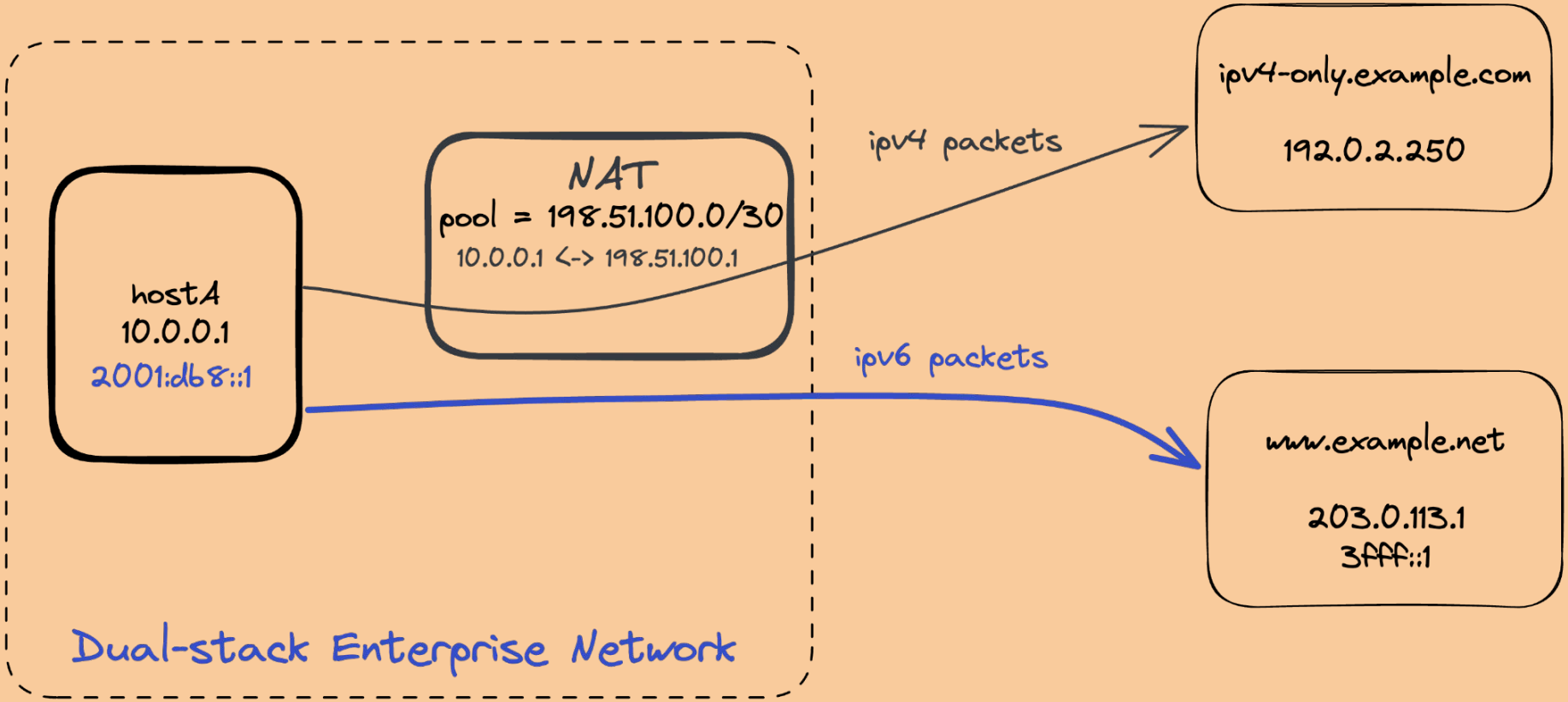
# Heavy Lifting Done by Early Adopters

Bugs

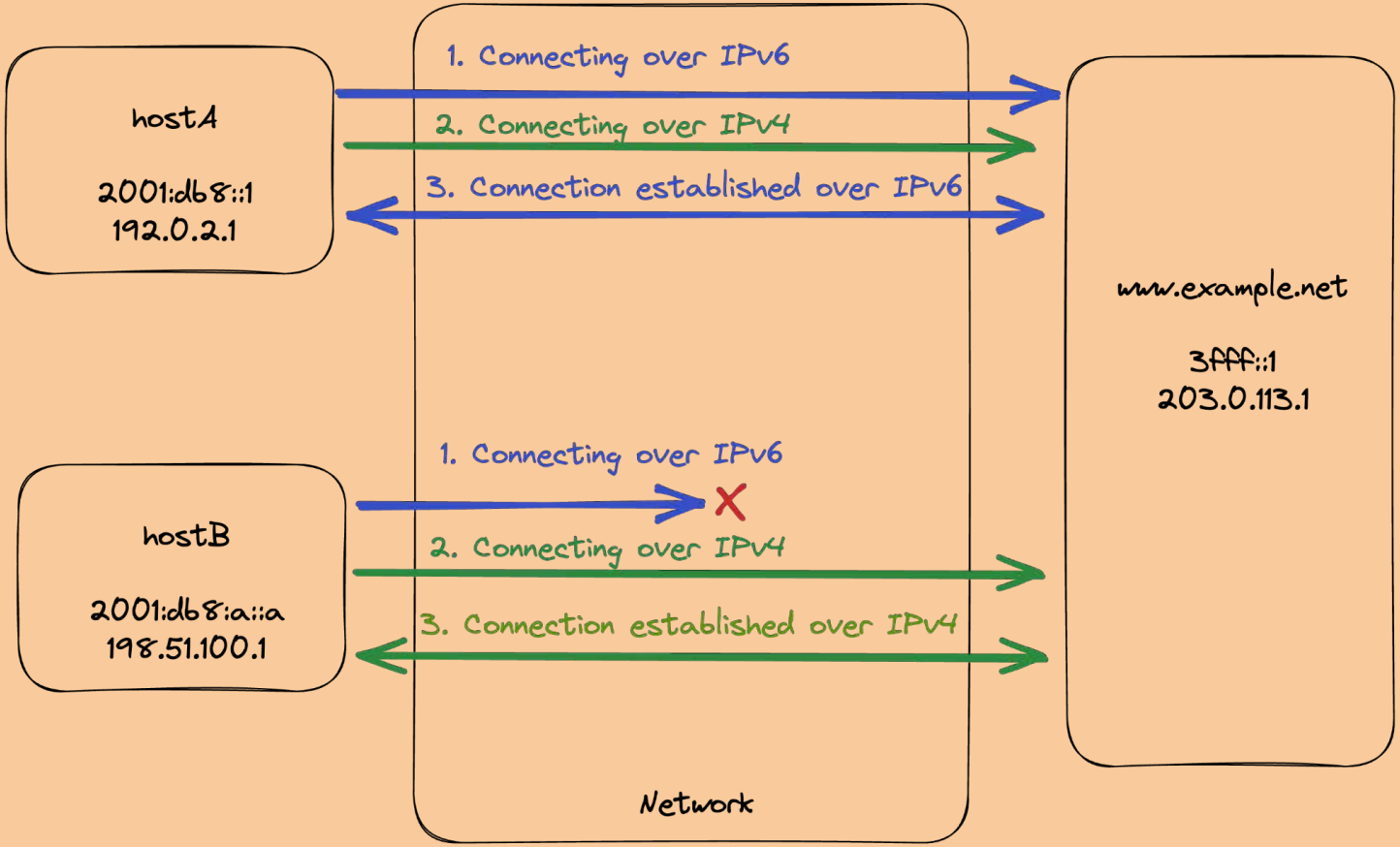
Features



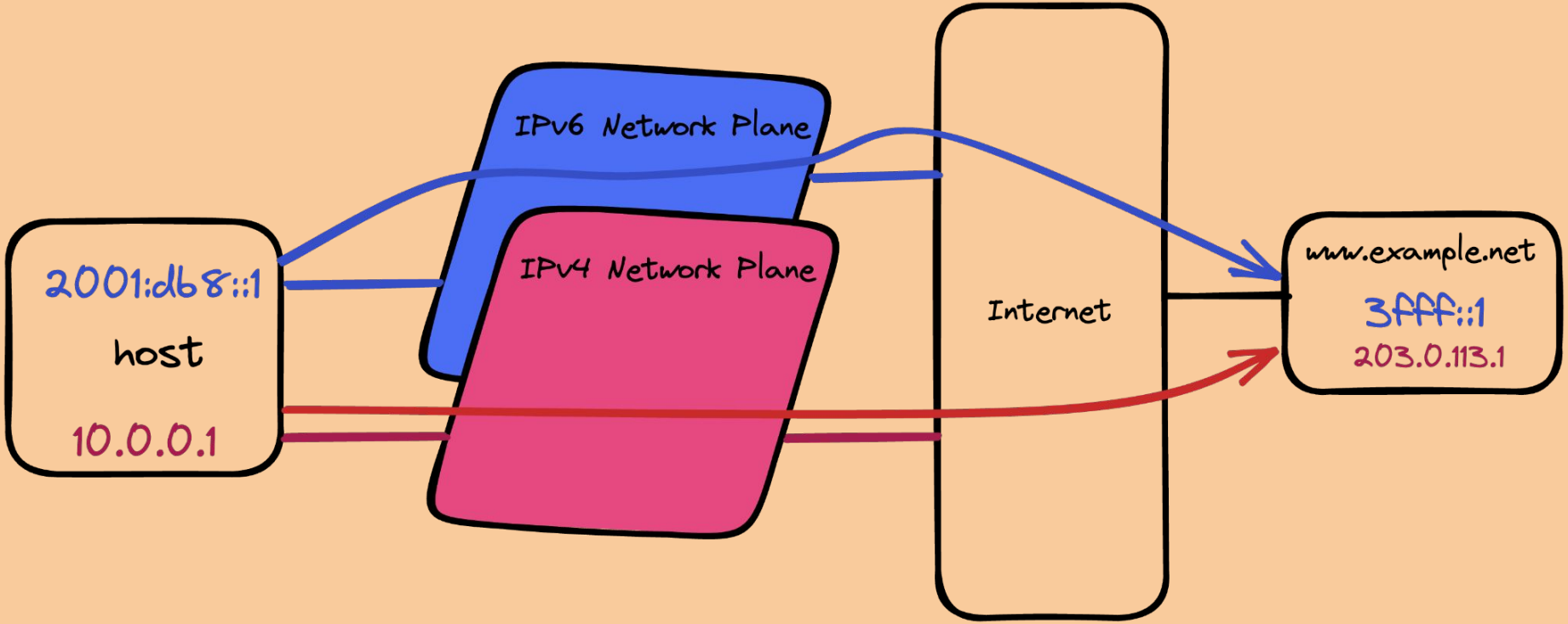

ipv4-only.example.com
192.0.2.250
NAT
pool = 198.51.100.1
ipv4 packets
hostA
10.0.0.1
10.0.0.1 <-> 198.51.100.1
ipv4 packets
www.example.net
203.0.113.1
3fff::1
IPV4-only Enterprise Network


ipv4-only.example.com
192.0.2.250
ipv4 packets
NAT
pool = 198.51.100.0/30
10.0.0.1 <-> 198.51.100.1
hostA
10.0.0.1
2001:db8::1
ipv6 packets
www.example.net
203.0.113.1
3fff::1
Dual-stack Enterprise Network

# Happy Eyeballs (Simplified)



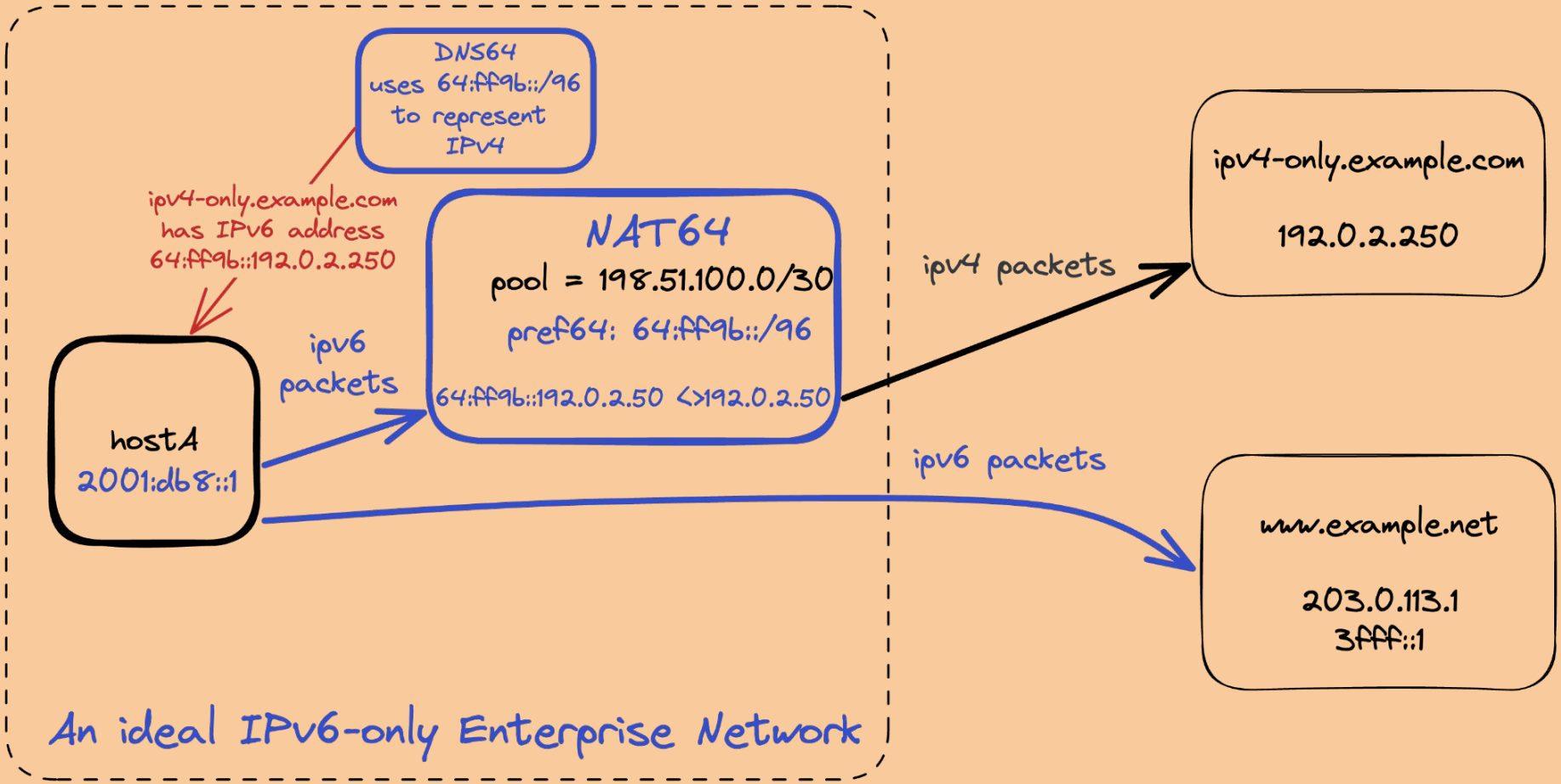
# Dual-Stack: The Honey and the Sting



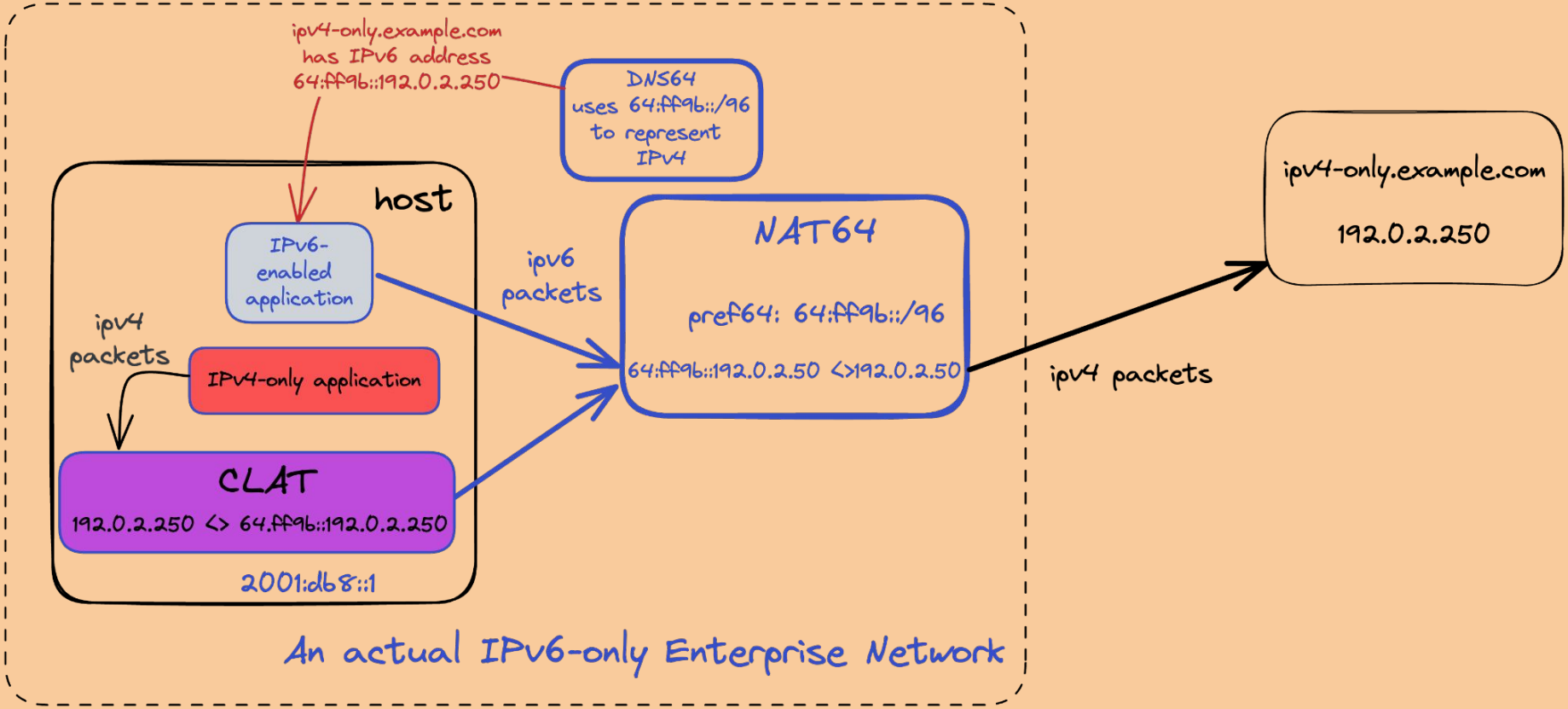
# Dual-Stack Doesn't Solve the IPv4 Exhaustion Problem


Time to start disabling IPv4

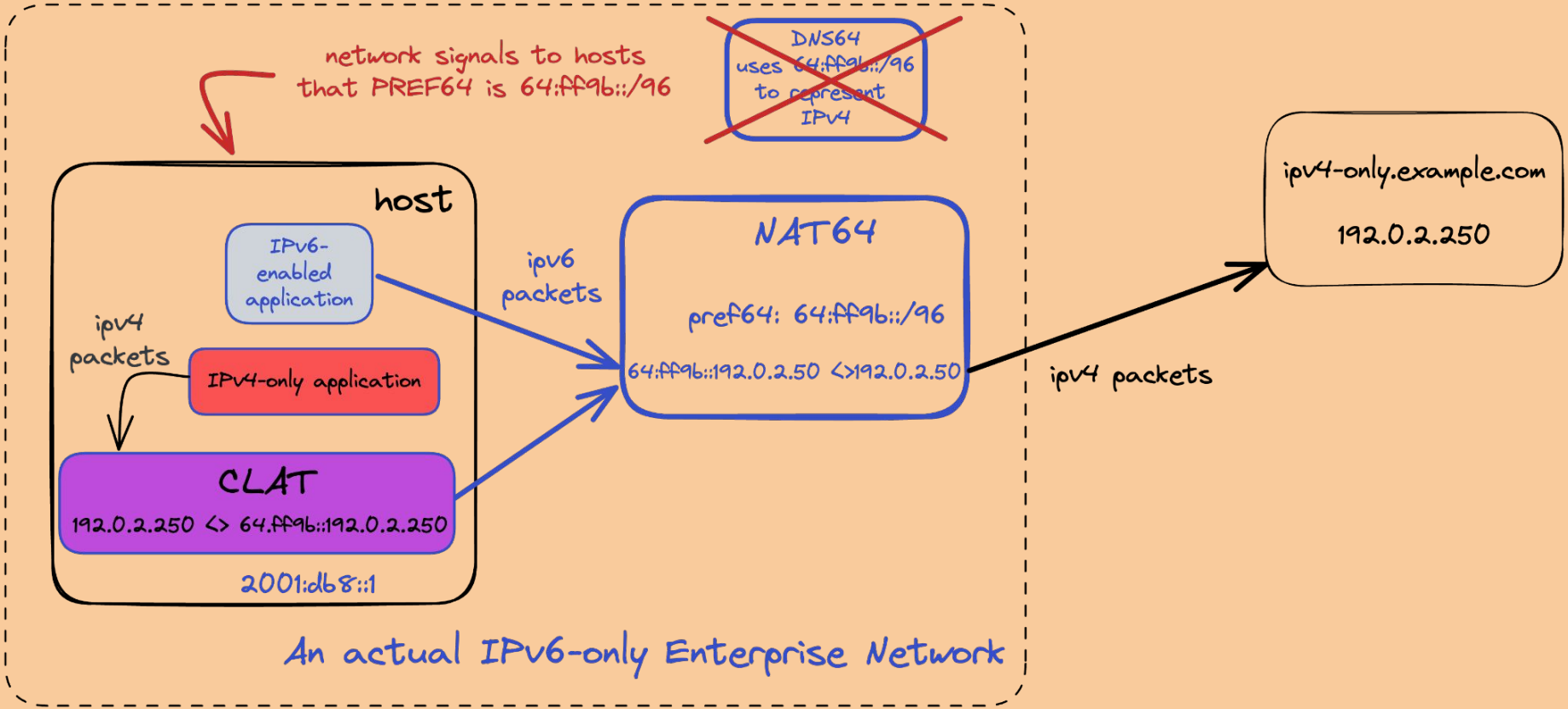
# Reaching IPv4-only Destinations from an IPv6-only Network

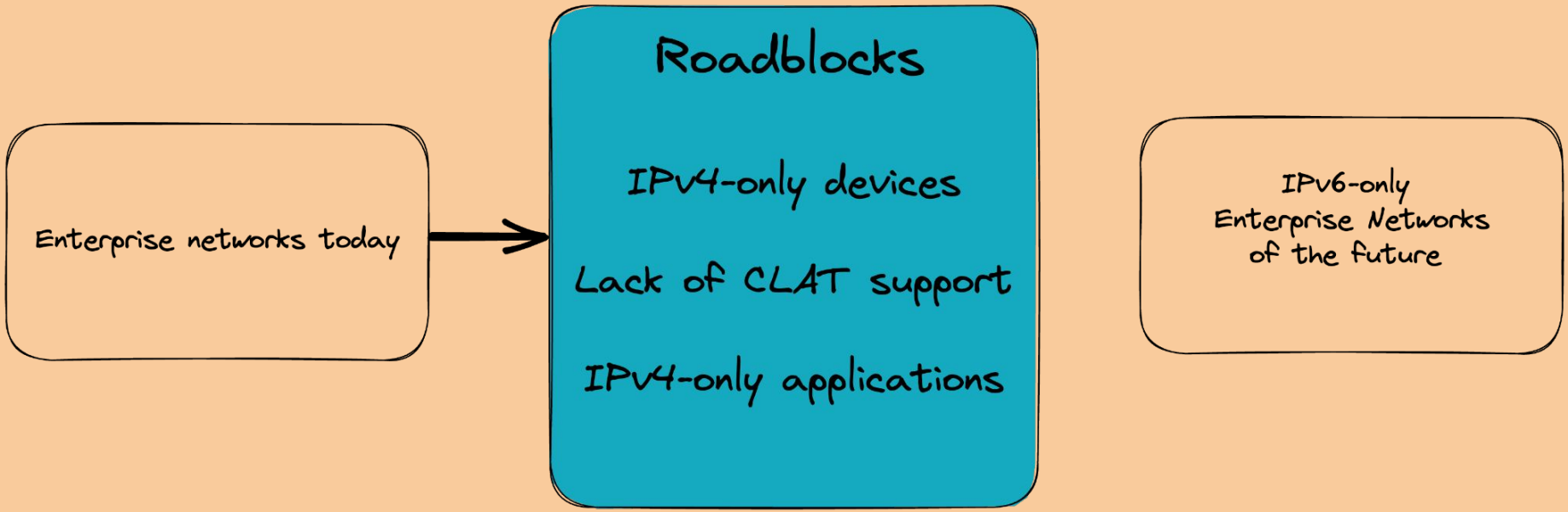


# Reaching IPv4-only Destinations from an IPv6-only Network

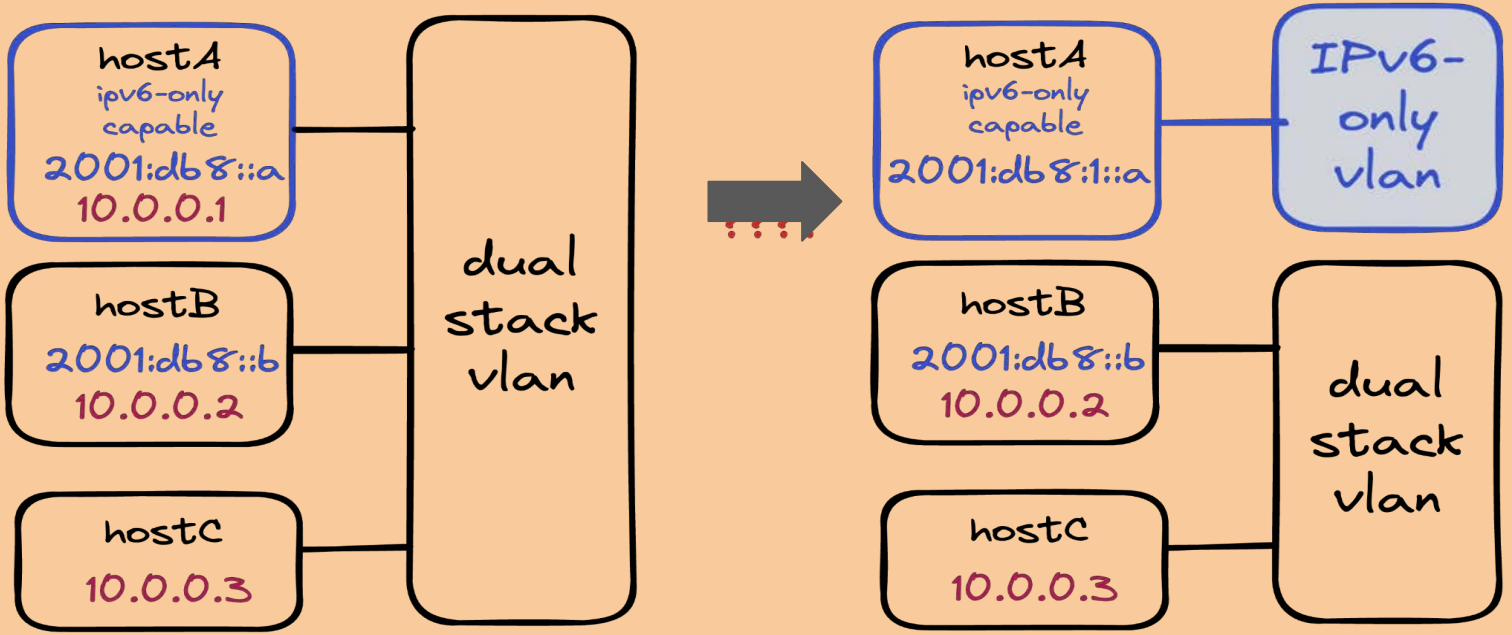


# Eliminating DNS64




Enterprise networks today
Roadblocks
IPv4-only devices
Lack of CLAT support
IPv4-only applications
IPv6-only
Enterprise Networks
of the future

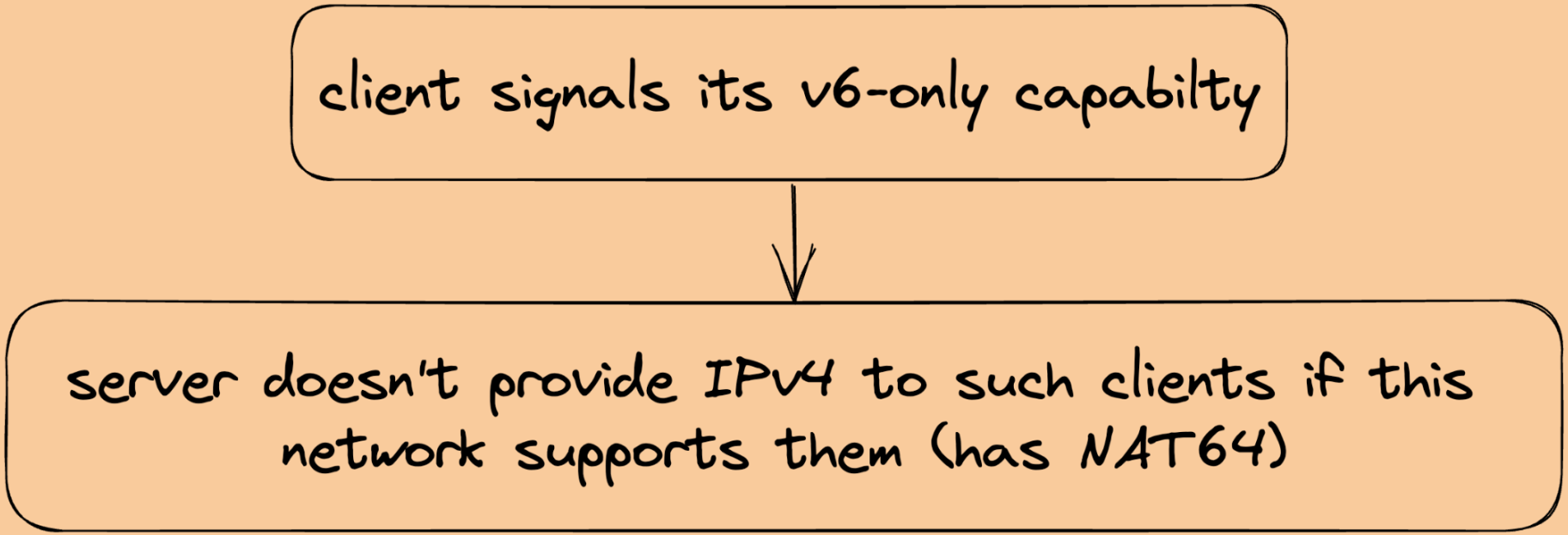
# Incremental Migration: Dedicated Network?



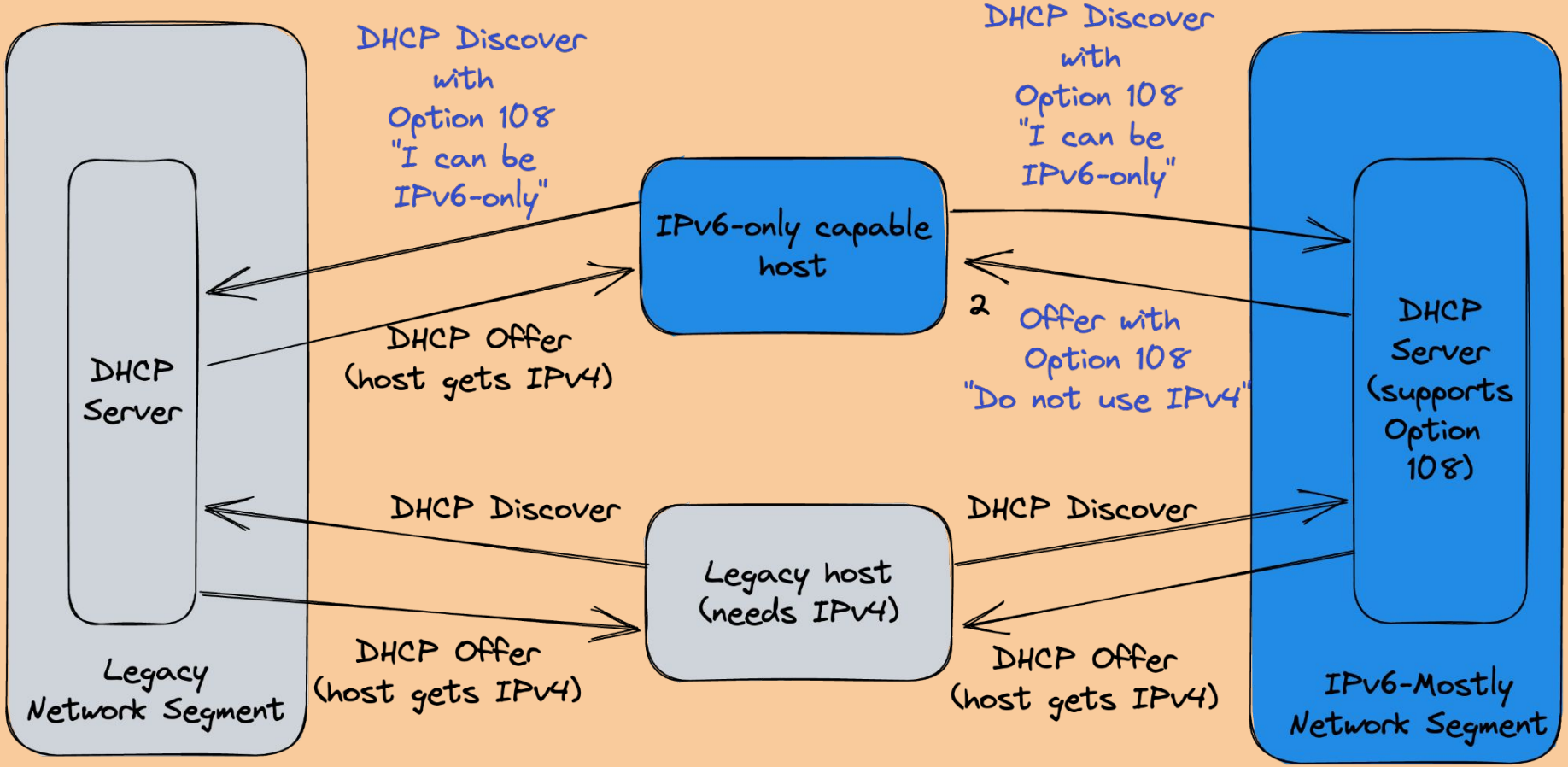

* Operational complexity
* Scalability concerns
* Limited issues observability
* Higher IPV4 consumption

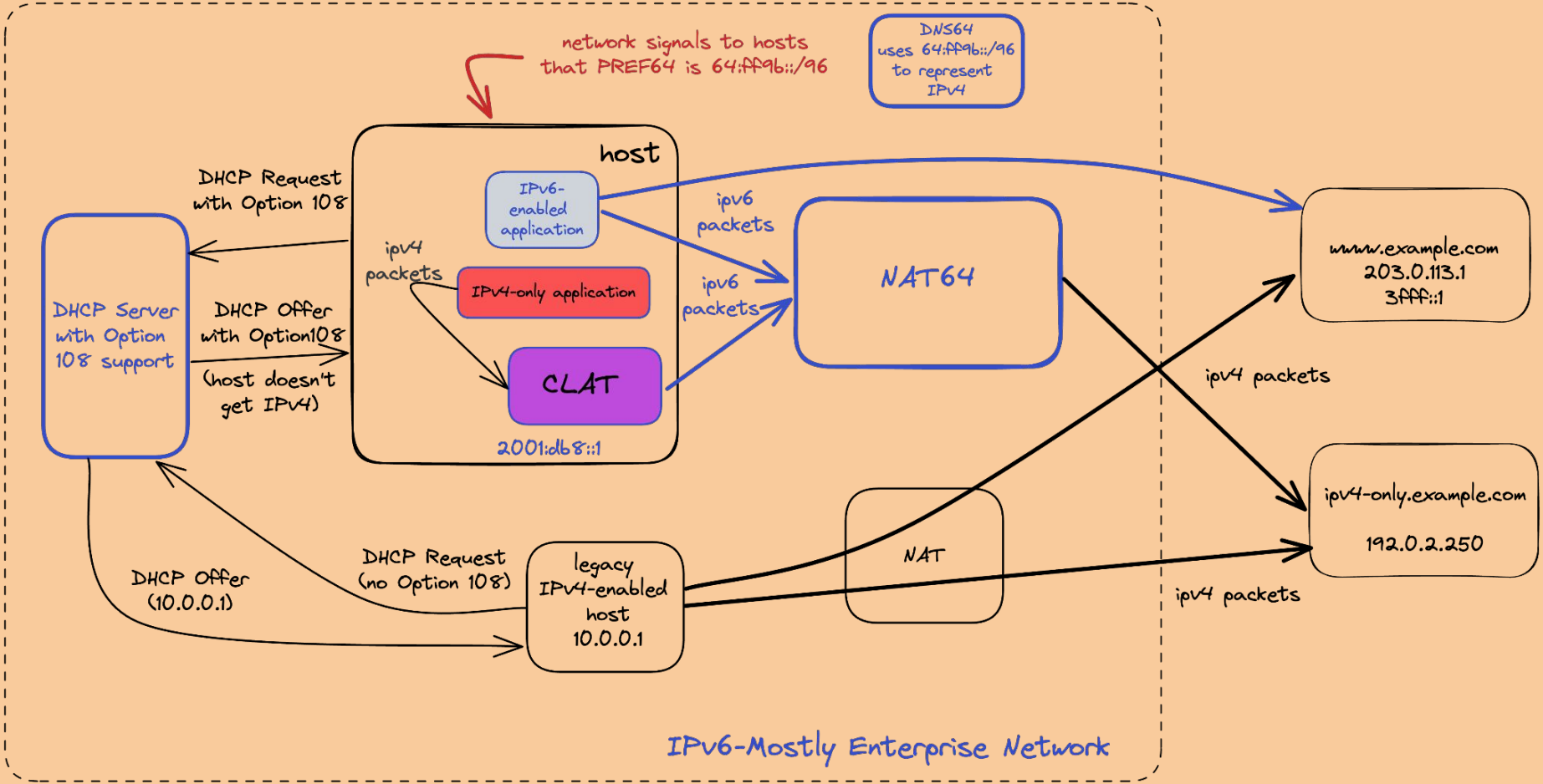
# Incremental Migration: IPv6-Mostly

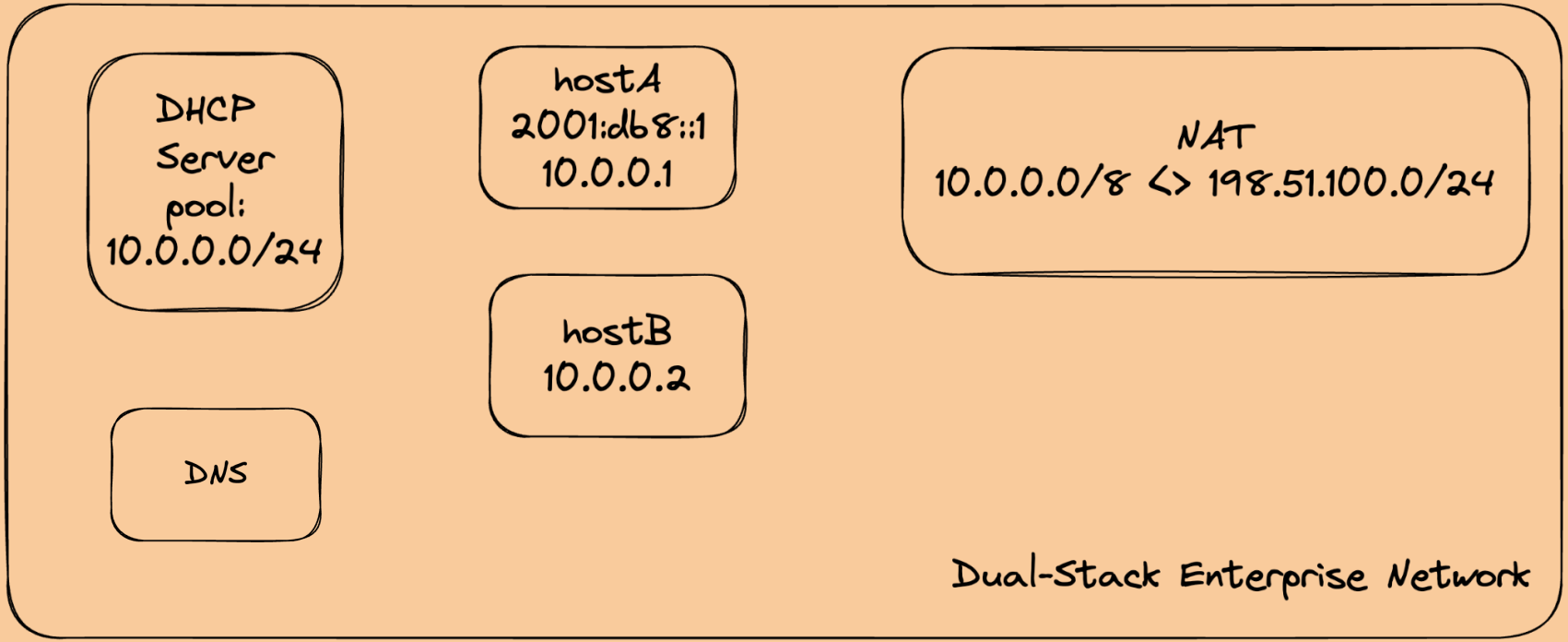
A network enabling co-existence of IPv6-only and IPv4-enabled devices

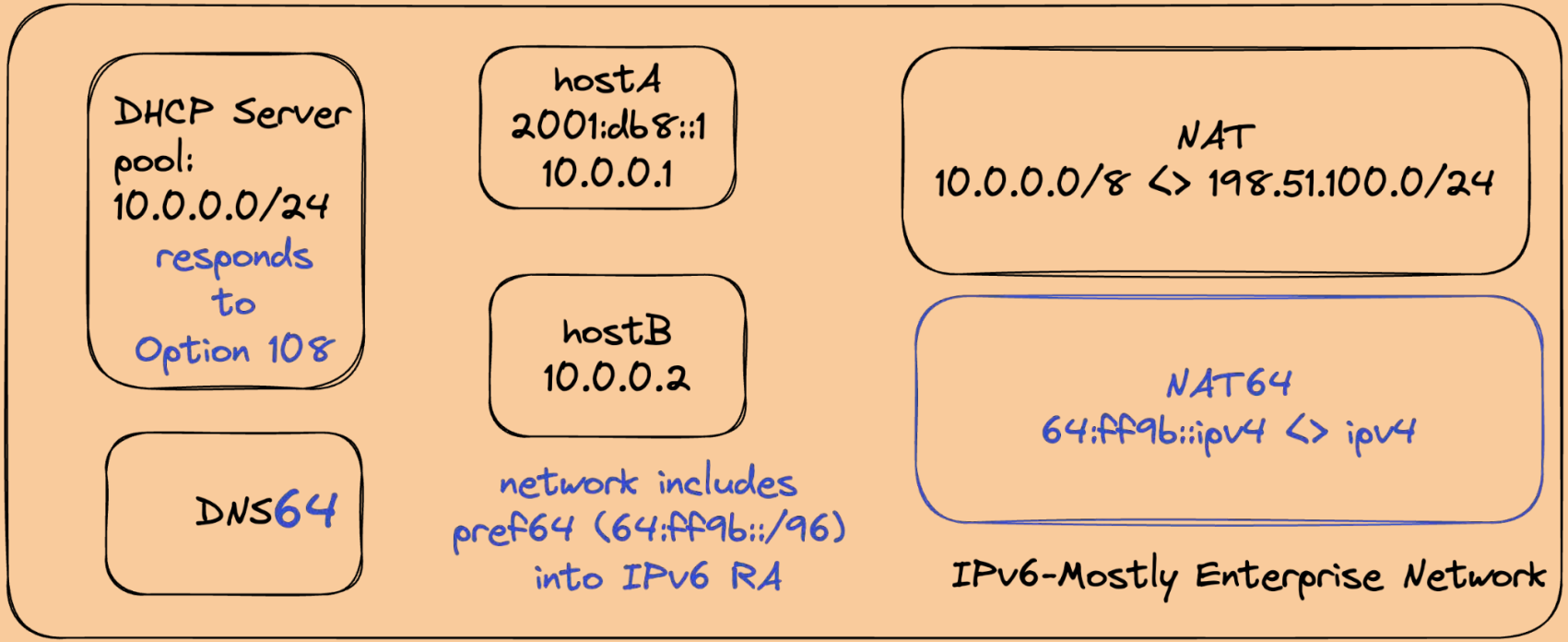


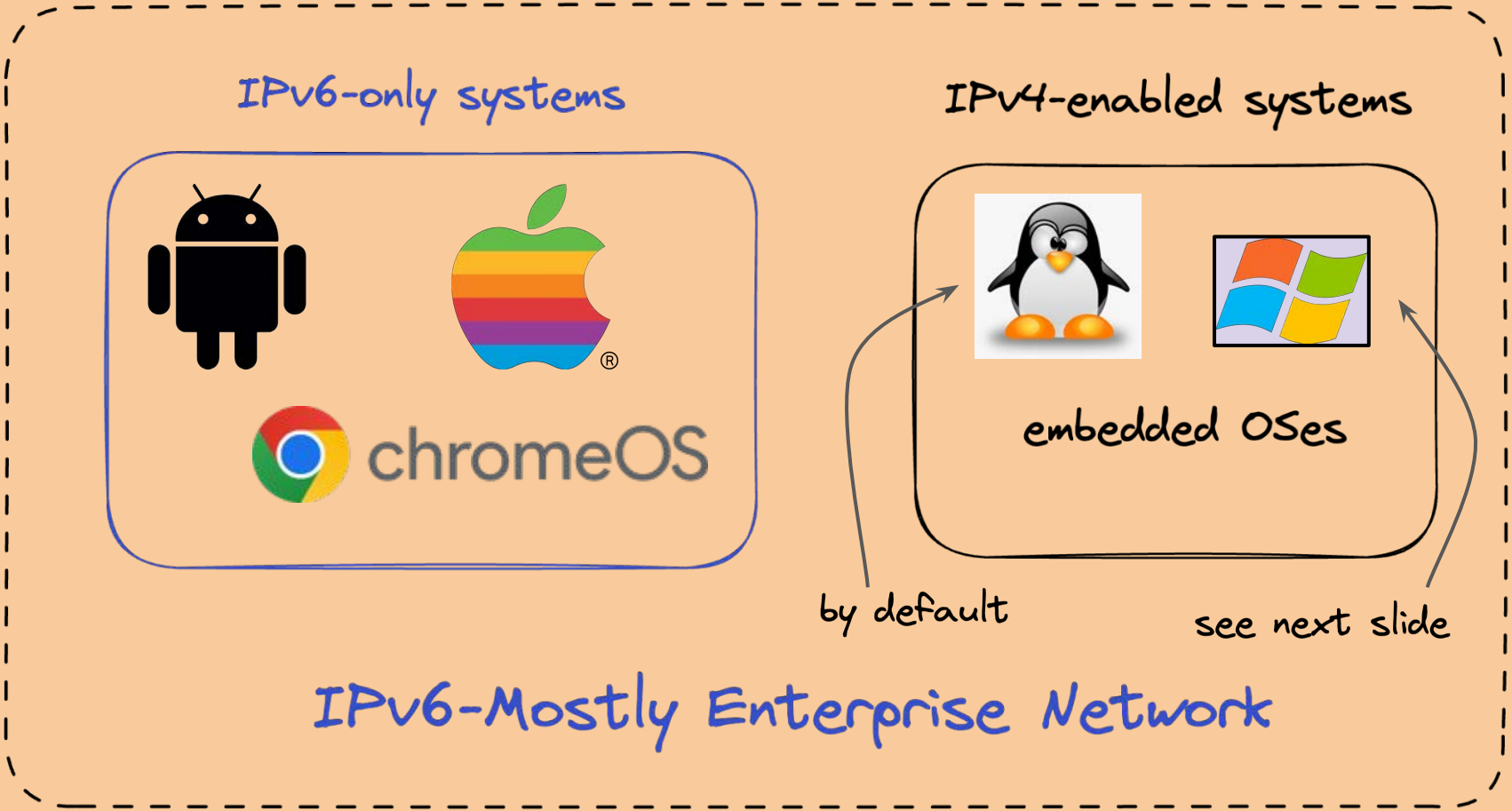
# RFC8925: How to Use DHCPv4 to Turn IPv4 Off




network signals to hosts that PREF64 is 64:ff9b::/96
DNS64 uses 64:ff9b::/96 to represent IPv4
host
IPv6-enabled application
IPv4-only application
CLAT
2001:db8::1
DHCP Request with Option 108
DHCP Server with Option 108 support
DHCP Offer with Option108
(host doesn't get IPv4)
ipv4 packets
ipv6 packets
ipv6 packets
NAT64
www.example.com
203.0.113.1
3fff::1
ipv4 packets
ipv4-only.example.com
192.0.2.250
NAT
ipv4 packets
DHCP Request (no Option 108)
DHCP Offer (10.0.0.1)
legacy IPv4-enabled host
10.0.0.1
IPv6-Mostly Enterprise Network


DHCP
Server
pool:
10.0.0.0/24
hostA
2001:db8::1
10.0.0.1
NAT
10.0.0.0/8 <> 198.51.100.0/24
hostB
10.0.0.2
DNS
Dual-Stack Enterprise Network


DHCP Server
pool:
10.0.0.0/24
responds
to
Option 108
DNS64
hostA
2001:db8::1
10.0.0.1
hostB
10.0.0.2
network includes
pref64 (64:ff9b::/96)
into IPv6 RA
NAT
10.0.0.0/8 <> 198.51.100.0/24
NAT64
64:ff9b::ipv4 <> ipv4
IPv6-Mostly Enterprise Network


IPv6-only systems
IPv4-enabled systems
chromeOS
embedded OSes
by default
see next slide
IPv6-Mostly Enterprise Network

techcommunity.microsoft.com/blog/NetworkingBlog/windows-clat-enters-private-preview-a-milestone-for-ipv6-adoption/445...

marks

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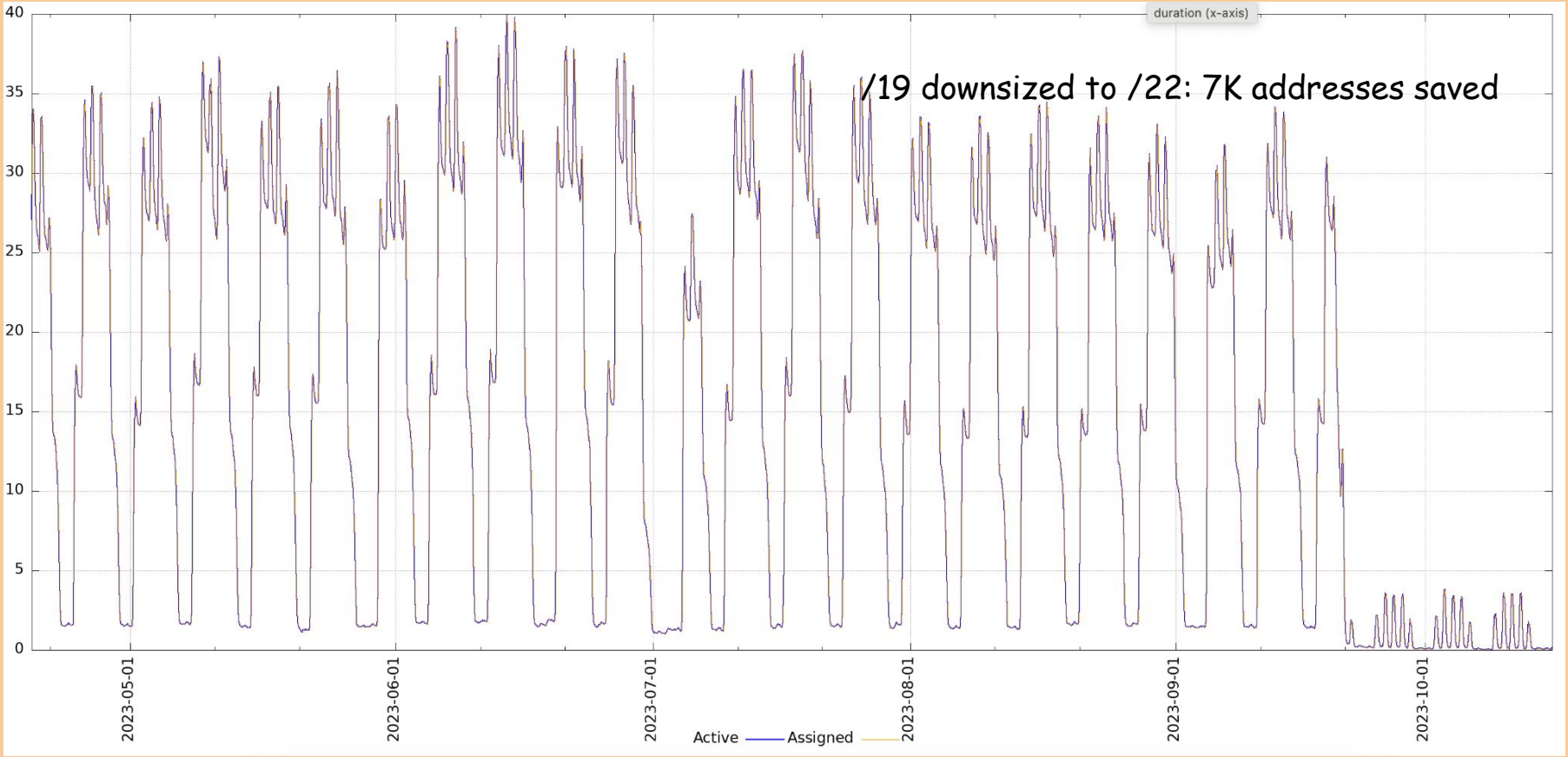
## Listening to Our Community

In early 2024, the **Windows Core OS Networking team** ran an IPv6 migration survey. The results were clear: **CLAT was the most requested IPv6 feature for Windows**. This feedback helped shape our roadmap and reinforce our commitment to delivering CLAT support.

## It's Here: Windows CLAT Private Preview

It's been over a year since we last updated our community on CLAT and today, we're thrilled to announce that **Windows CLAT is now in private preview**. See below for details on **how to participate** in the preview.

https://techcommunity.microsoft.com/blog/NetworkingBlog/windows-clat-enters-private-preview-a-milestone-for-ipv6-adoption/4459534


duration (x-axis)
/19 downsized to /22: 7K addresses saved
40
35
30
25
20
15
10
5
0
2023-05-01
2023-06-01
2023-07-01
2023-08-01
2023-09-01
2023-10-01
Active
Assigned

You Are Not Operating IPv6
Until
You Turn IPv4 Off

# Setting Expectations: Network

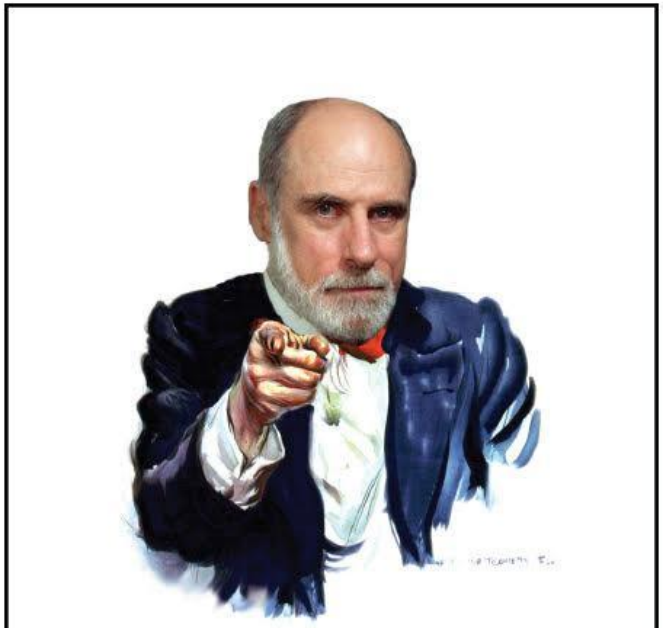
* All hidden issues resurface
* IPv6 specifics become evident
    * Fragmentation
    * Extension headers (IPSec)
    * Security policies (ICMP vs ICMPv6)
    * Multiple addresses per host

* Choose pilot locations wisely
* Identify key teams and find allies
* Start with low-hanging fruit
    * guest networks
    * mobile devices/laptops

# Setting Expectations: Humans

* People get confused
* People expect IPv4
* People will be re-enabling IPv4
* People will be turning IPv6 off


RealNetwork
Throughput
NTP9
252%
HTTP
HTTPS
NTP
DNS
Server Response Times
CPU
This Is Not the End...



# I WANT YOU TO USE IPv6

– VINT CERF

www.cs.brown.edu/~adf/cerf