What's New on the IPv6 Front at the IETF?

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Disclaimers

- The oral / written comments on IETF work represent neither my employer nor the Internet Engineering Steering Group view
- Slides are *work in progress*

Unless specified all pictures and logos are from Microsoft Powerpoint stock images

Some Brief News at V6OPS 1/3

- draft-ietf-v6ops-rfc3849-update-01
  - *Expanding the IPv6 Documentation Space*
  - Smaller /20 prefix rather than 2001:db8::/32

- draft-ietf-v6ops-ipv6-only-resolver-00
  - *IPv6-only Capable Resolvers Utilising NAT64*
  - How IPv6-only iterative resolvers can use NAT64 to establish communications with IPv4-only authoritative servers
  - Need to discover the Pref64

Some Brief News at V6OPS 2/3

- draft-ietf-v6ops-ula-usage-considerations-03 i*s back from the dead after 6 years* ☹️
- draft-winters-v6ops-cpe-lan-pd-05
  - DHCP-PD on the LAN side of residential gateways *(cfr SNAC WG later)*
- draft-pauly-v6ops-happy-eyeballs-v3-00
  - Add transport selection QUIC vs. TCP using SVCB DNS Resource Records

Some Brief News at V6OPS 3/3

Network	
Net Range	2630:: - 2630:FFFF:FFFF:FFFF:FFFF:FFFF:FFFF:FFFF
CIDR	2630::/16
Name	CAPITAL-ONE-INTERNAL-01
Handle	NET6-2630-2
Parent	NET6-2600 (NET6-2630-1)
Net Type	Direct Allocation

- ARIN just allocated a huge /16 to a bank...
- Possibly because of ‘nibble’ boundary policy ? Some discussion to do the same address policy at RIPE

- Source: https://whois.arin.net/rest/net/NET6-2630-2

draft-ietf-v6ops-dhcp-pd-per-device-05

- Using DHCPv6-PD to Allocate Unique IPv6 Prefix per Client in Large Broadcast Networks
- Scalability: aggregation of all IPv6 addresses of a node in a single prefix
  - Delegated prefix is off-link, routing to the client LLA, no NDP ;-)
- Allow for network extension (SNAC, thetering, ...)
- Similar to
  - the /64 to mobile 3GPP hand sets
  - RFC 8273 Unique IPv6 Prefix per Host

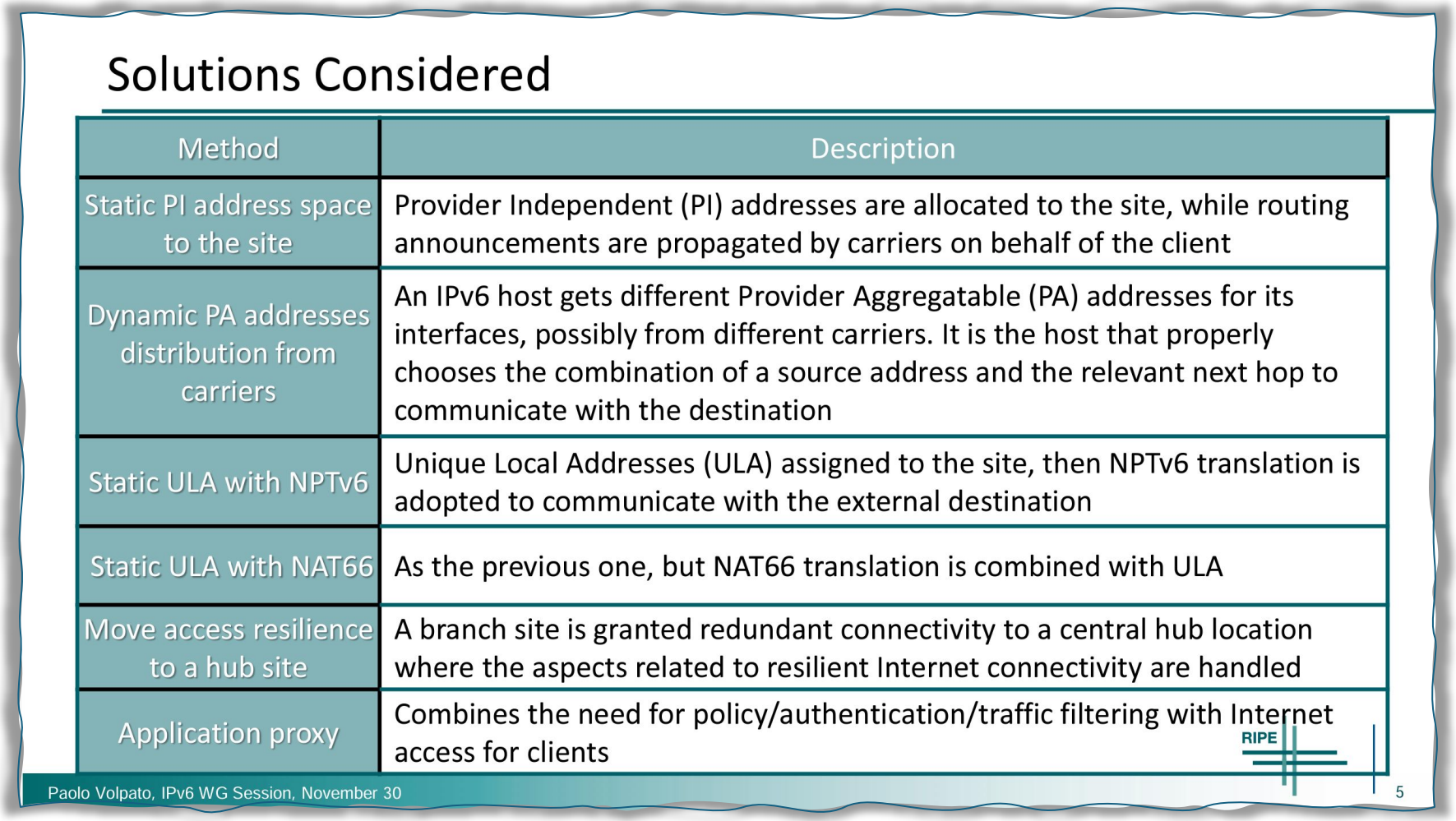
IPv6 Site connection to many Carriers

- draft-fbnvv-v6ops-site-multihoming-01

- Use case:
  - Residential or small offices with no routing (*)
  - 2 CPE
  - 2 service providers
  - ⇒ each host has 2 global prefixes

(*) else source-based routing must be used

draft-fbnvv-v6ops-site-multihoming

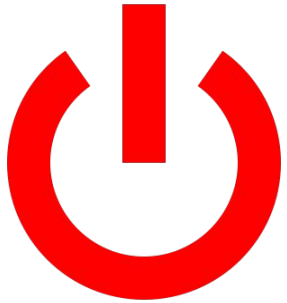


Solutions Considered

Method	Description
Static PI address space to the site	Provider Independent (PI) addresses are allocated to the site, while routing announcements are propagated by carriers on behalf of the client
Dynamic PA addresses distribution from carriers	An IPv6 host gets different Provider Aggregatable (PA) addresses for its interfaces, possibly from different carriers. It is the host that properly chooses the combination of a source address and the relevant next hop to communicate with the destination
Static ULA with NPTv6	Unique Local Addresses (ULA) assigned to the site, then NPTv6 translation is adopted to communicate with the external destination
Static ULA with NAT66	As the previous one, but NAT66 translation is combined with ULA
Move access resilience to a hub site	A branch site is granted redundant connectivity to a central hub location where the aspects related to resilient Internet connectivity are handled
Application proxy	Combines the need for policy/authentication/traffic filtering with Internet access for clients

Source: https://ripe87.ripe.net/presentations/82-IPv6-Multihoming-Paolo-Volpato.pdf

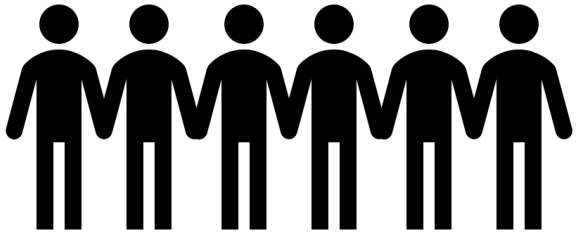
Turning IPv4 Off in an Enterprise Network



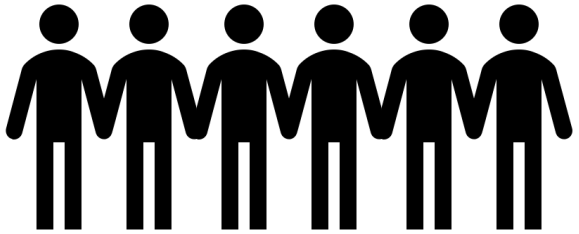
- Presented by Jen Linkova@Google at V6OPS but also RIPE & IPv6 Council UK
  - SLAAC (no DHCP-IA),
  - DNS64/NAT64 (config via RA),
  - 464XLAT
  - RFC8925: IPv6-Only Preferred Option for DHCPv4, option 108 indicate that a host supports an IPv6-only mode and is willing to forgo obtaining an IPv4 address
  - DHCP-PD to the host (network extensions, VM, tethered nodes)
  - Default Address Selection Rule 5.5 == Critical when clients move between segments

See also: https://ripe87.ripe.net/wp-content/uploads/presentations/32-IPv6-Mostly-Office_-JenLinkova_RIPE87.pdf

Some Brief News from



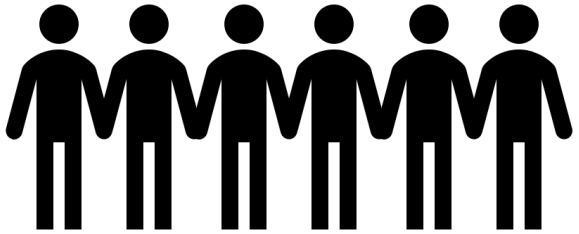
Some Brief News from



- draft-ietf-6man-pio-pflag-00
  - *Signalling DHCPv6 Prefix Delegation Availability to Hosts*
  - See the V6OPS about DHCP-PD to the host
  - A flag in the Prefix Information Option of the RA

- draft-ietf-6man-rfc6724-update-04
  - *Preference for IPv6 ULAs over IPv4 addresses in RFC6724*
  - Current preferences: IPv6 GUA, IPv4, IPv6 ULA
  - Some US Federals have deployed ULA-only networks ☹ and cannot meet the US Mandate of being IPv6-only
  - Personal concerns about ULA usage and operation in a mixed environment

Shorter News from



- draft-bctb-6man-rfc6296-bis
  - R*FC 6296bis IPv6-to-IPv6 Network Prefix Translation*
  - From *experimental* to *informational* status (not standard track!)

- draft-templin-6man-ipid-ext-00
  - *IPv6 Identification Extension*
  - Having more than 2^{16} fragment IDs

Extension Headers in 6MAN

- draft-ietf-6man-eh-limits-10
  - *Limits on Sending and Processing IPv6 Extension Headers*
  - *A source host SHOULD NOT send a packet with an IPv6 header chain larger than 104 bytes*
  - Assumed to set "*minimum baseline of support*"...
    - ??? Can this become the value for all procurements or RIPE-772ng ???

- draft-ietf-6man-hbh-processing-12
  - *IPv6 Hop-by-Hop Options Processing Procedures*
  - New Hop-by-Hop options SHOULD be designed to ensure the router can process the options at the full forwarding rate
  - Top two bits of option code are now "MAY discard" (i.e., ignore)

Routing Headers at 6MAN

- draft-ietf-6man-sids-03
  - *Segment Identifiers in SRv6*
  - clarify the relationship of SRv6 SIDs to the IPv6 Addressing Architecture [RFC4291]
  - Optional specific /16 prefix for SRv6

- draft-ietf-6man-comp-rtg-hdr-00
  - *The IPv6 Compact Routing Header (CRH)*
  - Experimental, not linked to SPRING / SRv6

- draft-bdmgct-spring-srv6-security-00
  - *SRv6 Security Considerations*
  - Very drafty, more work to be done, but high expectations

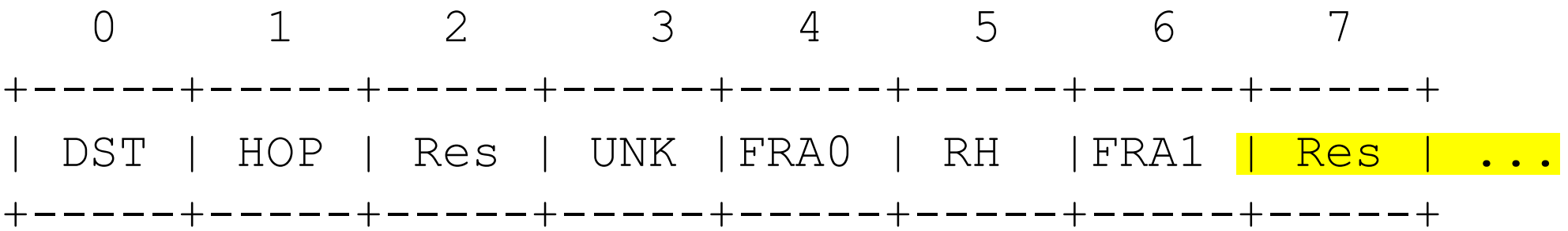
6MAN Publication Road Can be Bumpy

- draft-ietf-6man-rfc6874bis-09
  - *Representing IPv6 Zone Identifiers in Address Literals and Uniform Resource Identifiers*
  - `ping ff02::1%eth0`
  - But, `http://[fe80::1%eth0]/` is conflicting with %-encoding in URL

Blocked by two Area Directors as this I-D conflicts with browser community even if authors are quite flexible

OPSAWG: Extended TCP Options and IPv6 Extension Headers IPFIX Information Elements

- draft-ietf-opsawg-ipfix-tcpo-v6eh-05
- draft-ietf-opsawg-ipfix-fixes-03
- Old RFC 5102 -> IANA IPFIX Entities per RFC 7012



- New/updated IPFIX information elements
  - ipv6ExtensionHeadersFull: bit-mask based on a registry
  - ipv6ExtensionHeaderCount: series of <EH, count>
  - ipv6ExtensionHeadersChainLength: *for every packet* ?

Stub Network Auto Configuration for IPv6 (snac WG)

- How to connect an IEEE 802.15.4 IPv6 network to the residential/home Wi-Fi (and possibly to the Internet), e.g., Matter/Thread ?
  - Different MAC address lengths 16/64 vs. 48 for Wi-Fi
  - Different speed / CPU (think airpods, light bulbs)
  - 6lo could be used, i.e., header compression
  - IPv6 is a must as ‘stub’ networks are IoT
- Challenge
  - Not a single change in the existing residential/home Wi-Fi
  - Must work with IPv4-only, dual-stack, IPv6-only Wi-Fi
  - Avoid homenet pitfalls: do not try to boil the ocean

SNAC WG: only one simple document

- draft-ietf-snac-simple-02
- Mainly re-using *existing* mechanisms
  - RA on Adjacent Infrastructure Link (AIL) to detect IPv6 and adjacent stub routers
  - ULA used
    - on the stub network in the absence of DHCP-PD
    - on IPv6-less AIL
  - NAT64
  - mDNS (same authors!)

DHC WG

- draft-ietf-dhc-rfc8415bis-03
  - Status: Internet Standard rather than Proposed Standard
  - Remove IA_TA (temporary address) as it was never used

- draft-ietf-dhc-addr-notification-06
  - Registering Self-generated IPv6 Addresses using DHCPv6
  - I.e., for hosts not using stateful DHCP IA_NA, but wanting to collect the addresses

Drones may rely on IPv6 addresses

Drone Remote Id Protocol (DRIP) WG

Identify a nearby drone (at least for US FAA) with a 128-bit identifier, DRIP Entity Tag (DET)

DET (oversimplified):

- 2001:30::/28 (RFC 9374)
- 28 bits to identify country + ID provider
- 8 bits for crypto algorithm hash
- 64 for hash of the public key

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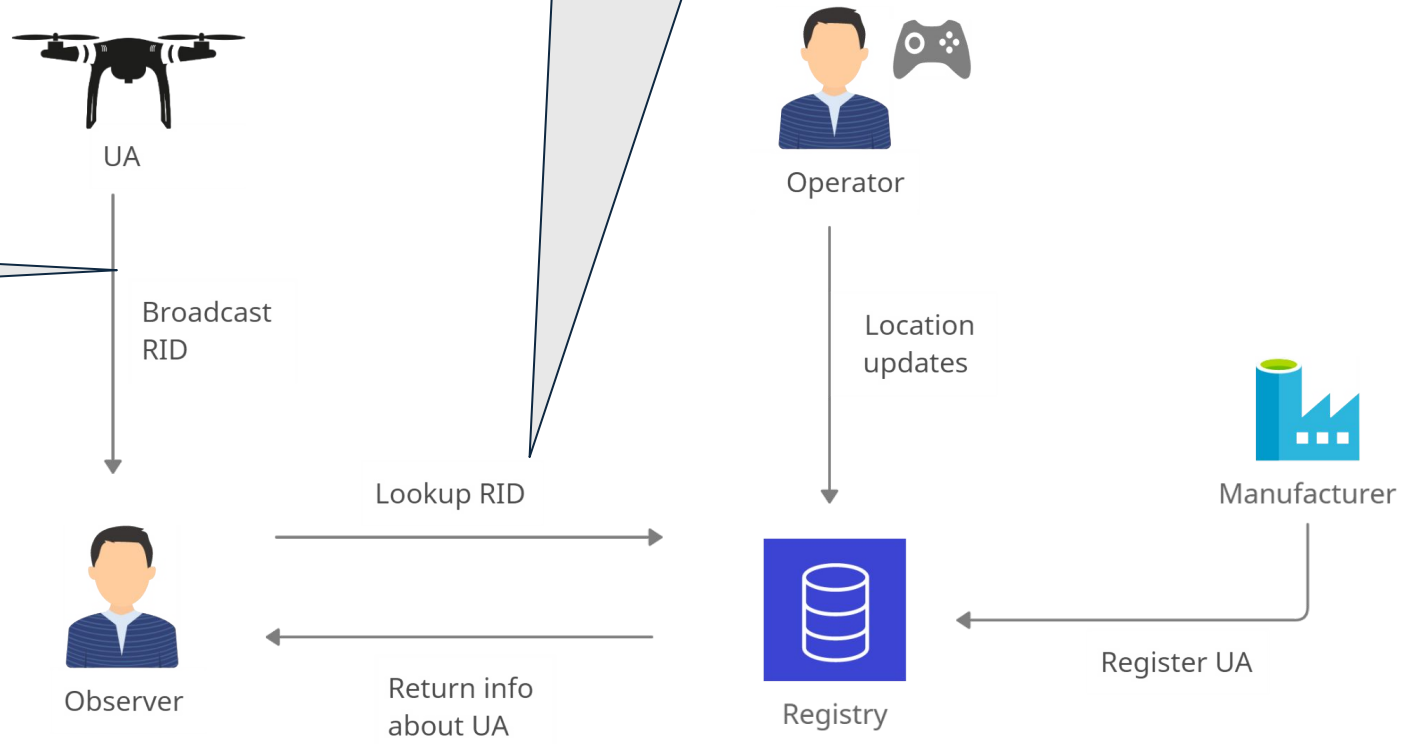
How does it fly ?

Potentially using reverse DNS lookup based on the DET “IPv6 addresses”

Over Bluetooth, Wi-Fi, …
Using the DET as ‘ID’ signed with private key



Source: https://www.ida.liu.se/~andgu38/drip/

A last one for ‘the route’ ;-)

Workgroup: Internet Area
Internet-Draft:
draft-chroboczek-int-v4-via-v6-02
Published: 12 December 2023
Intended Status: Standards Track
Expires: 14 June 2024

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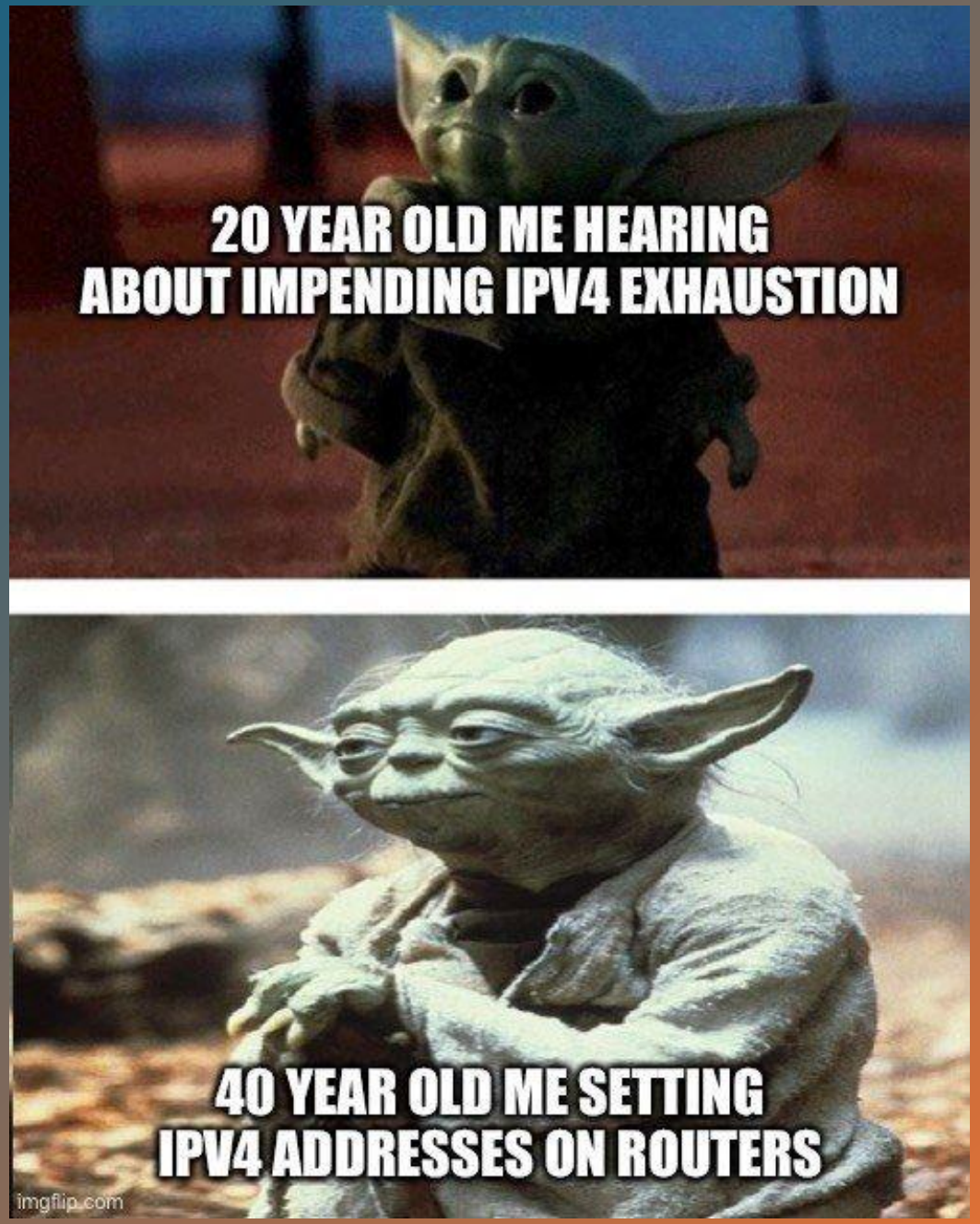
IPv4 routes with an IPv6 next hop

Abstract

We propose "v4-via-v6" routing, a technique that uses IPv6 next-hop addresses for routing IPv4 packets, thus making it possible to route IPv4 packets across a network where routers have not been assigned IPv4 addresses. We describe the technique, and discuss its operational implications.

More videos & slides over IPv6

- https://ripe87.ripe.net/programme/meeting-plan/ipv6-wg/ (Nov 2023)
- https://datatracker.ietf.org/meeting/118/proceedings/ (Nov 2023 – search for 6MAN, V6OPS, DHC, ...)



Source:

Conclusion

- IPv6 is not yet done
- A lot of work still in progress
- Join the IETF, at least mailing lists
- Presented work is *in progress* your input is still welcome