IPv6 Deployment: Dual-stack or IPv6-only

PacNOG 28

June, 2021

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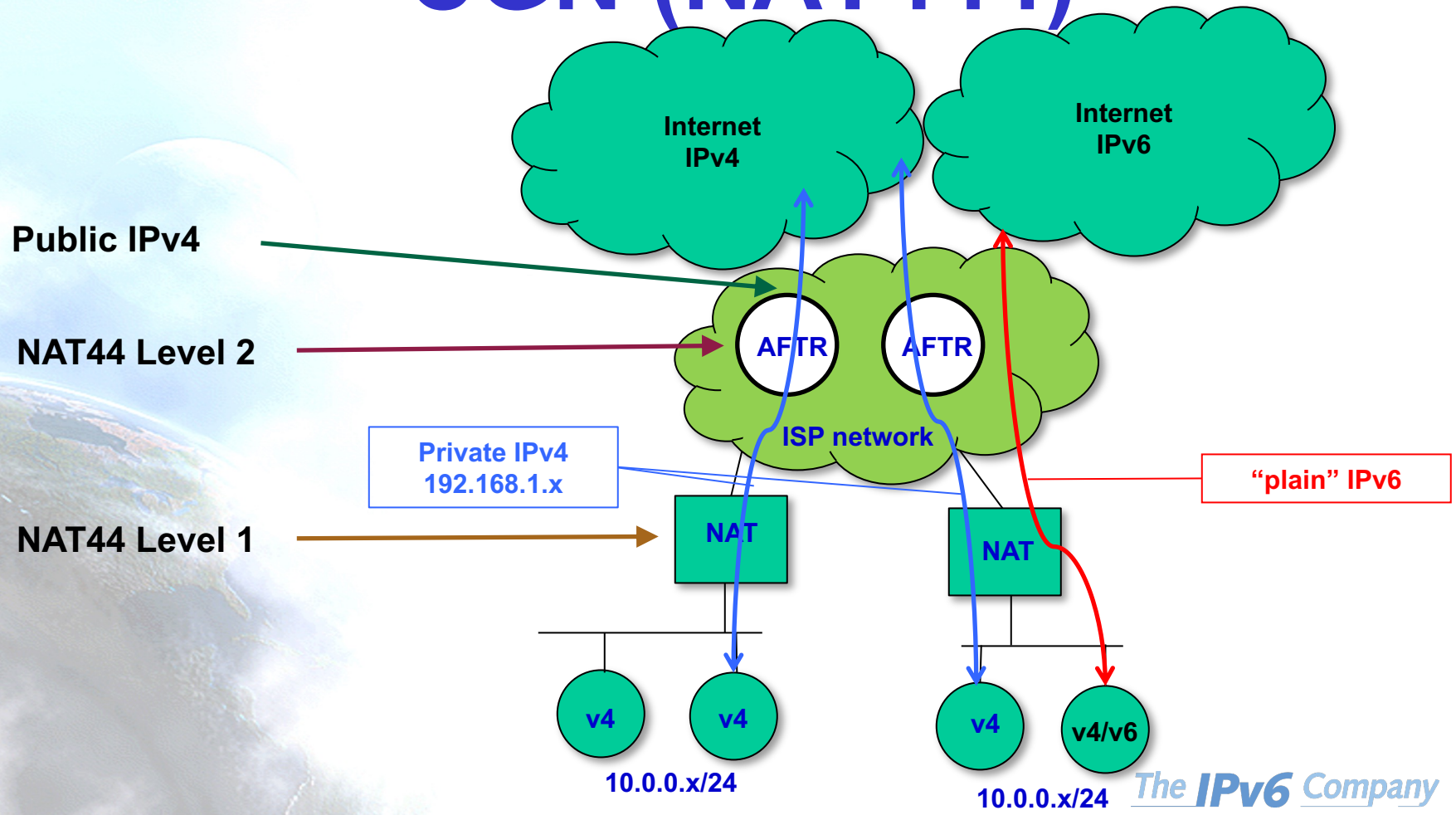
IPv4 is Over!

- In case you haven't noticed it …
- What is your plan? Maybe CGN?
- Or dual-stack?

CGN (NAT444)


Internet
IPv4
Internet
IPv6
Public IPv4
NAT44 Level 2
AFTR
AFTR
ISP network
Private IPv4
192.168.1.x
"plain" IPv6
NAT44 Level 1
NAT
NAT
v4
v4
v4
v4/v6
10.0.0.x/24
10.0.0.x/24

CGN Breaks …

- UPnP-IGD (Universal Plug & Play - Internet Gateway Device protocol)
- NAT-PMP (NAT Port Mapping Protocol)
- Other NAT Traversal mechs
- Security
- AJAX (Asyncronous Javascript And XML)
- FTP (big files)
- BitTorrent/Limewire (seeding – uploading)
- On-line gaming
- Video streaming (Netflix, Hulu, …)
- IP cameras
- Tunnels, VPN, IPsec, ...
- VoIP
- Port forwarding
- ...

- Most of the can be solved with extra work, ALGs, etc., but means extra resources, more overload of the CGN, so less throughput/performance: Need more CGNs for the same user-base

Cost of “not” Deploying IPv6

EUROPOL ABOUT EUROPOL ACTIVITIES & SERVICES CRIME AREAS & TRENDS PARTNERS & AGREEMENTS CAREE PROCU

HOME › NEWSROOM › ARE YOU SHARING THE SAME IP ADDRESS AS A CRIMINAL? LAW ENFORCEMENT CALL FOR THE END OF CARRIER GRADE NAT (CGN) TO INCREASE ACCOUN...

ARE YOU SHARING THE SAME IP ADDRESS AS A CRIMINAL? LAW ENFORCEMENT CALL FOR THE END OF CARRIER GRADE NAT (CGN) TO INCREASE ACCOUNTABILITY ONLINE

17 October 2017

Press Release

171

Europol and the Estonian Presidency of the EU Council address the serious online capability gap ir enforcement efforts to investigate and attribute crime created by CGN technologies.

On 13 October 2017, the Estonian Presidency of the Council of the EU and Europol held a workshop attended by 35 policy-makers and law enforcement officials, to address the increasing problem of non-crime attribution associatec the widespread use of Carrier Grade Network Address Translation (CGN) technologies by companies that provide a to the internet. The workshop was supported by experts from Europol's partners: Proximus, CISCO, ISOC, the IPv6 Company, and the European Commission.

CGN technologies are used by internet service providers to share one single IP address among multiple subscribers same time. As the number of subscribers sharing a single IP has increased in recent years – in some cases several thousand – it has become technically impossible for internet service providers to comply with legal orders to identif individual subscribers. This is relevant as in criminal investigations an IP address is often the only information that can link a crime to an individual. It might mean that individuals cannot be distinguished by their IP addresses anymore, which may lead to innocent individuals being wrongly investigated by law enforcement because they share their IP address with several thousand others – potentially including criminals.

OpenDNS CGNAT Issues - LISTAS

Mensaje

Eliminar Archivar Responder Responder a todos Reenviar Reunión Datos adjuntos Mover Correo no deseado Reglas Leído/No leído Clasificar Seguimiento

OpenDNS CGNAT Issues

DS **NANOG <nanog-bounces@nanog.org>** en nombre de **Darin Steffl <darin.steffl@mnwifi.com>**
North American Network Operators' Group
martes, 11 de septiembre de 2018, 15:14
Mostrar detalles

Hello,

I have a ticket open with OpenDNS about filtering happening on some of our CGNAT IP space where a customer has "claimed" the IP as theirs so other customers using that same IP and OpenDNS are being filtered and not able to access sites that fall under their chosen filter.

I have a ticket open from 6 days ago but it's not going anywhere fast.

Can someone from OpenDNS contact me or point me to a contact there to help get this resolved? I believe we need to claim our CGNAT IP space so residential users can't claim IP's of their own.

Thank you!

--
Darin Steffl
Minnesota WiFi
www.mnwifi.com
507-634-WiFi
Like us on Facebook

Buying CGNs or IPv4 Addresses

CG-NAT vs purchase IPv4

Aussie Broadband

	Year 1	Year 2	Year 3
Purchase IPv4 space	$4.8m	$6.7m	$7.6m
CG-NAT & Network Upgrade	$2.4m	$2.4m	$2.4m
Savings per year	$2.4m	$4.3m	$5.2m

Hardware solution is based on core upgrade to 100G with CG-NAT equipment, financed over 3 years.

- Moving to CG-NAT has become an economic decision
- Over the 3 year period CG-NAT and upgrading the core network is $11.9m cheaper then purchasing IPv4 space on the open market
- Savings are actually deeper if you include core network upgrade into IPv4 purchase figures
- Will provide an opt-out option for those that require a real world IPv4 address, and continue our static IPv4 purchase option
- We were not prepared to consider CG-NAT as a solution until we could provide dual stack native IPv6 to an nbn customer.

https://www.ausnog.net/sites/default/files/ausnog-2018/presentations/2.6_Phil_Britt_AusNOG2018.pdf

- You buy CGNs instead of IPv4 addresses
  - You start rotating the IPv4 pools at the CGNs because they get blocked after some time
  - Then you discover a couple of years after, that all your IPv4 addresses are blacklisted
  - Then you buy new addresses …
- Why not buying the addresses (now that are cheaper and available) instead of buying the CGNs?

Dual-Stack is NOT the Future

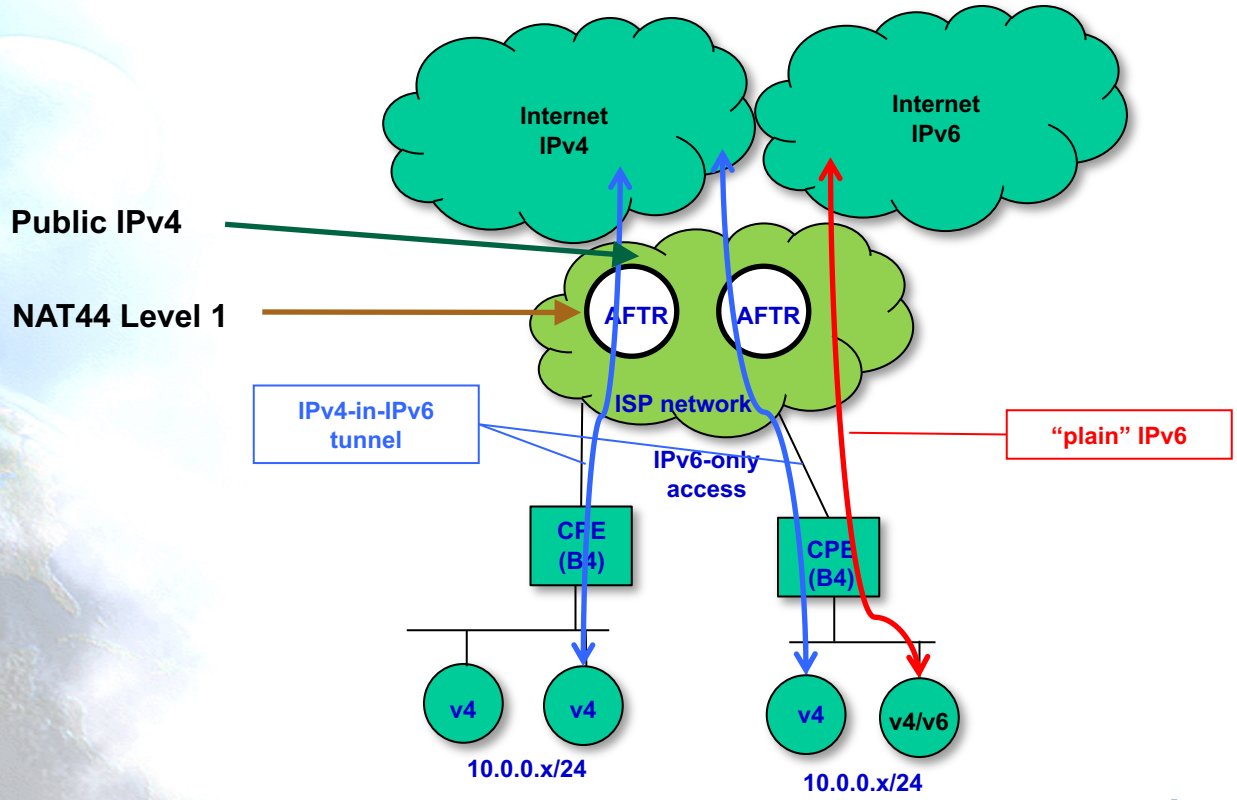
- We can't anymore think in dual-stack across an entire network: **IPv6-only with IPv4aaS** (IPv4-as-a-Service)
- Remove IPv4 as much as you can (access, even core) and keep dual-stack in "client" VLANs
  - As we are used to: Private IPv4 behind NAT
  - Add IPv6 GUA
  - Ensures that old apps and devices will keep working
- You can keep also dual-stack in a DC, but not really needed
  - Many organizations can't do that anymore
    - IPv6-only comes to the DC: SIIT-DC (RFC7755)
      - Other choices, including SIIT-DC-DTM (RFC7756)

IPv6-only+IPv4aaS Alternatives

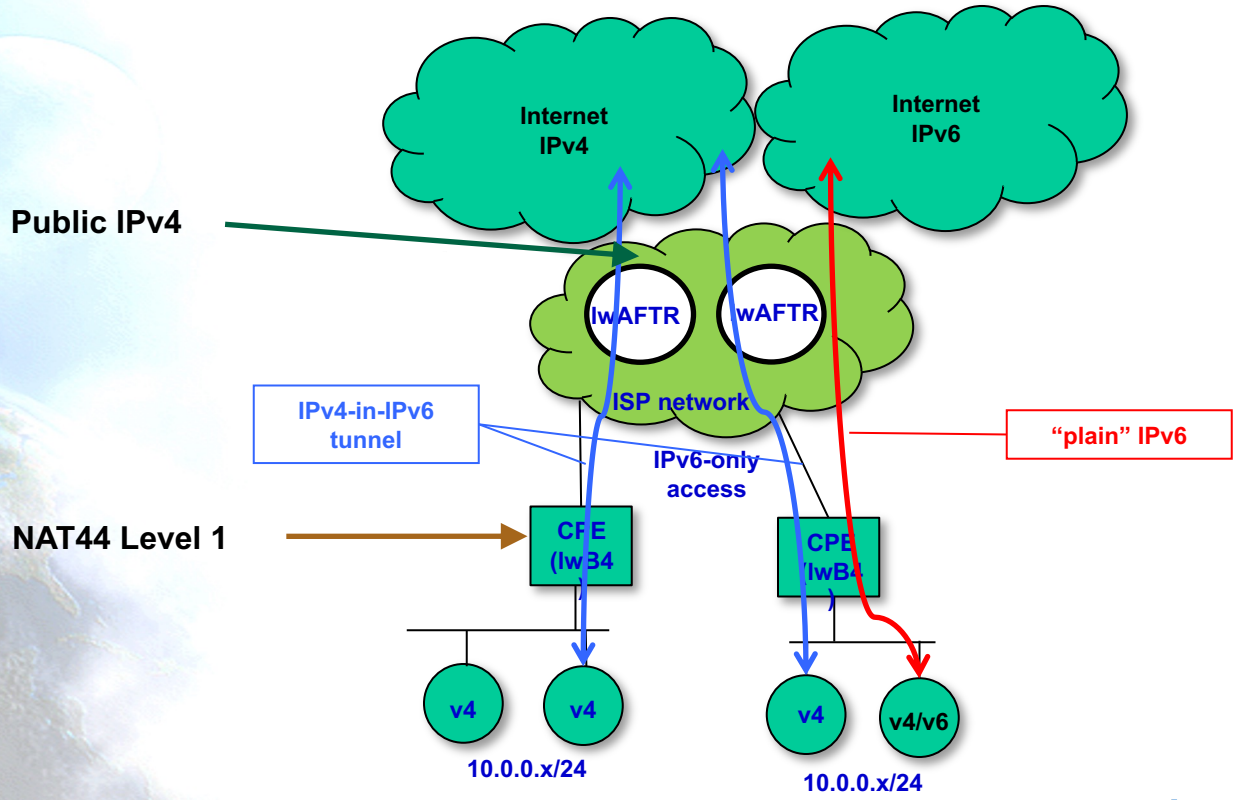
- DS-Lite
- lw4o6
- NAT64 (only IPv6!, no IPv4aaS)
- 464XLAT
- MAP-E
- MAP-T

- Cellular networks ONLY support NAT64 or 464XLAT

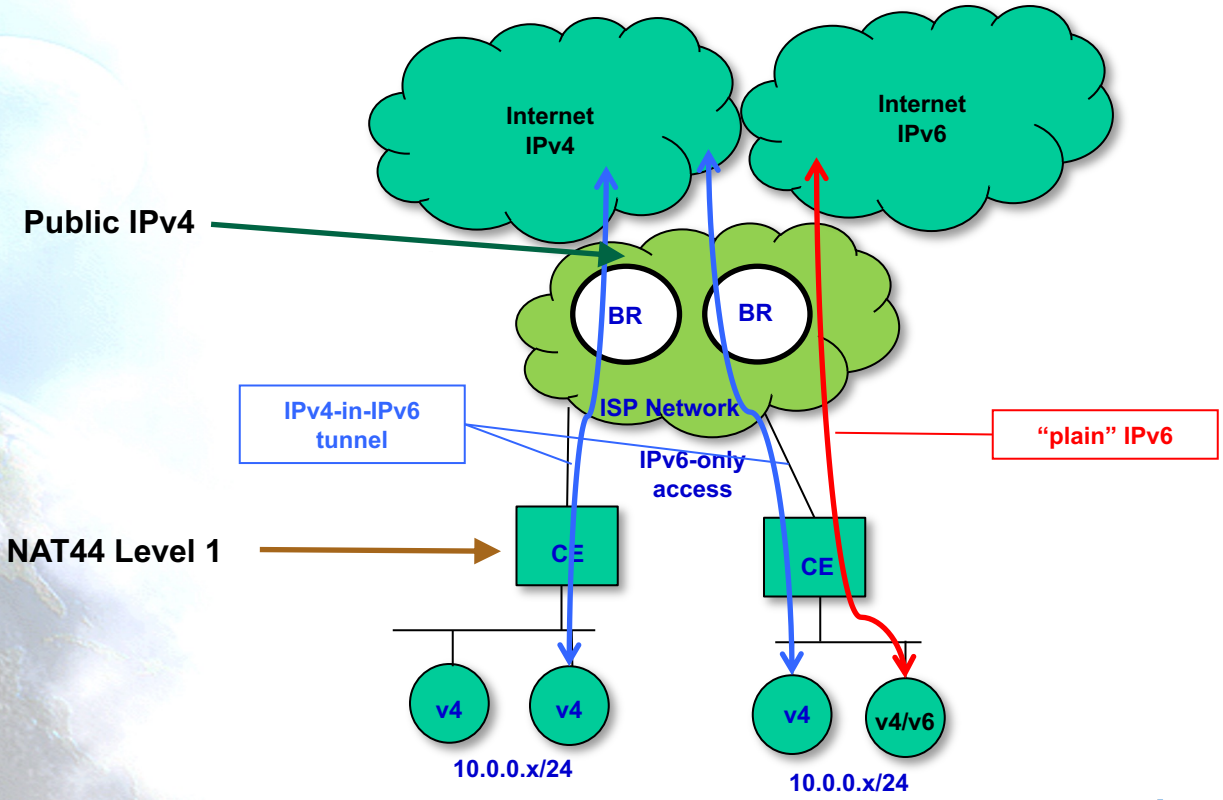
DS-Lite


Internet
IPv4
Internet
IPv6
Public IPv4
NAT44 Level 1
AFTR
AFTR
ISP network
IPv4-in-IPv6
tunnel
"plain" IPv6
IPv6-only
access
CPE
(B4)
CPE
(B4)
v4
v4
v4
v4/v6
10.0.0.x/24
10.0.0.x/24

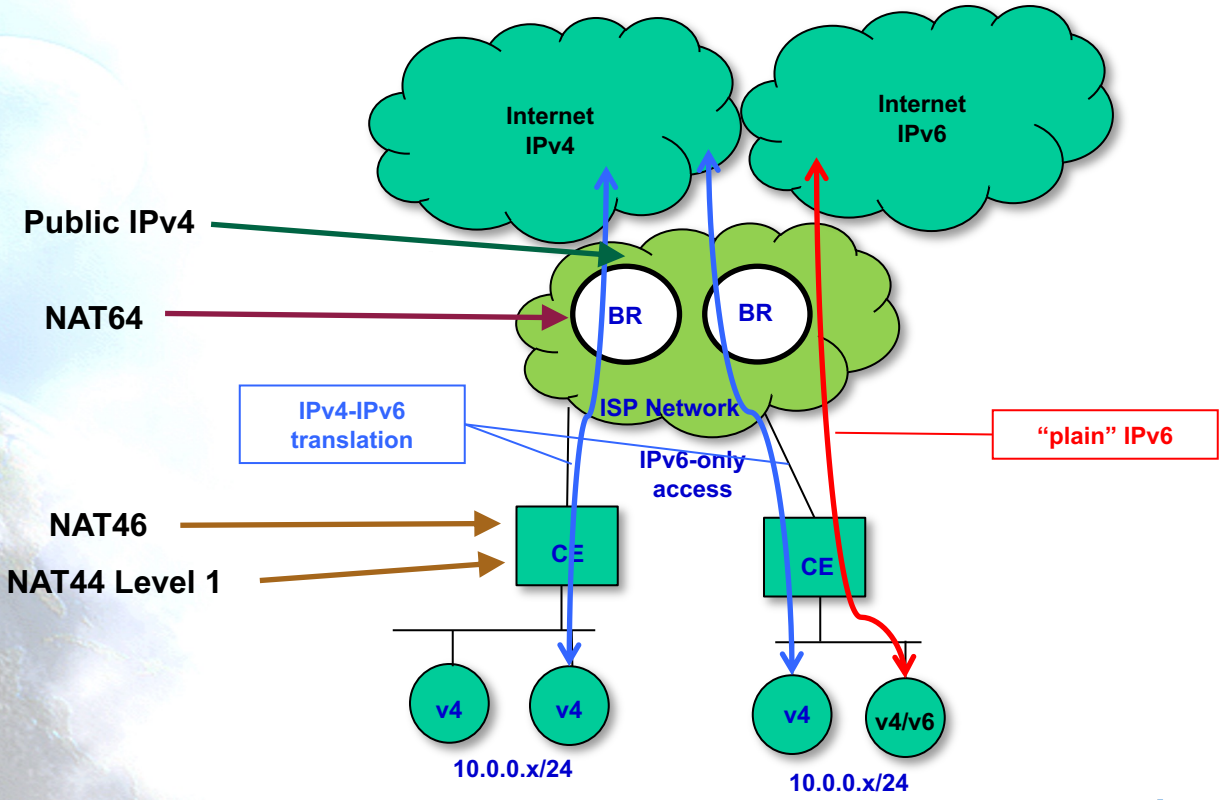
lw4o6


Internet
IPv4
Internet
IPv6
Public IPv4
lwAFTR
wAFTR
ISP network
IPv4-in-IPv6
tunnel
IPv6-only
access
"plain" IPv6
NAT44 Level 1
CPE
(lwB4
)
CPE
(lwB4
)
v4
v4
v4
v4/v6
10.0.0.x/24
10.0.0.x/24

MAP-E

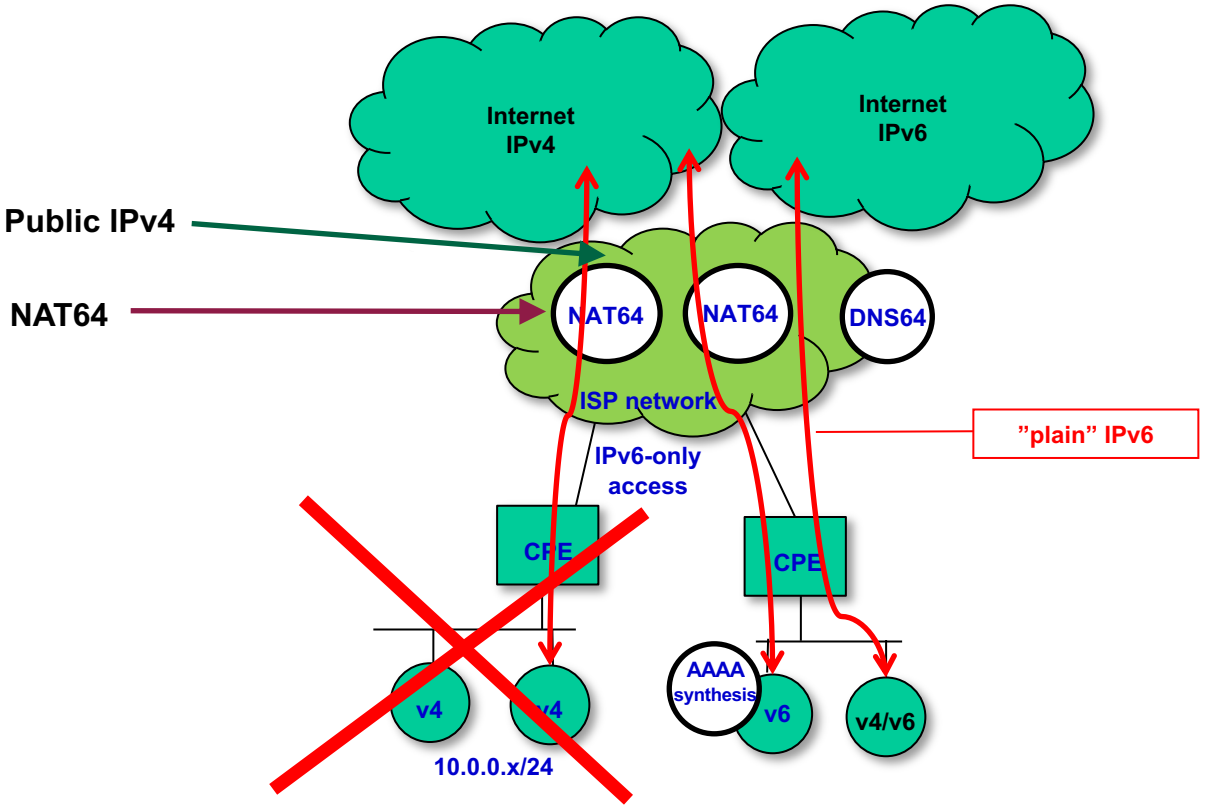

Internet
IPv4
Internet
IPv6
Public IPv4
BR
BR
ISP Network
IPv4-in-IPv6
tunnel
IPv6-only
access
"plain" IPv6
NAT44 Level 1
CE
CE
v4
v4
v4
v4/v6
10.0.0.x/24
10.0.0.x/24

MAP-T


Internet
IPv4
Internet
IPv6
Public IPv4
NAT64
BR
BR
ISP Network
IPv4-IPv6
translation
IPv6-only
access
"plain" IPv6
NAT46
NAT44 Level 1
CE
CE
v4
v4
v4
v4/v6
10.0.0.x/24
10.0.0.x/24

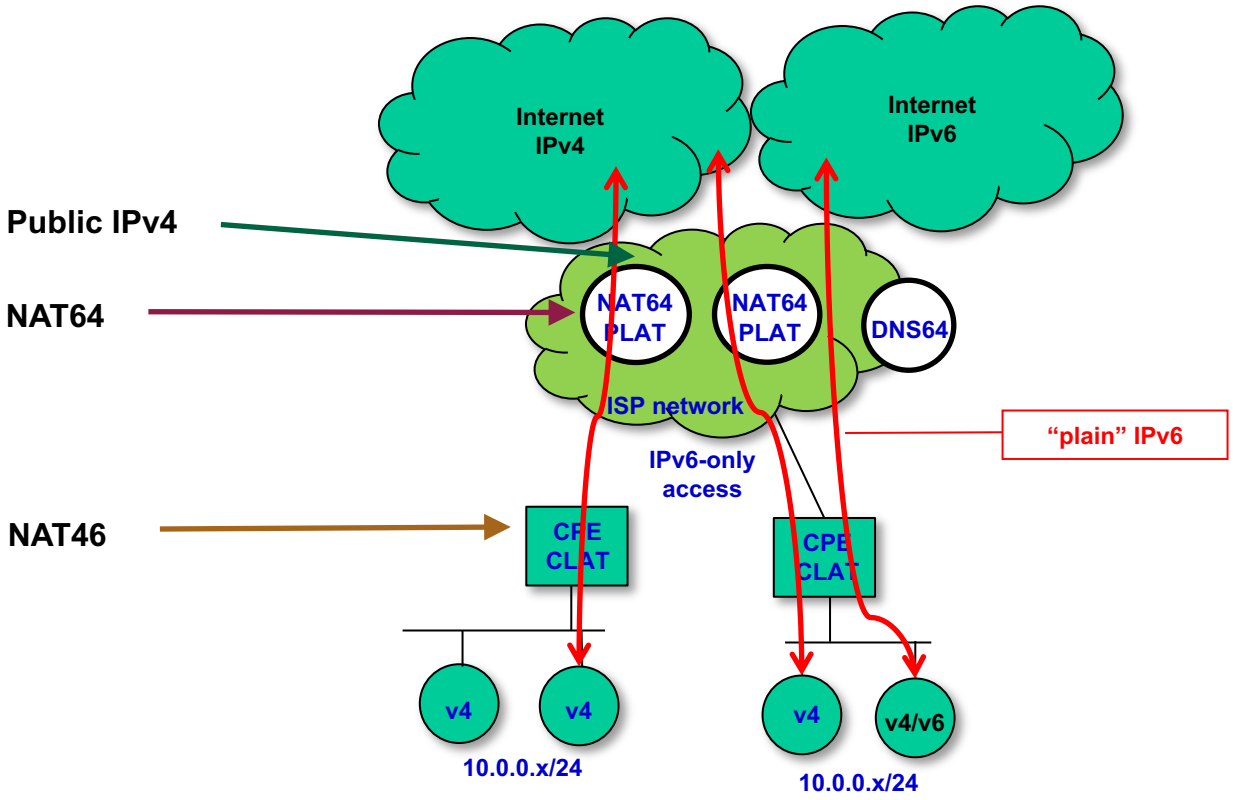
NAT64 is NOT a Valid Solution

- IPv4-only devices or apps will not work
- Some apps will don't work:
  - Peer-to-peer using IPv4 "references"
  - Literal addresses
  - Socket APIs



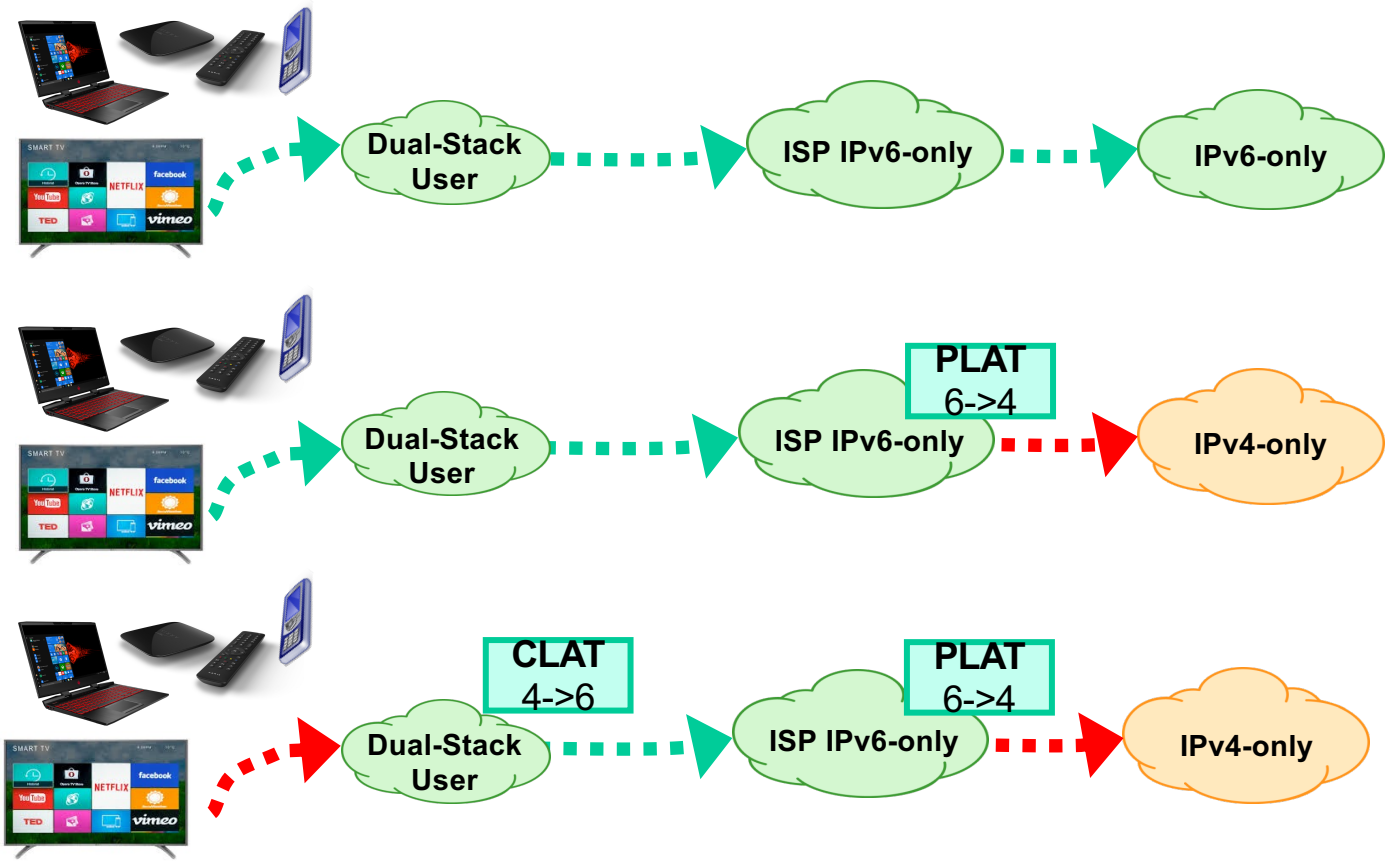
464XLAT is the Solution

- ONLY valid solution for cellular networks
- Best solution for broadband:
  - Wired
  - Wireless



464XLAT Traffic Flows

- Dual-stack support in user LANs, cellular apps and tethered devices
- Typically
  - >85% IPv6
  - 14% NAT64
  - 1% CLAT+NAT64



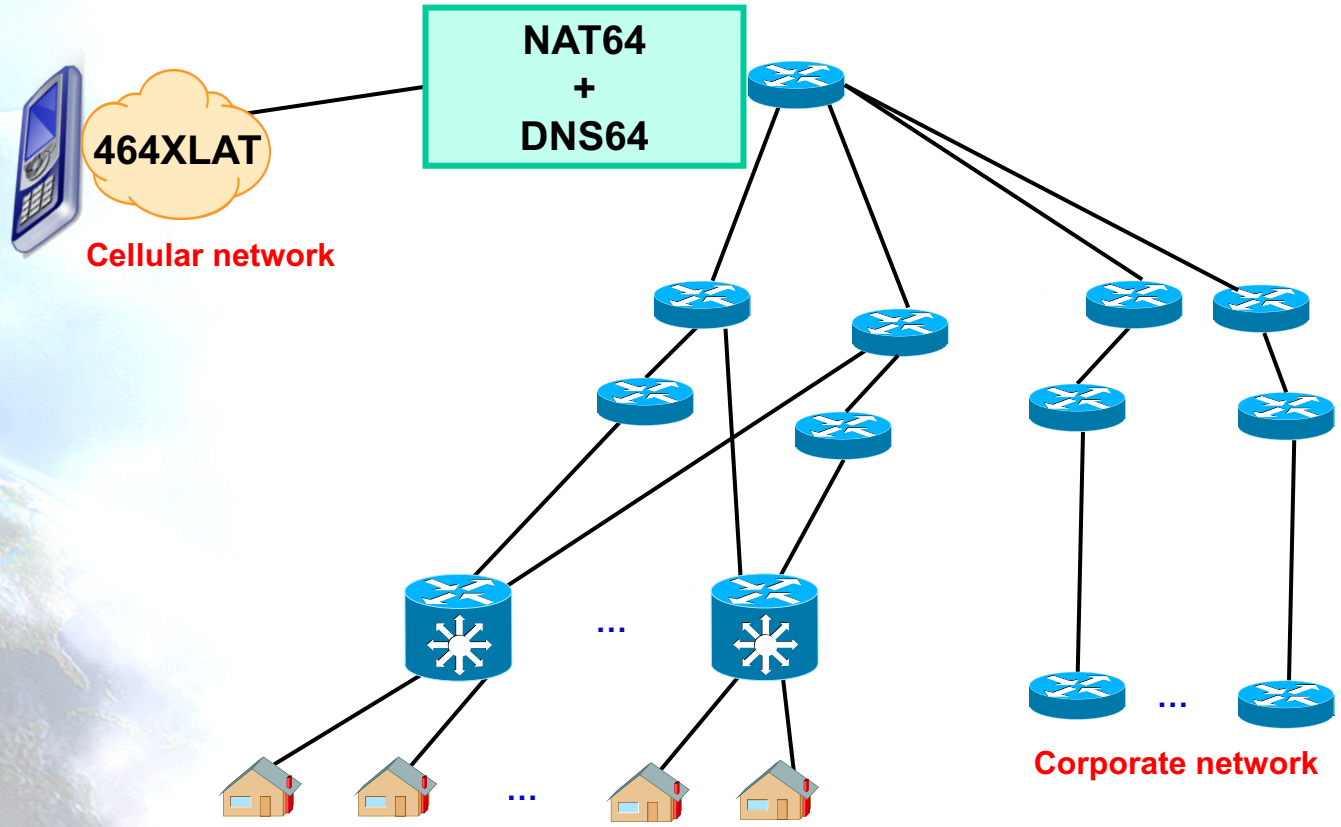
RFC8585, RFC8683 and more

- Starting points:
  - RFC8585 tells your CE providers what you need
  - RFC8683 is about considerations for your network
  - Work in progress:
    - draft-ietf-v6ops-transition-comparison
    - draft-ietf-v6ops-ipv6-deployment
- However … every network is a different (and special) animal
- We have done many **real cases, last one with 25 million subscribers** (“work in progress”)
  - Cellular, DSL & GPON

Savings

- CapEx and OpEx
- Avoid paying for IPv4 addresses
- If you replace CEs, reduce your investment in NAT64
- You can “sell” the CEs to customers because new “features”
  - Better WiFi coverage and security
  - New functions: opportunity for triple-play or 4K/8K IPTV
  - More bandwidth
  - Move customers from DSL to GPON and analog voice to VoIP
  - IoT offering
  - Upgraded warrantee

Multiservice Network



Thanks!

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