IPv6 Deployment In Mobile Network

UK IPv6 Council 2025

Victor Frolov
Bouygues Telecom

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Bouygues Telecom

The second largest Fixed/Mobile operator in France

36,6 millions
available FTTH connection points

la fibre **4,6 millions**
de clients FTTH

5,3 millions
Fixed Subscribers

over 99%
of the French population is covered by 4G.

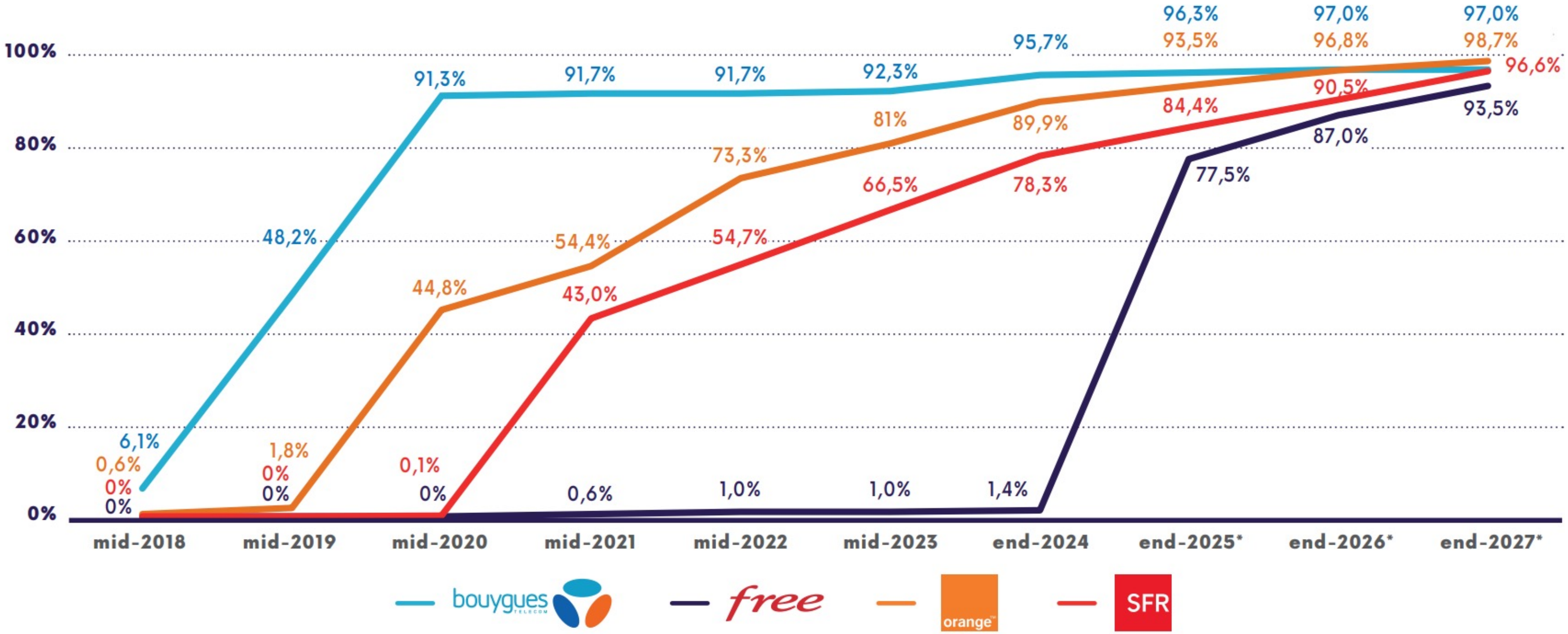
27 millions
number of mobile customers (including MtoM)

30/09/2025

https://www.corporate.bouyguestelecom.fr/nous-decouvrir/chiffres-cles/

IPv6 deployement

<u>Public mobile networks: percentage of IPv6-enabled customers</u>



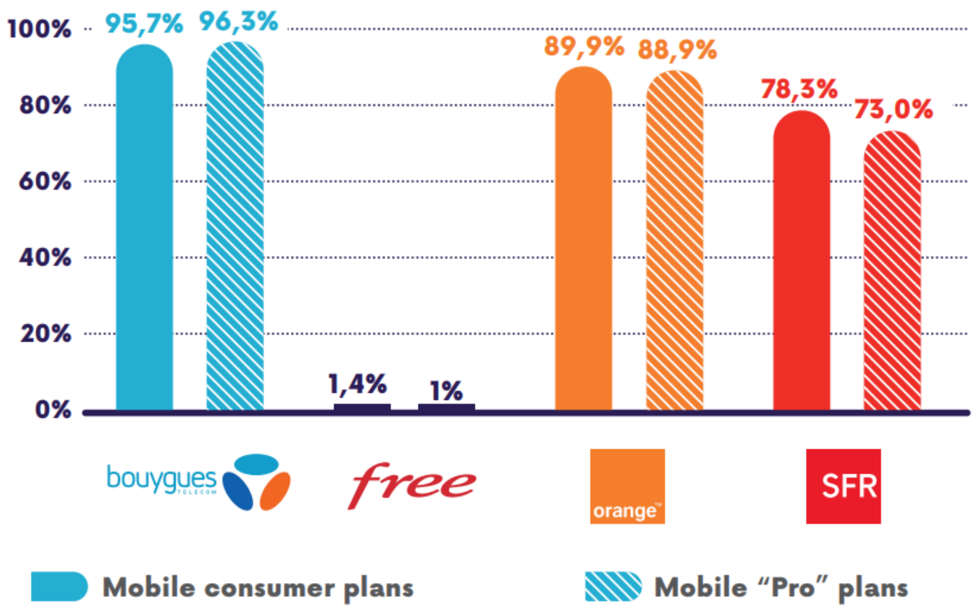
*Figures subject to change

Source: Data as of end of 2024, collected by Arcep from operators and aggregated, with an assumed 61% market share for Android and 30% for iOS.

https://www.arcep.fr/fileadmin/reprise/observatoire/ipv6/Arcep_2025_Barometer_of_the_Transition_to_IPv6.pdf

IPv6 deployement

Mobile network: percentage of IPv6-enabled customers



Source: Data as of end of 2024, collected by Arcep from operators and aggregated, with an assumed 61% market share for Android and 30% for iOS.

Android: Bouygues Telecom, Orange, and SFR all enable IPv6 by default on Android phones released after 2018 (Bouygues), 2020 (Orange), and 2021 (SFR). At the end of 2024, Free had not enabled IPv6 by default. Free is expected to enable IPv6 for smartphones sold in 2022 onwards, over the course of 2025.

iPhone: Bouygues Telecom, Orange, and SFR all enable IPv6 by default on iPhones with at least iOS 12.2 (Bouygues), iOS 13.0 (Orange for iPhone 7 and more recent), iOS 14.3 (SFR), and iOS 15.4 (Orange for iPhone 6S and SE). Free is expected to enable IPv6 by default in 2025 for iPhones running on iOS 15.4 and later.

https://www.arcep.fr/fileadmin/reprise/observatoire/ipv6/Arcep_2025_Barometer_of_the_Transition_to_IPv6.pdf

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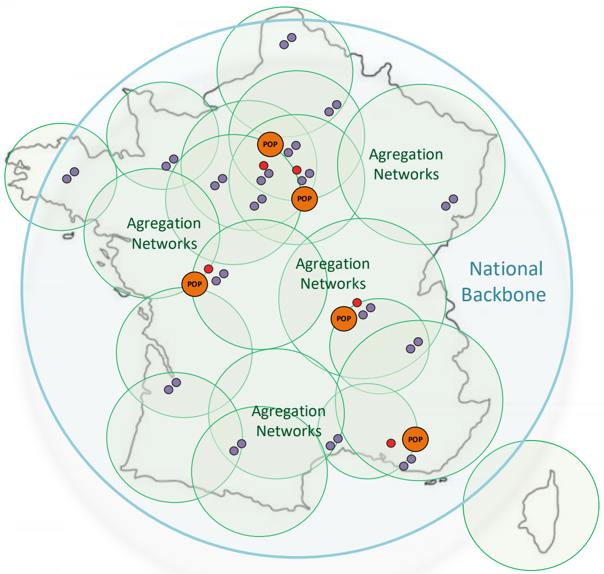
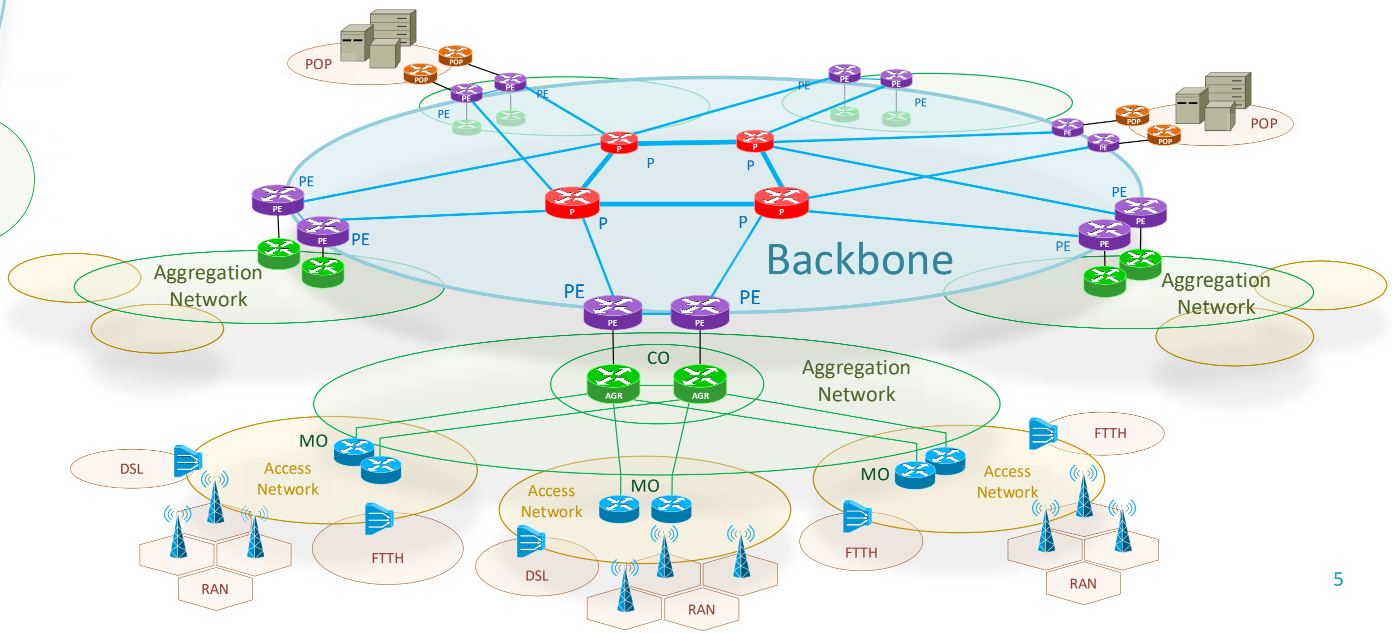
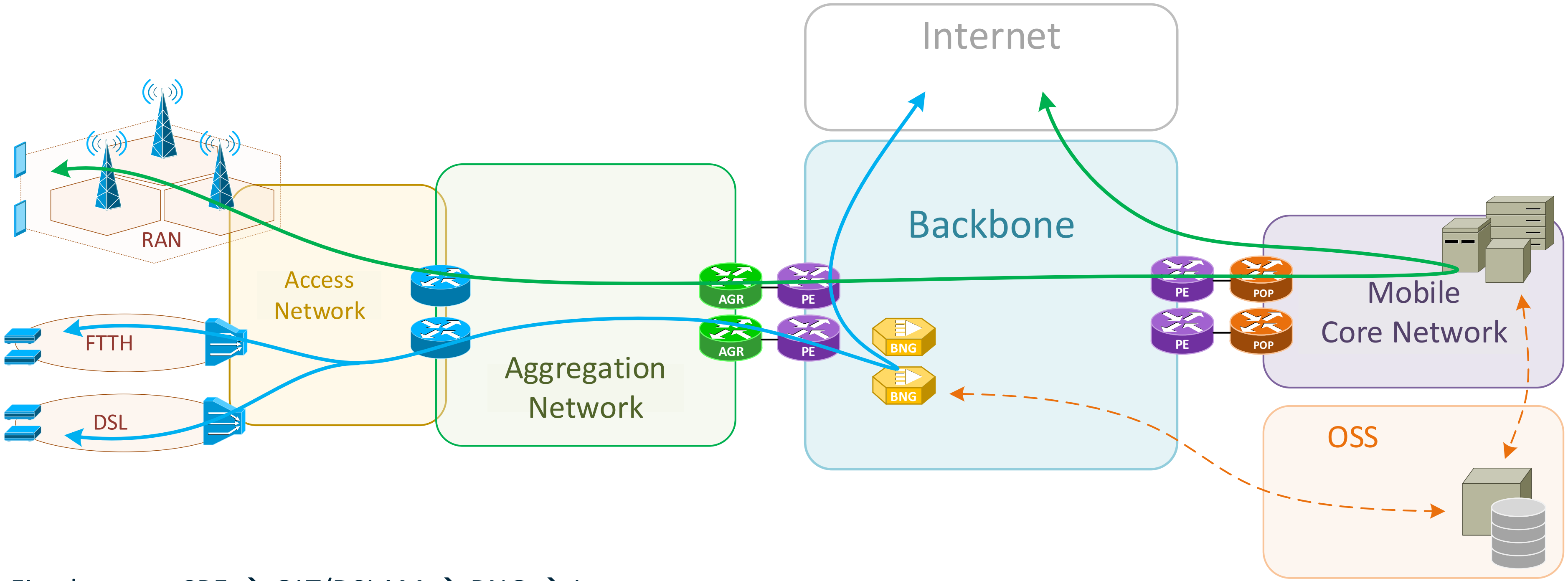


- National backbones (Public and Enterprise)
- Shared Fixed/Mobile Aggregation Networks
- Regionalised Mobile Core Datacenters



Mobile Architecture :: Flow IP



Fixed : CPE → OLT/DSLAM → BNG → Internet

Mobile : UE → eNB → Core Network (MME / SPGW) → Internet

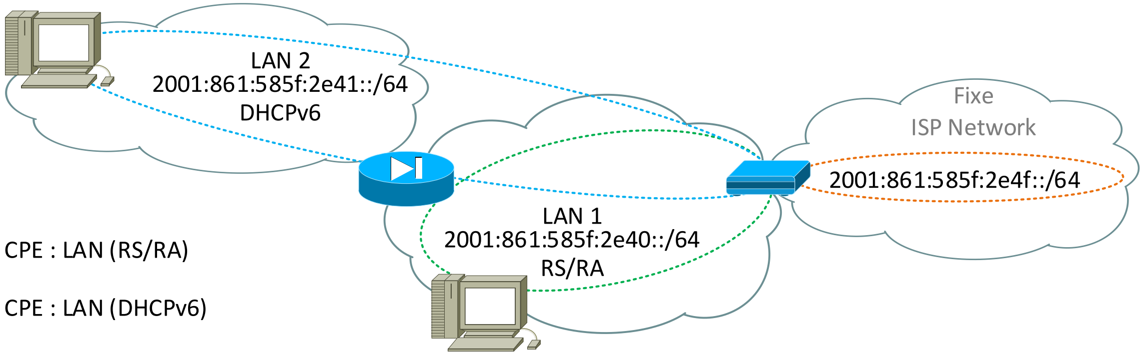
Mobile Architecture :: Allocation

Fixed Subscribers

Abonent Fixe 1 — 2001:861:585f:2e30::/60

Abonent Fixe 2 — **2001:861:585f:2e40::/60**
- 2001:861:585f:2e40::/64 — CPE : LAN (RS/RA)
- 2001:861:585f:2e41::/64 — CPE : LAN (DHCPv6)
- . . .
- 2001:861:585f:2e4f::/64 — CPE : WAN

Abonent Fixe 3 — 2001:861:585f:2e50::/60



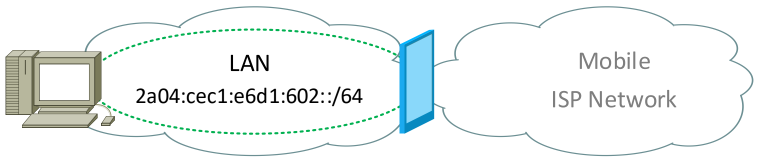
Mobile Subscribers

Abonent Mobile 1 — 2a04:cec1:e6d1:601::/64

Abonent Mobile 2 — 2a04:cec1:e6d1:602::/64

Abonent Mobile 3 — 2a04:cec1:e6d1:603::/64

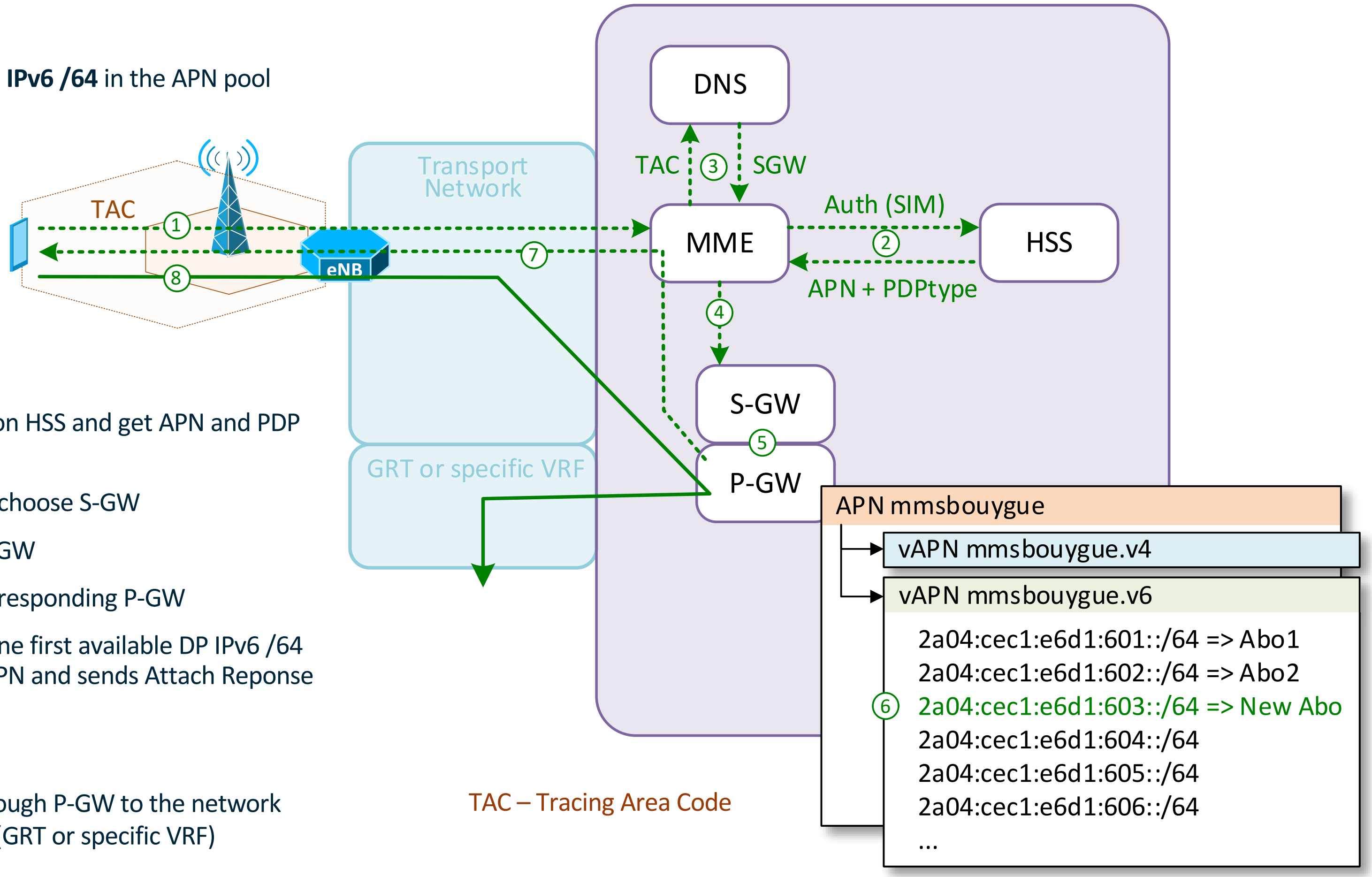
UE : LAN
(RS/RA and/or DHCPv6)



Mobile Architecture :: Provisionning

Public clients

Subscriber get **the first available DP IPv6 /64** in the APN pool

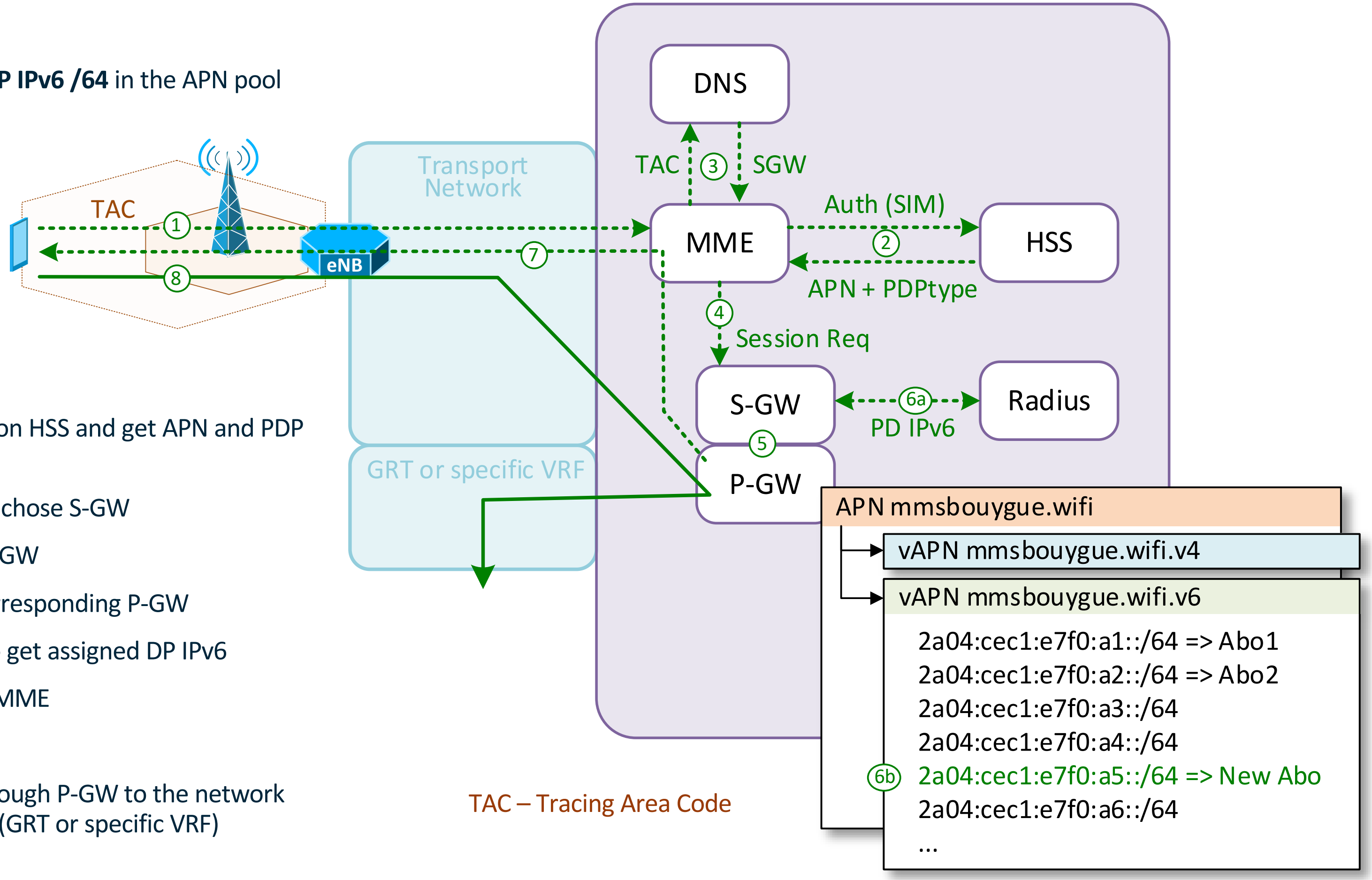


1. UE make Attach Request to MME
2. MME make authentication of UE on HSS and get APN and PDP Type
3. According to the APN+TAC, MME choose S-GW
4. MME sends Session Request to S-GW
5. S-GW pass Session Request to corresponding P-GW
6. According to the APN, P-GW assigne first available DP IPv6 /64 from pool corresponding to APN/vAPN and sends Attach Reponse to MME
7. MME sends DP IPv6 /64 to UE
8. Now UE could send the traffic through P-GW to the network corresponding to the APN on P-GW (GRT or specific VRF)

Mobile Architecture :: Provisionning

Enterprise clients

Subscriber get **the same assigned DP IPv6 /64** in the APN pool

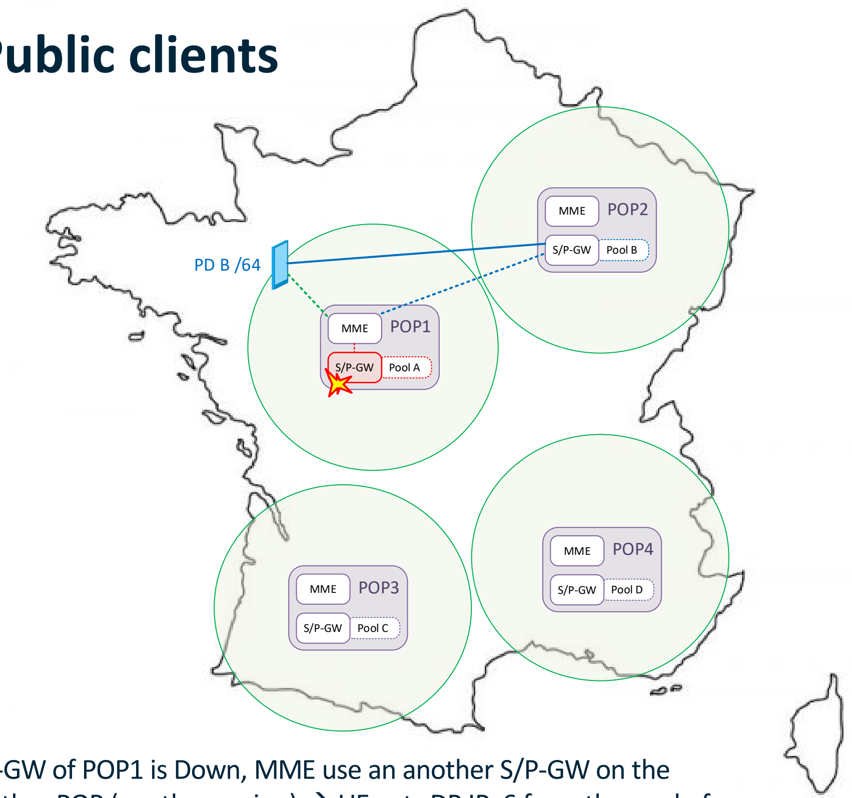


1. UE make Attach Request to MME
2. MME make authentication of UE on HSS and get APN and PDP Type
3. According to the APN+TAC, MME chose S-GW
4. MME sends Session Request to S-GW
5. S-GW pass Session Request to corresponding P-GW
6a. P-GW make request to Radius to get assigned DP IPv6
6b. P-GW sends Attach Reponse to MME
7. MME sends DP IPv6 /64 to UE
8. Now UE could send the traffic through P-GW to the network corresponding to the APN on P-GW (GRT or specific VRF)

TAC – Tracing Area Code

Mobile Architecture :: Redondancy

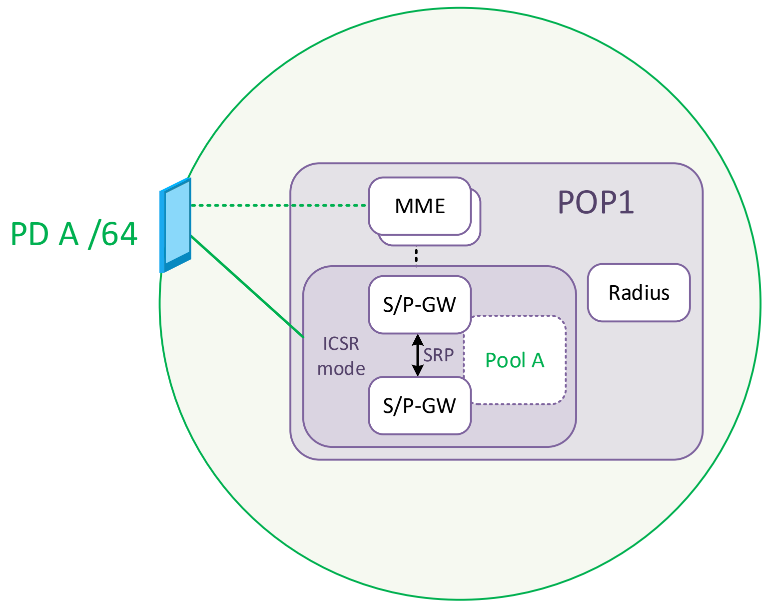
Public clients



If P-GW of POP1 is Down, MME use an another S/P-GW on the another POP (another region) → UE gets DP IPv6 from the pool of POP 2

- No impact for the Public subscribers
- Enterprise subscribers can't get the same DP IPv6

Enterprise clients



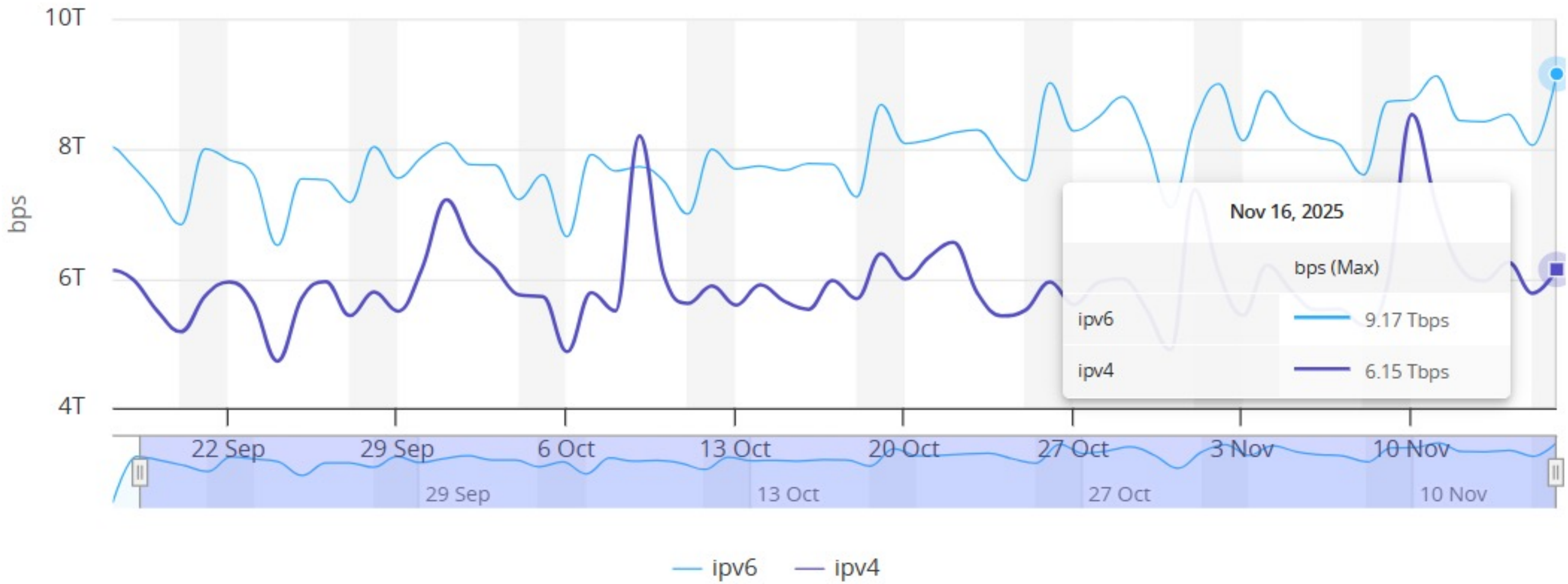
A cluster consisting of two S/P-GW (statefull mode ICSR)
S/P-GW synchronized by SRP protocol (LB, pools, sessions)
→ UE is assigned to the same POP and get the same DP /IPv6

- No impact for the Enterprise subscribers
- The amount of equipment needs to be doubled

Today

CURRENT TARGET : DUAL STACK

- DualStack for each Fixed/Mobile subscriber – Realised on 98%
- IPv6 traffic exceeds IPv4 traffic by 30%



ByTEL Reporting Dashboard Total IPv4+IPv6 Traffic received from peering & caches

What the next ?

NEXT STEP : TO THE IPV6-ONLY

- Underlay IPv6

  Currently all mobile network equipement are interconnected on IPv4 (NB/eNB/gNB/BTS/BSC/RNC/SGSN|MME|AMF/GGSN|S-PGW|UPF/HSS/PCRF/etc.)

  Target : Migrate underlay to IPv6

- SRv6 and Network Slicing

  Currently the transport infrastructure is based on SR/MPLS

  Target : Migrate transport to SRv6

  - More effective Trafic Engineering, paths programmed by SDN, Network Slicing

- Research : Fixed/Mobile networks mutualisation

  Mutualisation of the Fixed/Mobile Cores

Open questions

We provide users with the ability to communicate using IPv6.

But we have a poor understanding of what new capabilities we can provide IPv6 users.

We're copying the IPv4 mindset, but we're running into problems we haven't yet fully understood.

- Different Fixed/Mobile IPv6 DP?
- Multi-homing Fixed Mobile?
- IoT?
- The development of peer-to-peer networks?

Thank you !

Victor FROLOV

Network Architect

vicfrolo@bouyguestelecom.fr

Bouygues Telecom
Laboratory Department

bouyguestelecom.fr