

Mobile User Plane Evolution

draft-zhang-dmm-5g-distributed-upf

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draft-zhang-dmm-mup-evolution

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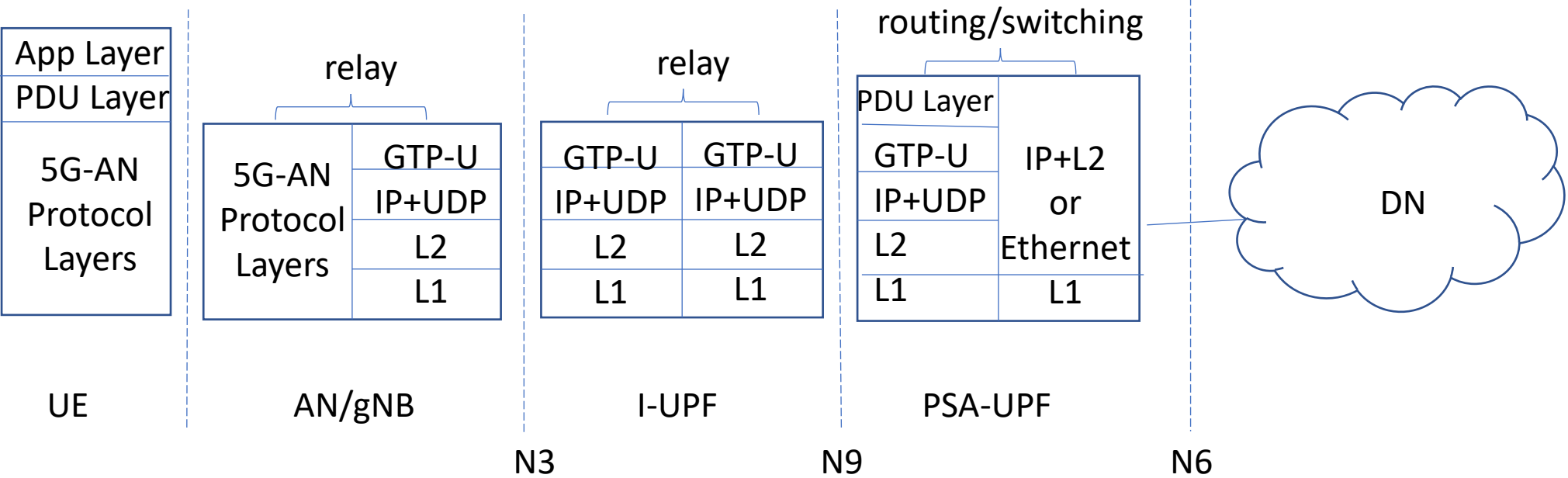
DMM, IETF113

Purposes

- draft-zhang-dmm-5g-distributed-upf
 - 5G User Plane overview, distribution trend, alternative implementation
 - Sets the stage for discussion in next draft
- draft-zhang-dmm-mup-evolution
 - Instead of co-located but logically separate gNB/UPF functions, what if they're integrated?
 - Would need to bring to 3GPP
 - Socializing the idea first among parties friendly with IETF/wireline technologies
 - No intention to do 3GPP work in IETF
 - With enough support, 3GPP delegates from supporting parties would bring to 3GPP
 - No official IETF involvement (e.g., no Liaison is expected)

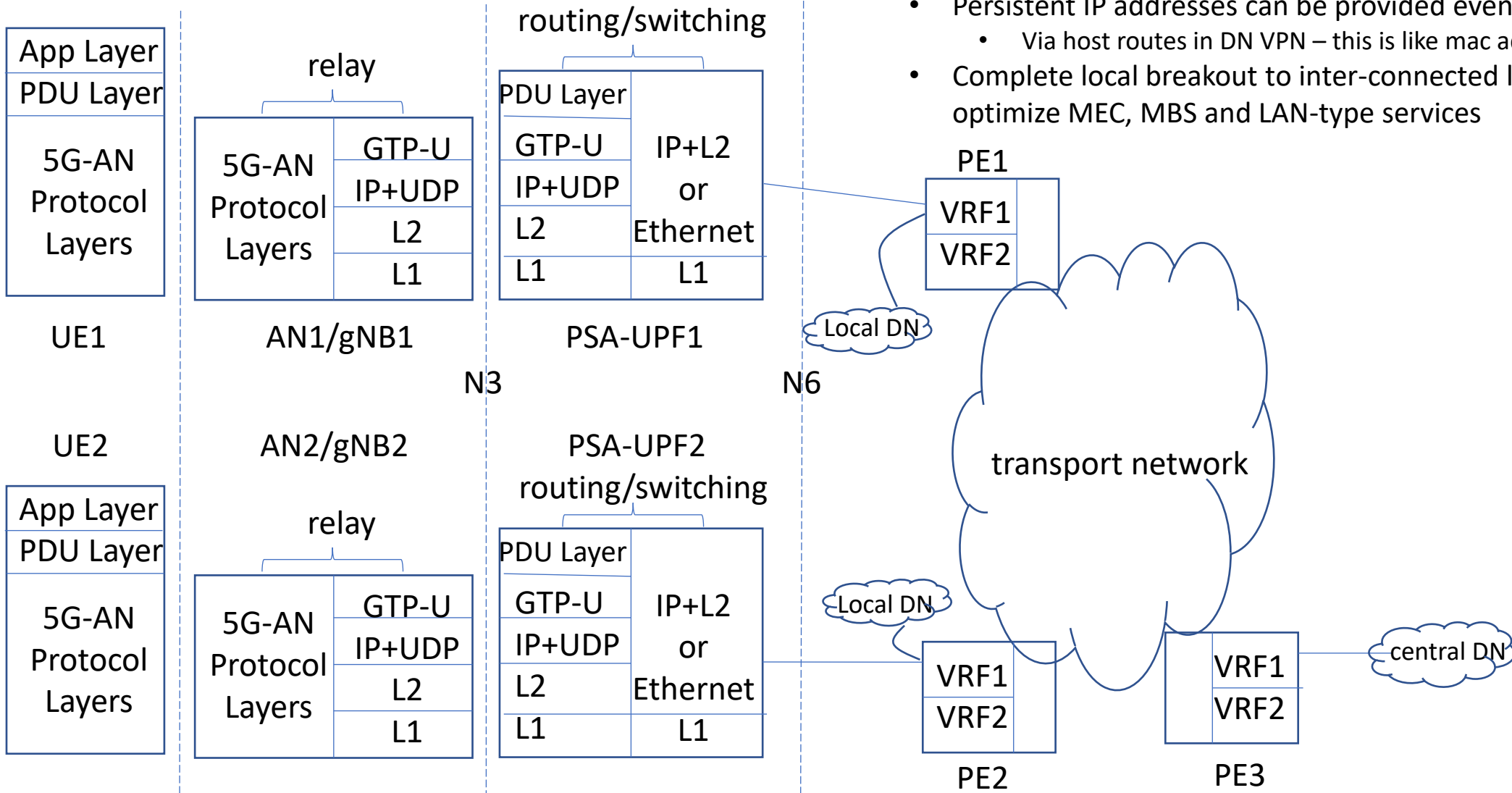
5G User Plane

- AN Part + CN Part
 - AN part – radio/access link between UE and AN/gNB; PDU over radio/access layers
 - CN part – GTP between AN/gNB and UPF; PDU over GTP
- AN/gNB extends the PDU to UPF over GTP
 - AN/gNB/I-UPF relays the PDU
 - UPF terminates GTP and routes/switches PDU to/from DN
 - “routing/switching” refers to traffic forwarding based on inner IP/Ether header



Distributed UPF and DN

- With MEC, UPFs are being distributed closer to AN/gNB
- DNs are also distributed to host edge resources
 - Implemented as VPNs for inter-site connection
- While central PSA UPFs can remain, they could be removed
 - Persistent IP addresses can be provided even when UEs re-anchor
 - Via host routes in DN VPN – this is like mac address routes
 - Complete local breakout to inter-connected local DN simplifies and optimize MEC, MBS and LAN-type services



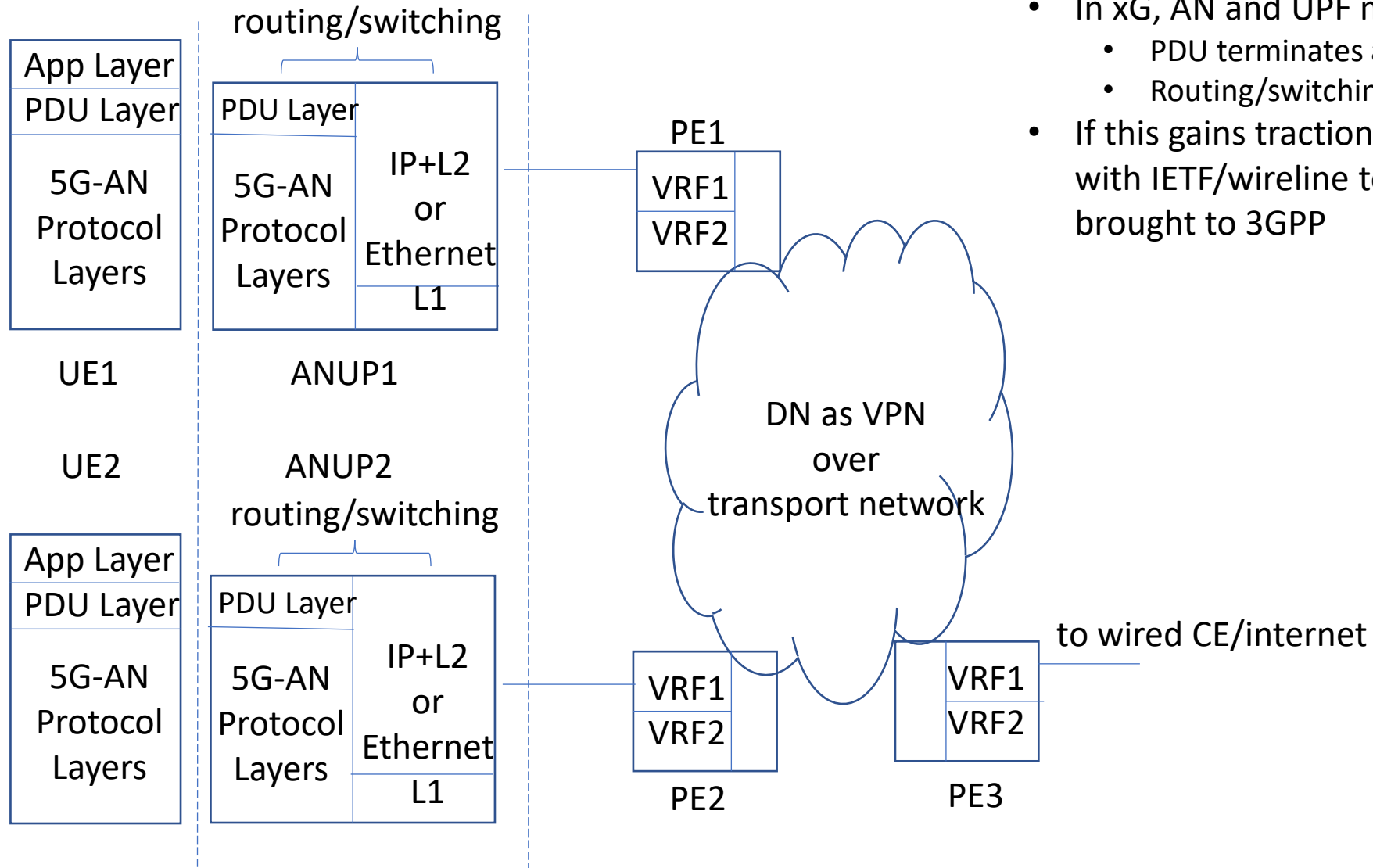
Alternatives to UPF/GTP implementation

- Some operators/vendors are pushing for alternative implementation/deployment
 - Under the hood – no 3GPP architecture/signaling changes
 - Discussions/specifications in DMM
- [SRv6-replacing-GTP](#): draft-ietf-dmm-srv6-mobile-uplane
 - Based on N2/N4-signaled GTP parameters, SRv6 tunnels are used instead
 - Information like TEID is embedded in SRv6 SIDs
 - SRv6 tunnels can start/end at gNB/UPF or GW attached to gNB/UPF
 - All claimed benefits can be achieved by MPLS as well
 - <https://datatracker.ietf.org/doc/draft-zzhang-pals-pw-for-ip-udp-payload/>
- [SRv6 MUP Architecture](#): draft-mhkk-dmm-srv6mup-architecture
 - An SRv6 specific, router based, and partial implementation of Distributed UP

An Alternative View of SRv6 MUP Architecture

- The collection of distributed <MUP Controller, MUP GWs, MUP PE> appears to the SMF as a single/central PSA-UPF
 - No change of 3GPP architecture/signaling
 - An alternative to distributed “traditional” UPFs
- This is actually SR-agnostic
 - Works equally well with (SR-)MPLS
 - <https://datatracker.ietf.org/doc/draft-zpm-dmm-mup-bgp-signaling> is the SR-agnostic version of BGP signaling from the MUP Controller
 - Based on draft-mpmz-bess-mup-safi w/ minimum changes
- This is so far just for partial UPF functions
 - For complete set of UPF functions, either extend this router-based architecture or just deploy traditional but distributed UPFs

Integrated AN/UP in xG?



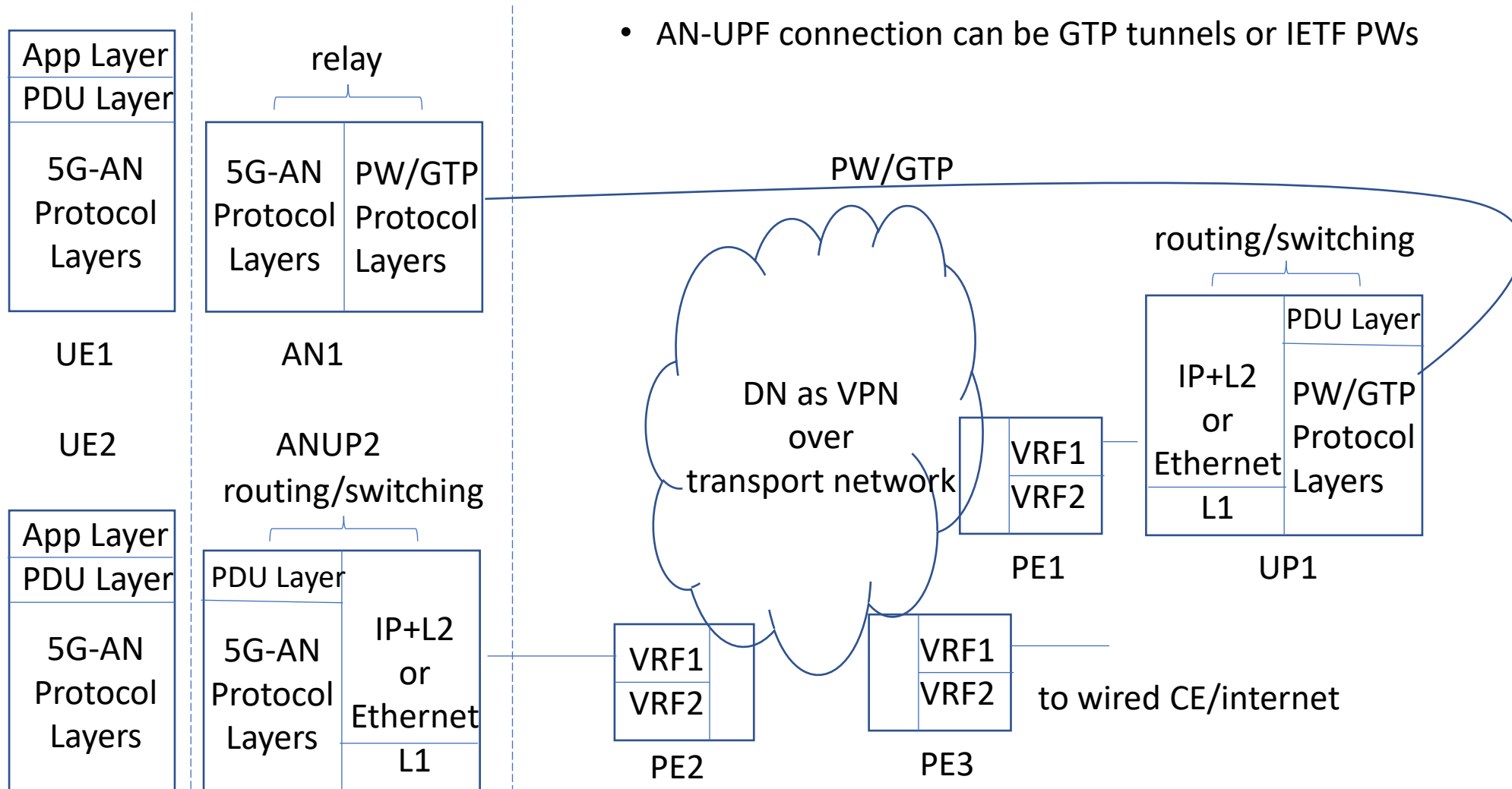
- In xG, AN and UPF may be integrated into ANUP
 - PDU terminates at ANUP
 - Routing/switching at ANUP
- If this gains traction with parties familiar/friendly with IETF/wireline technologies, it will then be brought to 3GPP

Why Bother?

- Simplified/flattened network architecture
 - 3GPP/wireless for the radio access; IETF/wireline for the rest
 - Seamless integration of wireline/wireless services
 - Not in the context of WWC, but for MEC, MBS, LAN-type services, etc..
- Optimized signaling and data plane
 - No need for separate N2 & N4 signaling
 - No need for AN-UPF connection
- This is feasible as NFs are more and more virtualized
 - Even VPN PE could be integrated into the ANUP device
 - As an implementation choice (not xG architecture assumption)

Separate UPFs May Still Be Used

- For home-routed roaming, MVNO, or one UPF for multiple ANs in proximity
- AN-UPF connection can be GTP tunnels or IETF PWs



Summary

- 5G already support distributed UPFs for MEC purposes
- Alternative User Plane implementation may be desired by some operators
 - “under the hood” w/o changes to 5G architecture/signaling
- In 6G, it may be desired to integrate AN/gNB and UPF functions into a single entity for a flattened architecture
 - 3GPP/wireless technology for radio connection
 - IETF/wireline technology for the rest
 - This is only to socialize the thoughts – actual work would be done in 3GPP
- Seeking comments and collaboration