

Discussions on Integrating AN and UPF

draft-zzhang-dmm-mup-evolution

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Basic Idea

- In 5G, UPFs are more and more distributed close to gNB-CU (AN)
 - For MEC purpose
 - Could be co-located – with direct link in between or even running on the same server
- In 6G, what if AN and UPF are integrated into a single NF (ANUP)?
 - A flattened, routing/switching-based architecture
 - ANUP is a router/switch with wireless/wired connections
 - Foundation of Internet
 - 3GPP/wireless technologies responsible for wireless access
 - Mobility Management, UE authentication/authorization, ...
 - IETF/wireline technologies for the rest

Disclaimer

- The work needs to be done in 3GPP
- We're discussing here only to first socialize the idea among IETF/wireline-friendly people
- Only if we get enough support among mobile operators may we bring it to 3GPP for further work

Advantages

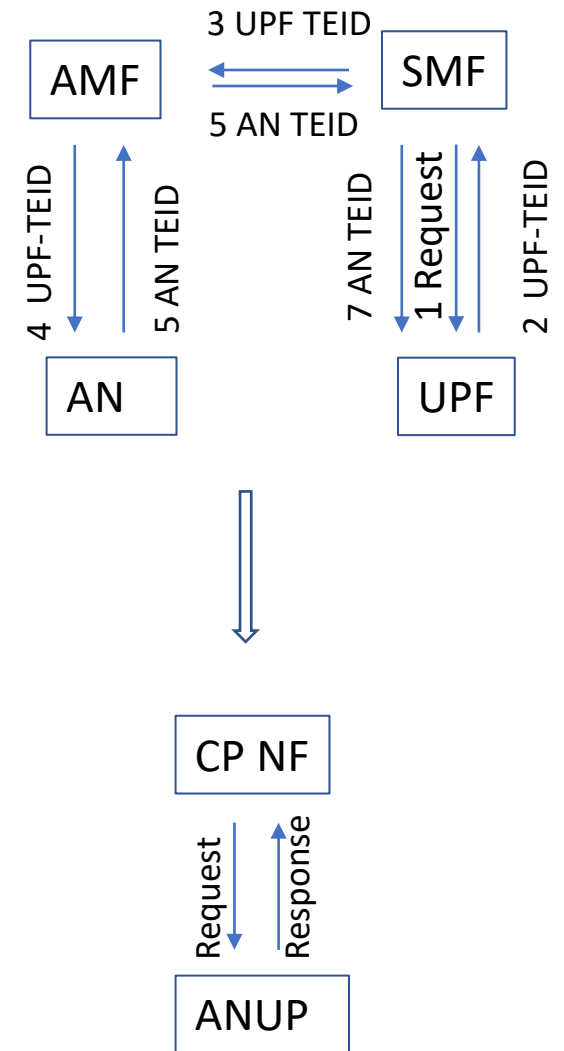
- Simplified, flattened architecture unified for wireline/wireless
- Simplified signaling
- Optimized data plane
- Many 5G special features/procedures are not needed anymore or can be greatly simplified
 - MEC
 - 5MBS
 - LAN-type services
 - ...

DMM Email Discussions

- <https://mailarchive.ietf.org/arch/msg/dmm/rFoO4Snkwm6C0EvrcHafZOKhE9g/>
- Advantages of integration (compared to co-located but separate NFs)
- Concerns for integration
- Other aspects

Simplified Signaling

- In 5G, N3 tunneling is used between separate AN and UPF
 - Even if they're co-located
 - Multi-step N2/N4/N11 signaling involved
- Since no tunnel is used with a router/switch ANUP:
 - Signaling only needs to tell ANUP which DN a PDU session belongs to
 - It's a new signaling, but for 6G a lot of change will happen anyway



Optimized Data Plane

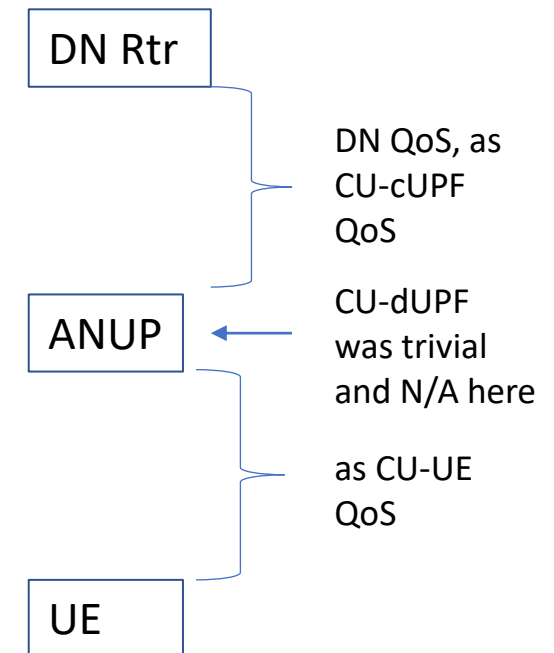
- Direct/short/internal AN-UPF connection is removed
- GTP-U encap/decap is removed
- Better throughput/performance

Multicast

- ANUP is a router/switch
 - With wireless connections to UEs and wired connections to DNs
- Multicast DL traffic arrives on ANUP via whatever DN multicast means
 - IngressReplication, PIM, BIER, P2MP, whatever
 - IETF/wireline technology
 - Then delivered to attached UEs via P2P/P2MP radio bearers
 - 3GPP/wireless technology
- Multicast UL traffic arrives on ANUP and then
 - Delivered to other ANUPs and DN routers via whatever DN multicast means
 - If needed, also delivered to locally attached UEs via P2P/P2MP bearers

QoS

- The ANUP-UE QoS is still like CU-UE QoS
- The QoS previously between CU and co-located UPF is trivial anyway and with integrated ANUP it is N/A
- The QoS previously related to N3 tunneling w/o co-location is now QoS in DN
 - Previously, N3-related QoS is realized through the transport infrastructure
 - Now it is DN (VPN) QoS realized through the same transport infrastructure
- The QoS parameters signaled to ANUP will be used for:
 - QoS between ANUP and UE, and,
 - QoS between DN routers and ANUP
 - DN routing signaling could be enhanced – e.g., the UE routes advertised into DN could carry QoS information so that DL traffic will be subject to the QoS handling



Network Sharing, I-UPF/SMF

- Separate AN and UPF may still be used
 - Home-routed Roaming, MVNO, 1:N ratio for UPF:AN
 - Integration when you can, separation when it is needed
- With integration, I-UPF/SMF is not needed
- W/o integration, I-UPF/SMF can still be used as before

Keep the Discussion Going!

- Really appreciate the comments
- Could you discuss this with your (3GPP/wireless) colleagues?
- Will update the draft accordingly
 - -01 missed some points that John/Hannu brought up, but they will be added