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 DN
- 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