

User Plane Protocol and Architectural Analysis on 3GPP 5G System

draft-ietf-dmm-5g-uplane-analysis

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[Ref.] Background

- This work is Related to User Plane Protocol Study in 3GPP CT4.
=> A part of LS-IN to 3GPP CT4 (<https://datatracker.ietf.org/liaison/1590/>)
- Motivations:
 - Unifying understanding of IETF to specifications on U-Plane of 3GPP 5G System
 - Showing to 3GPP that IETF has enough knowledge about 5G specs
- Way to work:
 - Analyzed GTP-U and architectural requirements for 5G user plane
 - GTP-U Specifications (TS29.281)
 - 5GS Architecture Specs (TS23.501, 502, 503, etc.)
 - Provided some evaluate aspects for candidate protocols

History

- 26th Jun. 2018: v00 was published
- 4th & 17th Jul. 2018: Presented at 3GPP CT4#85-bis and IETF 102 meetings
- 27th Jul. 2018: Sent as a part of LS-IN from IETF DMM-WG to 3GPP CT4
- 10th Aug. 2018: Updated for reflecting LS-OUT from 3GPP CT4
- 22nd Oct. 2018: Updated for reflecting discussion on ML
- 6th Jan. 2019: Adopted as WG document
- 11th Mar. 2019: Updated for reflecting feedback on ML

Major Updates

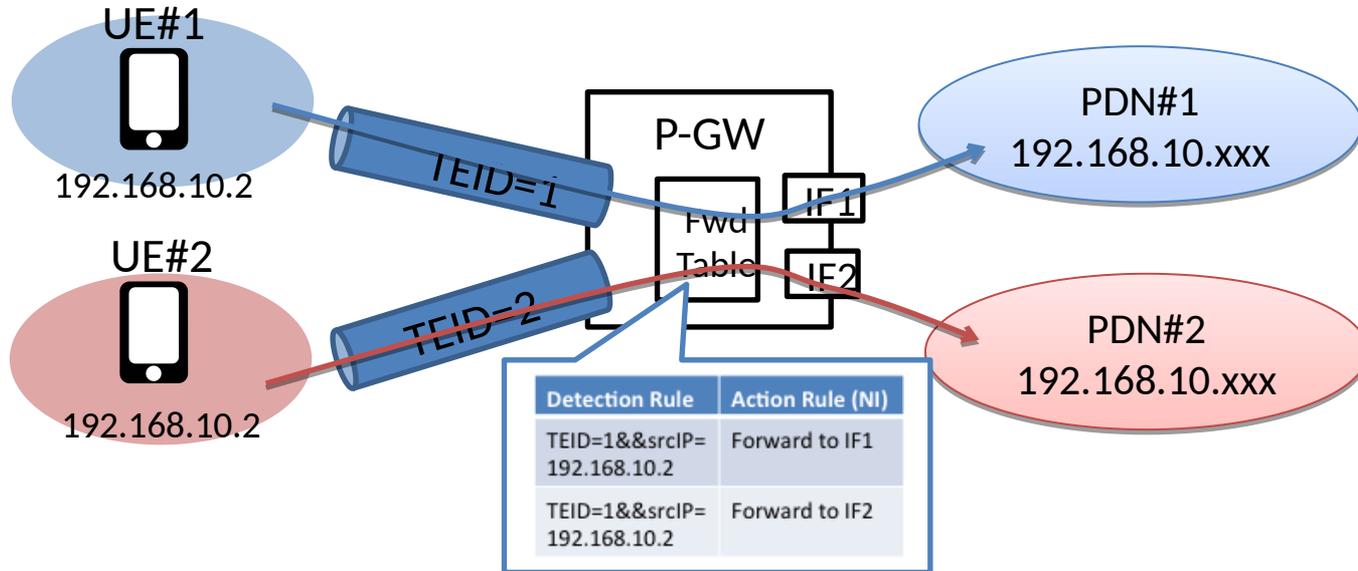
Object	Update Details
[Section2] Added terms of CP protocol	<ul style="list-style-type: none">• Added terminologies and definition about PFCP, PDR, and FAR.
[Section4.1.1] Complemented UPF functionalities	<ul style="list-style-type: none">• Complemented UPF functionalities defined in TS23.501 such as packet inspection, lawful intercept, traffic usage reporting, etc.
[Section4.1.2] Complemented UP traffic detection	<ul style="list-style-type: none">• Complemented IP/Ethernet filter set defined in section 7.5.2.2 of TS29.244.
[ARCH-Req-3] Clarified definition of IPv6 Multi-homing in 3GPP	<ul style="list-style-type: none">• Clarified the definition of IPv6 multi-homing in 3GPP.<ul style="list-style-type: none">- Branch for multi prefixes is called IPv6 multi-homing- Branch of single prefix with ULCL is not called multi-homing
[ARCH-Req-8] Added End Marker support	<ul style="list-style-type: none">• Described the role and usage of End Marker as an ARCH-Req

Major Updates (Cont.)

Object	Update Details
[Arch-Req-7] Update specification of network slicing	<ul style="list-style-type: none">• Reflected specifications related to network slicing described in the current TS23.501.-> Network Instance as IE may be used for gluing UPF and slice
[Eval-Aspect-7] Clarified challenges on network slicing	<ul style="list-style-type: none">• Derived three ways to glue UPF and slices:<ul style="list-style-type: none">- Option1: Integrate UPF and PE- Option2: Integrate UPF and CE- Option3: Put UPF behind CE• Analyzed their features and challenges
[Section6] Changed the conclusion	<ul style="list-style-type: none">• Modified text to indicate that this document would be help for work in IETF, not only 3GPP

PFCP and Network Instance

- PFCP is a CP protocol to handle UP traffic (Ref. TS29.244)
- PFCP contains some Information Element (IE), and S/P-GW or UPF detects traffic and decides its forwarding action with IE.
- Network Instance is an IE, and it is used for deciding IP domain when UE's IP addresses are duplicated.



Network Instance and Network Slicing

- A new definition about usage of Network Instance to glue UPF and transport slices

5.6.12 Use of Network Instance ↵

The SMF may provide a Network Instance to the UPF in FAR and/or PDR via N4 Session Establishment or Modification procedures. ↵

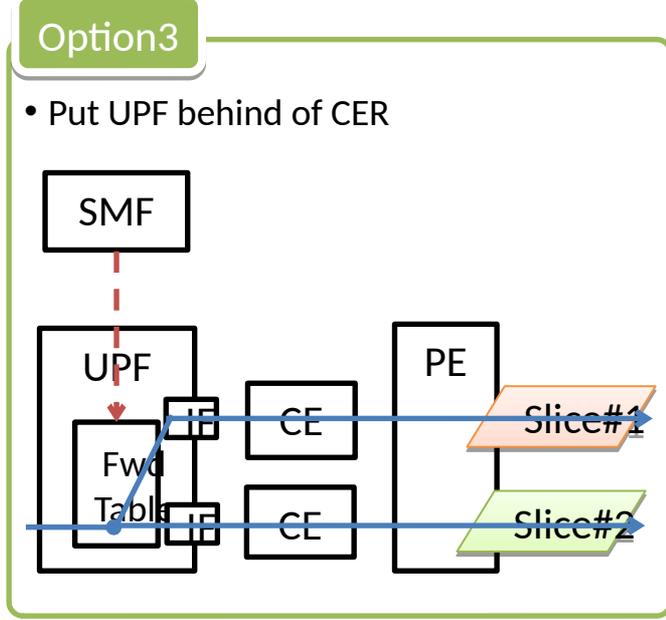
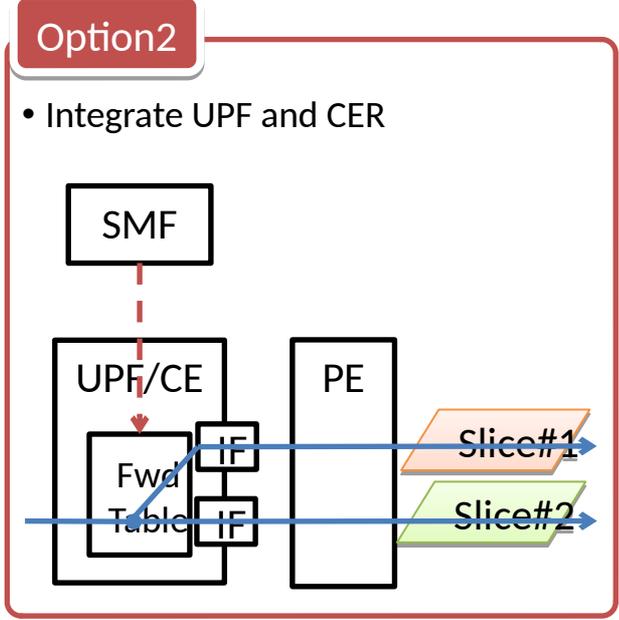
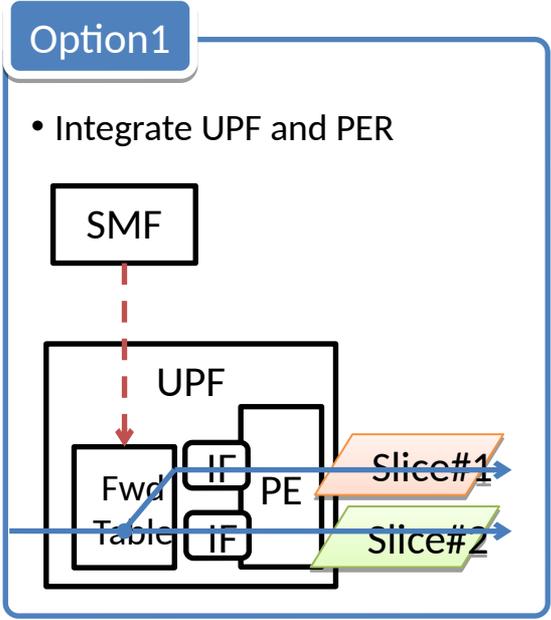
- NOTE 1: a Network Instance can be defined e.g. to separate IP domains, e.g. when a UPF is connected to 5G-ANs in different IP domains, overlapping UE IP addresses assigned by multiple Data Networks, transport network isolation in the same PLMN, etc. ↵

The SMF may determine the Network Instance for N3, N9 and N6 interfaces, based on the e.g. UE location, registered PLMN ID of UE, S-NSSAI of the PDU Session, DNN, etc. ↵

- NOTE 2: As an example, the UPF can use the Network Instance included in the FAR, together with other information such as Outer header creation (IP address part) and Destination interface in the FAR, to determine the interface in UPF (e.g. VPN or Layer 2 technology) for forwarding of the traffic. ↵

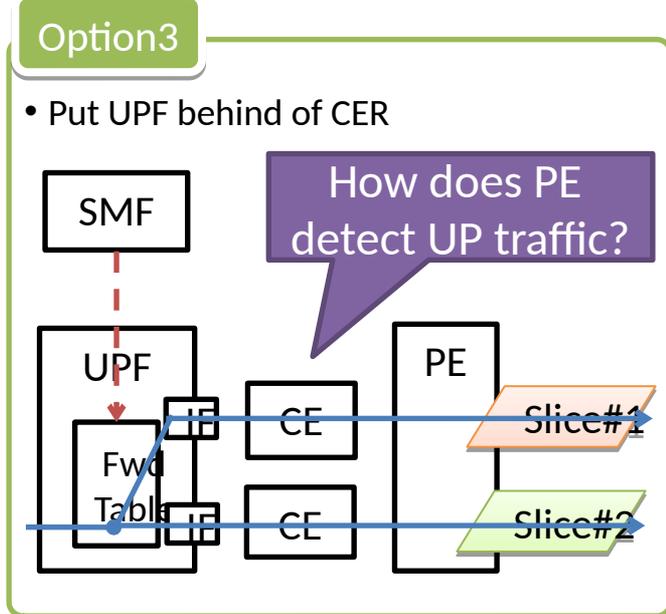
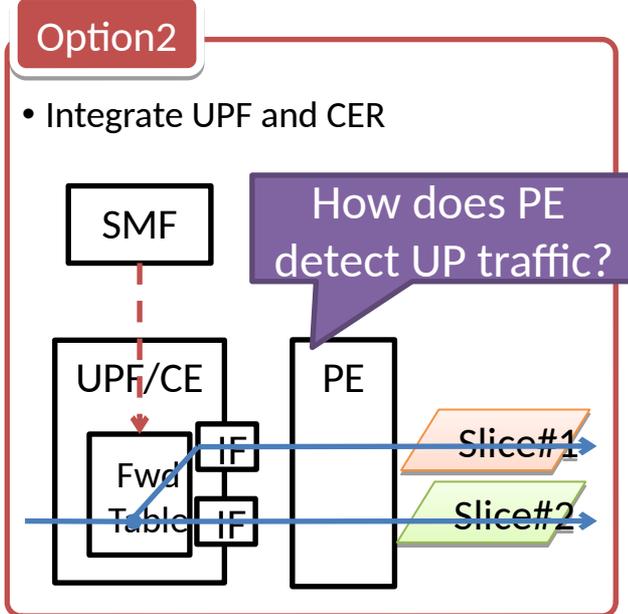
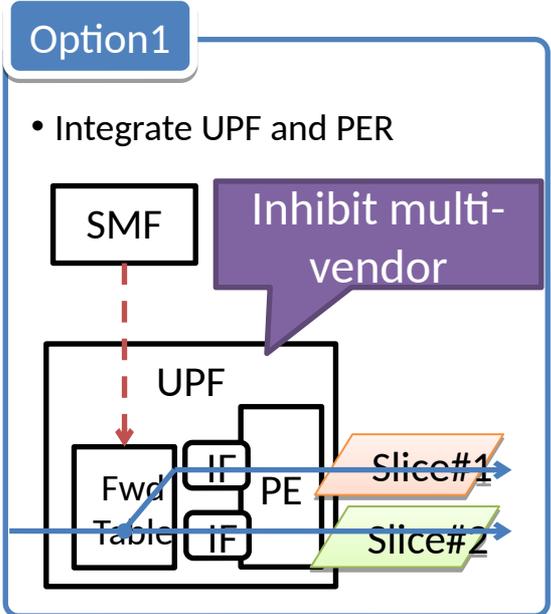
Slicing with Network Instance in PFCP

- TS23.501 added specification about gluing UPF and transport slices with Network Instance
- In case that MPLS is used as transport-slice, three options are considered as means of gluing UPF and slices as below:



Slicing with Network Instance in PFCP (cont.)

- Option1 make it hard to expect multi-vendor development case.
- Option2 and 3 would need more concrete specification to indicate transport slice for separated PE



Status & Next Steps

- Reflected feedback on ML and improved the content.
- Will add clarification of PFCP related to UP handling at next update.
- Appreciated further review, feedback, and advice toward RFC.

Thanks!
Questions?