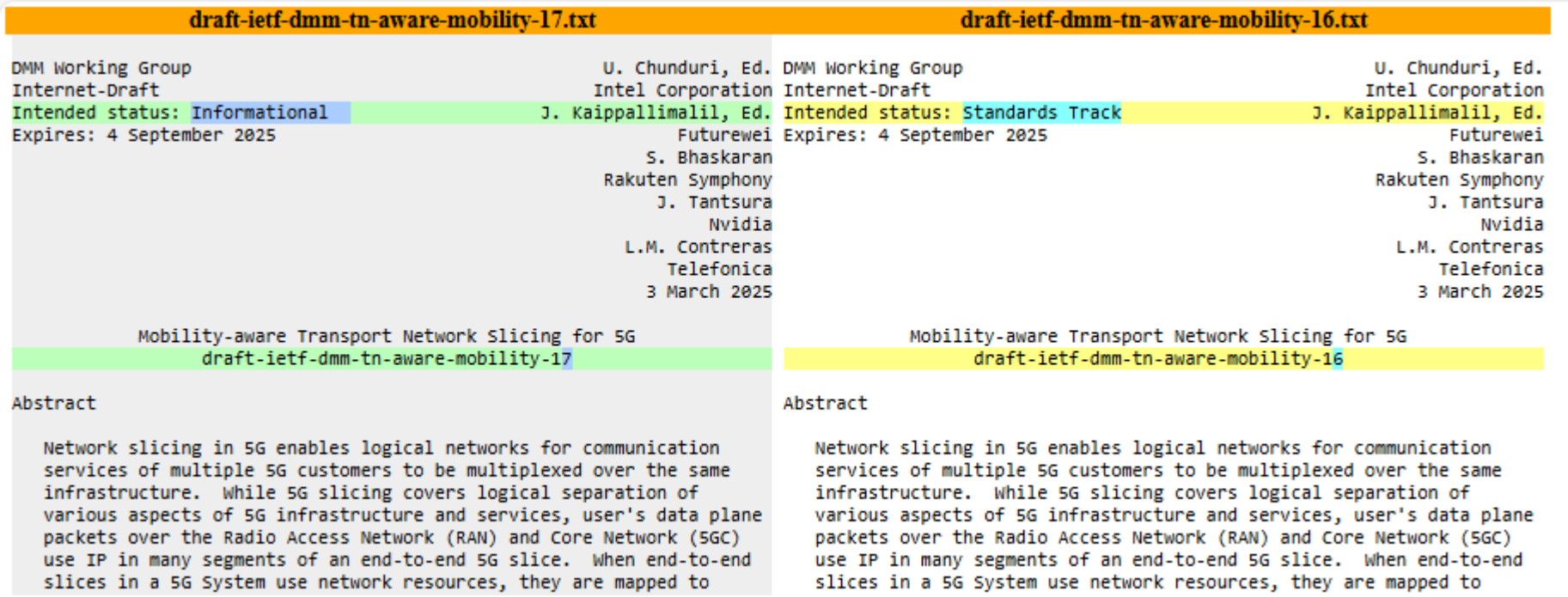
Mobility Aware Transport Network Slicing for 5G

draft-ietf-dmm-tn-aware-mobility-17

IETF 122 Bangkok, March 2025

Revised to Informational draft



draft-ietf-dmm-tn-aware-mobility-17.txt

DMM Working Group — Internet-Draft — Intended status: Informational — Expires: 4 September 2025

U. Chunduri, Ed. — Intel Corporation
J. Kaippallimalil, Ed. — Futurewei
S. Bhaskaran — Rakuten Symphony
J. Tantsura — Nvidia
L.M. Contreras — Telefonica
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Abstract

Network slicing in 5G enables logical networks for communication services of multiple 5G customers to be multiplexed over the same infrastructure. While 5G slicing covers logical separation of various aspects of 5G infrastructure and services, user's data plane packets over the Radio Access Network (RAN) and Core Network (5GC) use IP in many segments of an end-to-end 5G slice. When end-to-end slices in a 5G System use network resources, they are mapped to

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Abstract

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1st Change:

Comment: "status changed to STD from INFO.

It might be for some reason, i.e. namespaces allocation request to IANA. But XML NS and YANG parameters don't require STD status RFC. Is STD sufficient status instead of INFO?"

The reason for switching from INFO to STD was that in section 5, this draft added /extended YANG specification to support GTP-U/UDP. However, in offline discussion with the chairs I believe this is not needed and in version 17, the draft has reverted to INFO.

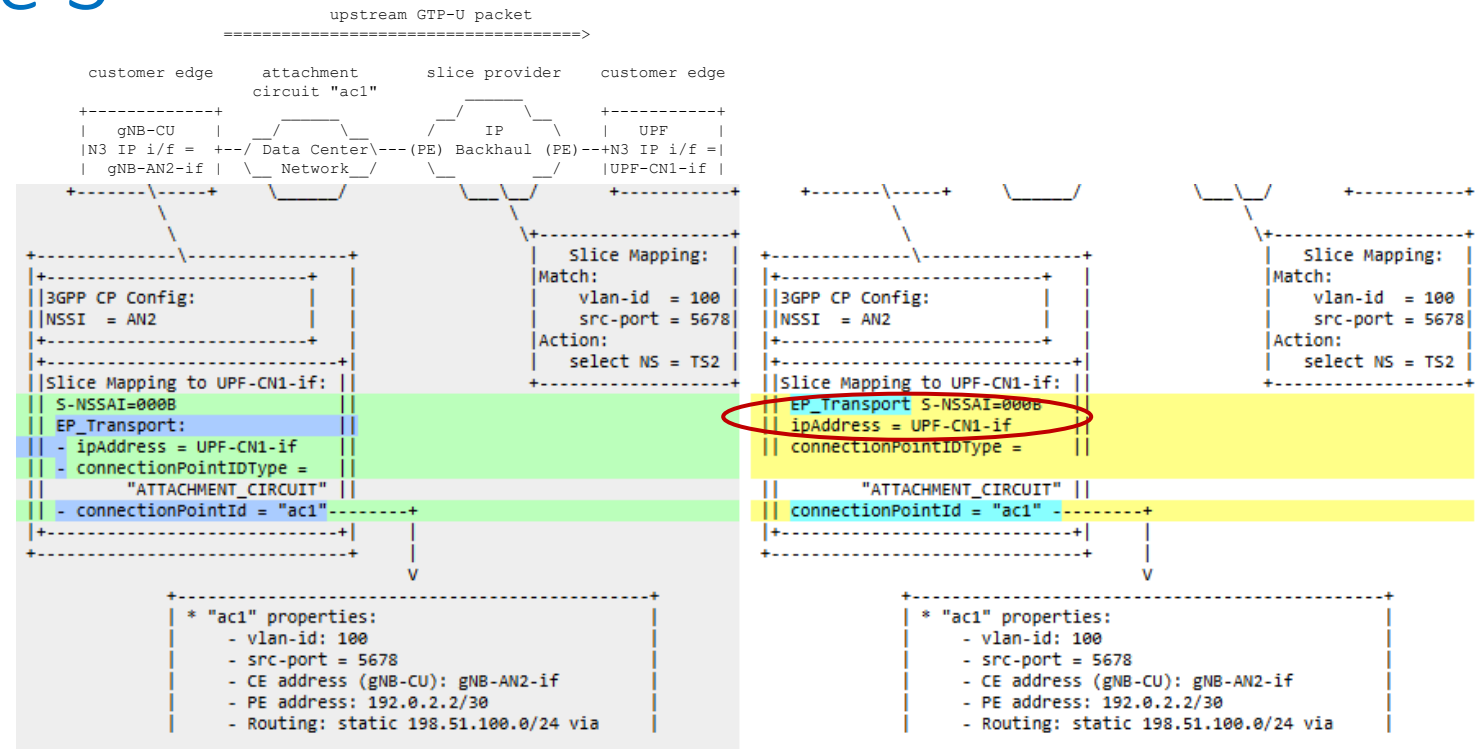
Revised S-NSSAI in Figure 3

2nd Change:

Comment: "Assumed information model In Fig.3, "EP_Transport" at gNB-CU includes S-NSSAI. But when I read TS28.549, the EP_Transport class doesn't include attributes regarding S-NSSAI. Does this draft refer to the correct spec in 3GPP to show how the slice mapping be made?"

TS 28.541 has configuration information for EP_Transport and the mapping to AC. However, we agree that S-NSSAI as shown in the figure (in old version/16) does not belong to EP_Transport.

This is now revised in the figure and accompanying text has been updated.



In this example, a GTP-U packet at gNB-CU (user plane) is from a UE session with S-NSSAI = 000B and to be forwarded to UPF-CN1 (i.e., as already setup by SMF during PDU session establishment). The associated 3GPP and IP transport network instances in the figure provide mapping to slice resources. The gNB-CU (UP) uses the slice mapping to "ac1" shown in Figure 3 when forwarding the GTP-U packet to UPF-CN1-if with source address of gNB-AN2-if and UDP source port number 5678 (GTP-U /UDP outer encapsulation source port). The slice mapping proposed in this document does not depend on VLANs, however, this example is to illustrate that the UDP mapping can be used in conjunction with other AC properties. The GTP-U packet is forwarded by the data center network to the PE router at IP backhaul network. The PE matches on VLAN ID of GTP-U packet and IP source port to select the provisioned slice (NS = TS2). The GTP-U packet is then forwarded to the UPF. For a downstream GTP-U packet, the UPF customer edge may similarly be attached to a PE and have similar slice configuration and mapping (details are not shown in the figure).

In this example, a GTP-U packet at gNB-CU (user plane) is from a UE session with S-NSSAI = 000B (and thus associated to 3GPP and IP transport network instances in the figure for providing slice resources). Since the GTP-U packet belongs to a session with S-NSSAI = 000B, the gNB-CU (UP) maps it to UDP port 5678 in the GTP-U header (outer encapsulation source port) and uses VLAN ID 100 based on the slice mapping to EP_Transport and "ac1" as shown in the figure. The slice mapping proposed in this document does not depend on VLANs, however, this example is to illustrate that the UDP mapping can be used in conjunction with other AC properties. The GTP-U packet is forwarded by the data center network to the PE router at IP backhaul network. The PE matches on VLAN ID of GTP-U packet and IP source port to select the provisioned slice (NS = TS2). The GTP-U packet is then forwarded to the UPF. For a downstream GTP-U packet, the UPF customer edge may similarly be attached to a PE and have similar slice configuration and mapping (details are not shown in the figure).

Update in 5.1 – Attachment Circuit Extension for UDP Tunnel

```
5.1.  Attachment Circuit Extension for UDP Tunnel

   Section 3.2 provided a description of how a GTP-U connection AC can
   be mapped using source address and port number to an IETF transport
   slice.  To facilitate slice capabilities within a provider network,
   the AC is a means to bind the slice service that is previously agreed
   between the customer (i.e., 3GPP network) and provider (i.e., IP
   network provider).  This section uses provisioning of attachment
   circuits described in [I-D.ietf-opsawg-teas-attachment-circuit] and
   extends it to support UDP tunnels - GTP and encapsulated GTP.  The
   attachment circuit structures below may be used or extended in future
   to support other UDP tunnels/capablities but is not in the scope of
   this document.

   The 'l3-service' and 'l3-tunnel-service' in the attachment circuits
   structure in [I-D.ietf-opsawg-teas-attachment-circuit] is used to
   configure the relevant layer 3 tunnel properties of a UDP tunnel AC.
   IPv4 and IPv6 properties of the UDP tunnel AC are provided in "ip-
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   module: ietf-ac-udpt
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```

3rd change:

Offline comment: - that it was not easy to find GTP specific content in the YANG model or its relation to section 3.2

Revised 5.1 to note that the ietf-ac-udpt is for UDP tunnels GTP and encapsulated GTP.
This may be enhanced in future for other Layer 3 bearers (GENEVE?, GRE?. ., etc.) but is not in the scope of this draft.

Add HDLLC slice type; Remove linkage to 5QI/DSCP

Proposed version 18 change A:

services that 5G systems provide. Slice types defined by the 3GPP include enhanced mobile broadband (eMBB) communications, ultra-reliable low latency communications (URLLC), massive internet of things (MIoT), vehicle-to-X (V2X), high-performance machine type communications (HMTC) and High Data rate and Low Latency Communications (HDLLC). Other slice types can be defined in future.

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Comment: - "Since your intension here is to list all the standardized SST values, there is a new one 'HDLLC' (High Data rate and Low Latency Communications) which you may consider including here."

Proposed version 18 change B:

[TS.29.281-3GPP]. Data in each user's PDU session is mapped to corresponding TN slices across N3/N9/F1-U interfaces based on the 5G slice requirements. Multiple UEs traffic (e.g., eMBB) at a location that have the same requirements may use a TN slice. 3GPP network functions (i.e., gNB-DU, gNB-CU and UPF) may however be distributed (e.g., across multiple data centers) and therefore require multiple TN slices across the respective interfaces. The TN PE does not consider 5QI in the DSCP or GTP-U header for mapping the 5G slice. Mapping a 3GPP slice to a TN slice using GTP-U (UDP) source port number is described in Section 3.2.

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Comment: - "The 5G network function takes the 5QI into consideration when selecting the GTP-U (UDP) source port number…
… This sentence is not of importance to the theme of the draft. So, you may consider removing it."

Summary

Thank you all for the detailed reviews.

- Revised to Informational draft.
- Revised S-NSSAI configuration details (and not part of EP_Transport in 3GPP TS 28.541).
- Clarified applicability of ietf-ac-udpt to UDP tunnels. Only GTP-U or encap GTP-U in this draft.
- Proposed in version 18: Add HDLLC slice type; Remove linkage to 5QI/DSCP.

Other comments?

Slice Configuration, section 2.4, Figure 2 (unchanged)

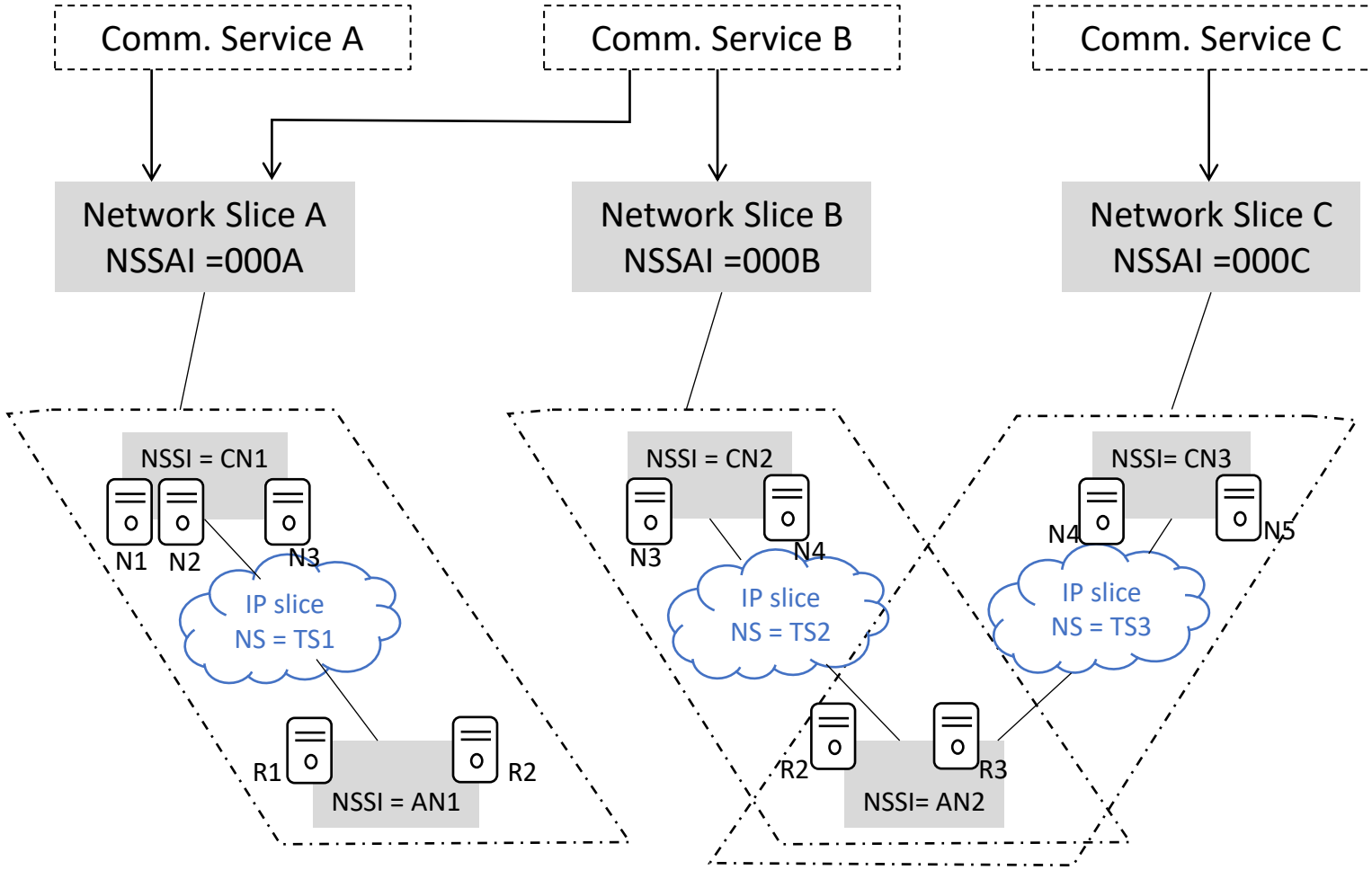

Figure and description in section 2.4 on 3GPP network slice structure and relation to IP network slice (IETF slice)

New: EP_Transport in 3GPP → ACaaS in IETF

3GPP TS 28.541

6.3.18 EP_Transport

The attribute "externalEndPointRefList" contains information required to identify associated model instances which reside outside of 3GPP MIB

6.3.18.2 Attributes

. . . externalEndPointRefList

6.4.1 Attribute Properties

externalEndPointRefList	This parameter is used to identify a list of connection point info(s).	Type: ConnectionPointInfo multiplicity: * isOrdered: False isUnique: False defaultValue: None isNullable: False

connectionPointId	This parameter specifies the identifier of a TN object.	type: String multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False
connectionPointIdType	This parameter specifies the type of the connection point identifier. Allowed values: VLAN, MPLS, SEGMENT, IPV4, IPV6, ATTACHMENT_CIRCUIT	type:ENUM multiplicity: 1 isOrdered: N/A isUnique: N/A defaultValue: None isNullable: False

IETF ACaaS

https://datatracker.ietf.org/doc/draft-ietf-opsawg-teas-attachment-circuit/

ACaaS Extension for UDP Tunnel /GTP-U

```
module: ietf-ac-udpt

     augment /ac-svc:attachment-circuits/ac-svc:ac/ac-svc:ip-connection
             /ac-svc:l3-service/ac-svc:l3-tunnel-service
             /ac-svc:l3-tunnel-service:

       +--rw (udp-port)?
          +--:(port-range-or-operator)
             +--rw source-port-range-or-operator
                +--rw (port-range-or-operator)?
                   +--:(range)
                   |  +--rw lower-port    inet:port-number
                   |  +--rw upper-port    inet:port-number
                   +--:(operator)
                      +--rw operator?     operator
                      +--rw port          inet:port-number


                      Figure 5: UDP Tunnel Yang Module
```