



A Realization of IETF Network Slices for 5G Networks Using Current IP/MPLS Technologies

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Overall Goal & Approach

- Main Goal
 - Assess to what extent IETF Network Slices can be implemented using ***current IP/MPLS technologies without requiring extensions***
 - ***Provide a reference*** to document approaches to deploy slices with such technologies
- Approach
 - Rather than generic claims, pick a slice deployment context and ***exemplify the assessment***
 - Pick 5G for the applicability assessment
 - Because 5G is an iconic slicing case

CAUTION

- We are using 5G terminology, specifically RAN/CN/TN, and slicing in the transport domain on purpose.
- Some of the key consumers of this document are mobile engineers, so we are using the terminology that they are familiar with
- Whenever we mention transport, it refers to IP/MPLS network, so transport slice refers to IETF Network Slice

What's in?

- Overview of 5G networking
- Different hand-off methods between RAN/CN and TN
- How to realize transport for 5G slices using currently available IP/MPLS technologies
 - Brownfield deployments
 - Aligning the 5G SLO deployment models with other SLO deployment models (business services, wholesale, ...) used typically at SP
- TN Slicing QoS models (5QI-unaware, 5QI-aware)
- Capacity planning/management

Different Mapping Options

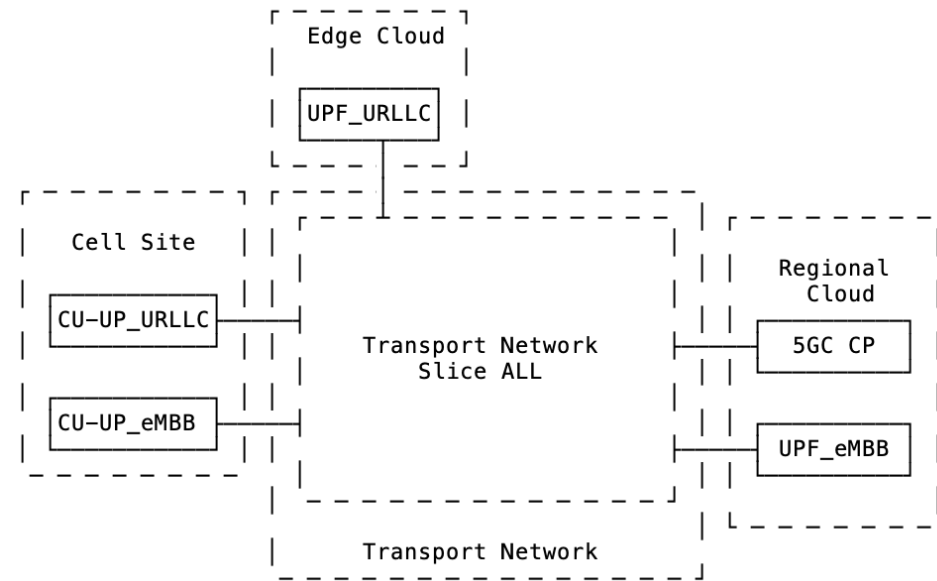
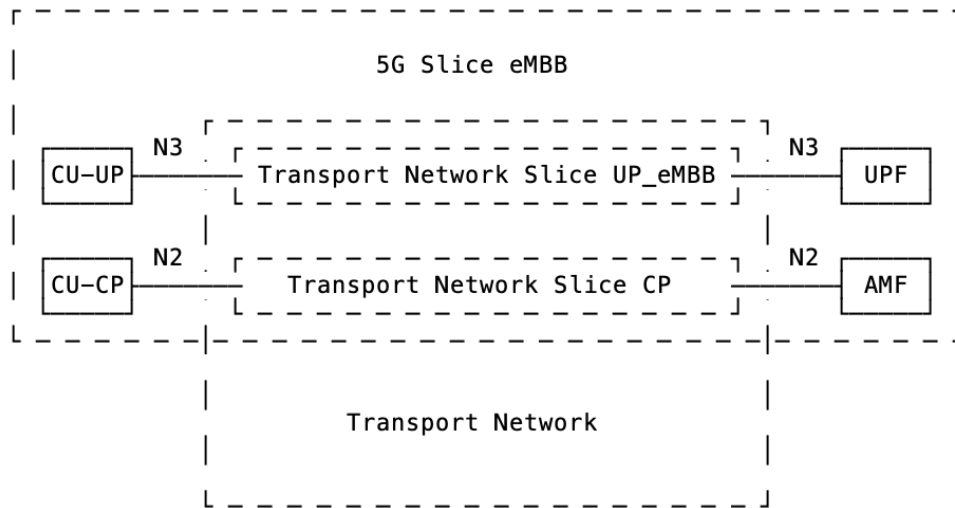


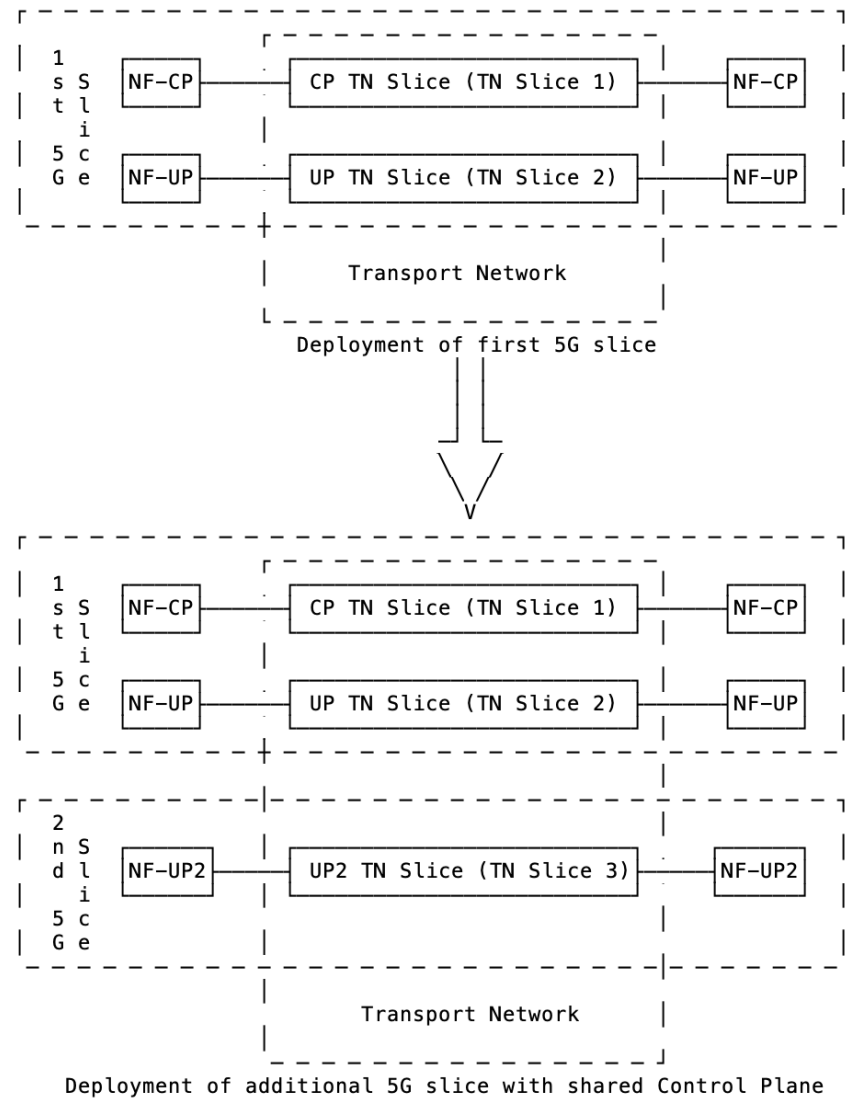
Figure 8: 1 (5G slice) to N (TN slice) mapping

Figure 9: N (5G slice) to 1 (TN slice) mapping

TN slice term is used as seen from 3GPP perspective

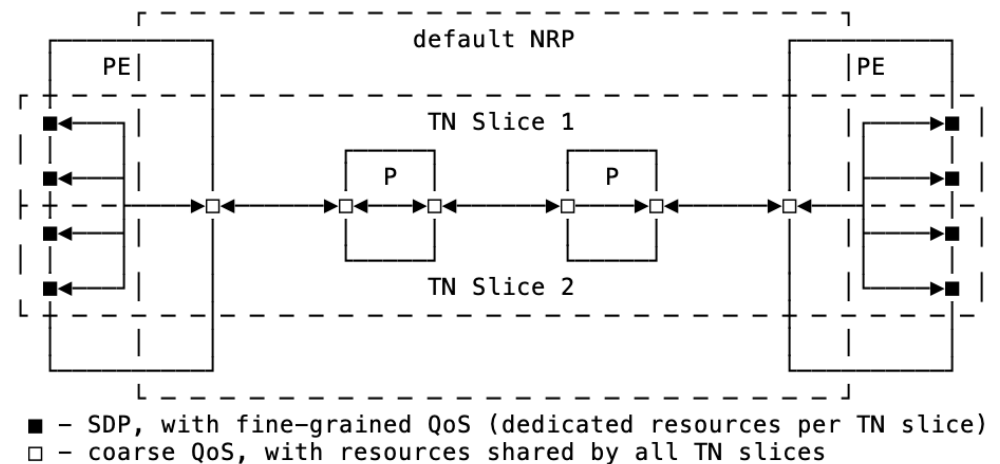
1st vs Subsequent 5G Slices

- 5G slices require connectivity for both CP and UP mobile core entities
- In many deployments, 5G CP uses shared slice for multiple 5G UP dedicated slices
- Thus, the creation of the "first slice" is subject to a specific logic since it must deploy both CP and UP

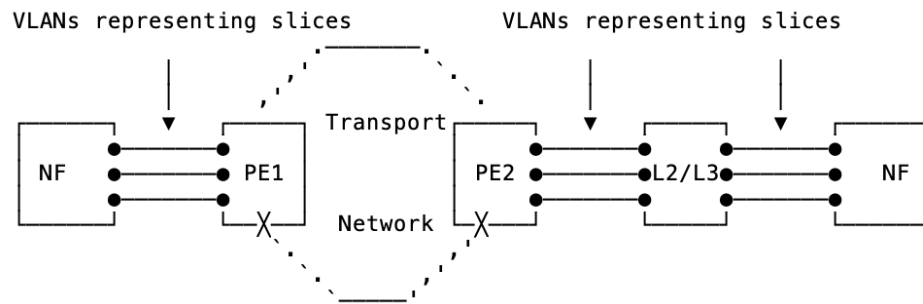


High-Level overview of the realization model

- Building blocks using existing IP/MPLS features
 - L2VPN/L3VPN for traffic separation
 - Fine-grained resource (admission) control at the TN edge links (attachment circuits)
 - Coarse resource control at the TN transit links
 - Capacity planning/management to secure isolation between slices

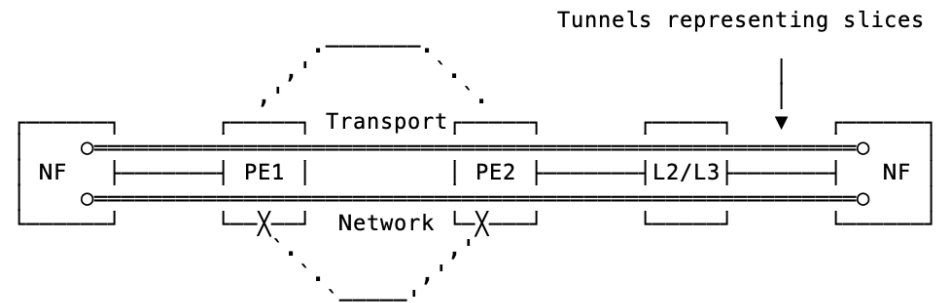


Different Hand-off Methods Between (extended) RAN/CN and TN domains



● – logical interface represented by VLAN on physical interface

Figure 12: 5G slice with VLAN hand-off

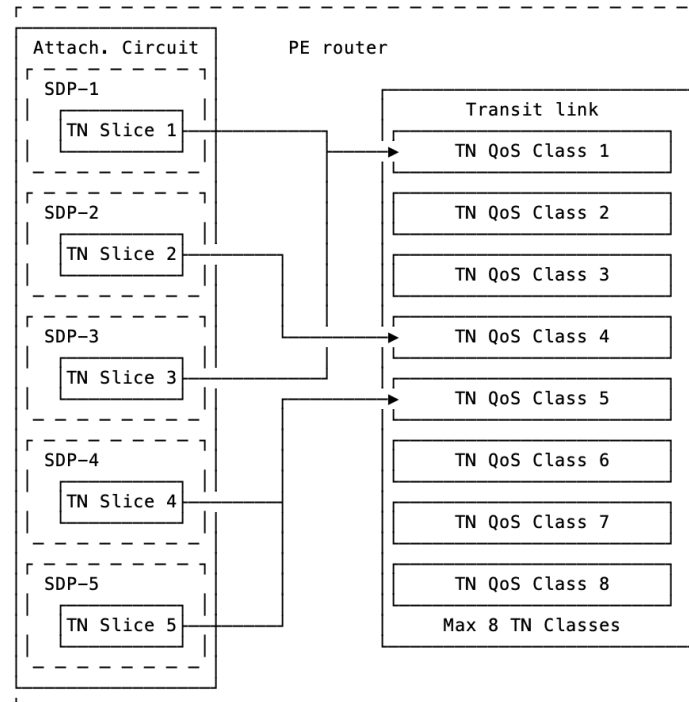


○ – virtual interface a la loopback (not associated with a VLAN) for tunnel (IPsec, GTP-U, ...) termination

Figure 13: 5G slice with IP hand-off

- IPv6 addresses might be allocated to loopback(s) in such a way, that part of the address (i.e. last 32 bits) equals to S-NSSAI

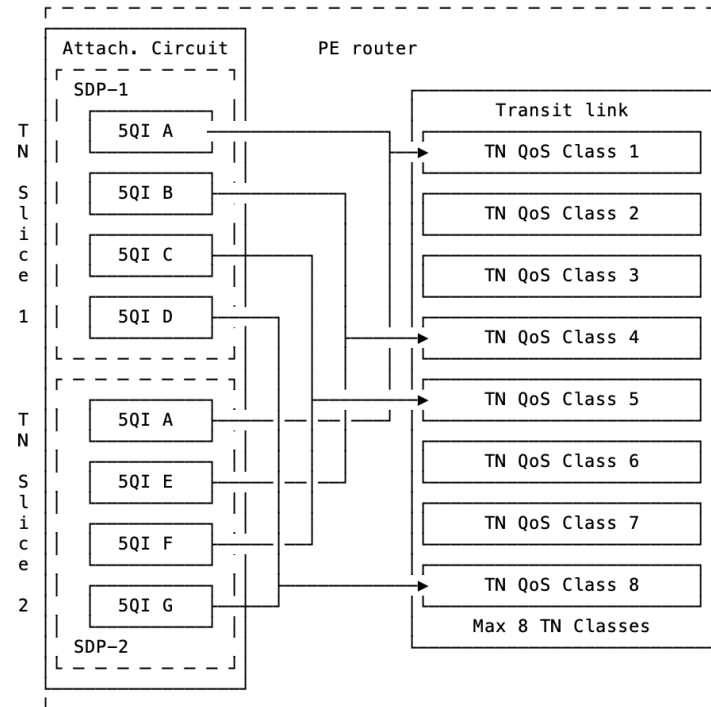
QoS Models: Mapping Examples



Fine-grained QoS enforcement
(dedicated resources per TN slice)

Coarse QoS enforcement
(resources shared by multiple TN slices)

5QI-unaware mode



Fine-grained QoS enforcement
(dedicated resources per TN slice)

Coarse QoS enforcement
(resources shared by multiple TN slices)

5QI-aware mode

Capacity Planning/Management

- Many schemes are considered:
 - Scheme 1: shortest path forwarding
 - Scheme 2: TE LSPs with fixed bandwidth reservations (static BW)
 - Scheme 3: TE LSPs without bandwidth reservations (dynamic BW)
 - Additional schemes can be considered (draft-ietf-teas-rfc3272bis)

Early Conclusions

- Existing IETF technologies provide good foundation for implementing 5G slicing in IETF domain
 - Subsequent revisions of this draft revisions will expand on it

Next Steps

- Does the WG think this is a useful effort?
- Comments and suggestions are welcome

- Any question?