Framework for End-to-End IETF Network Slicing
draft-li-teas-e2e-ietf-network-slicing-01
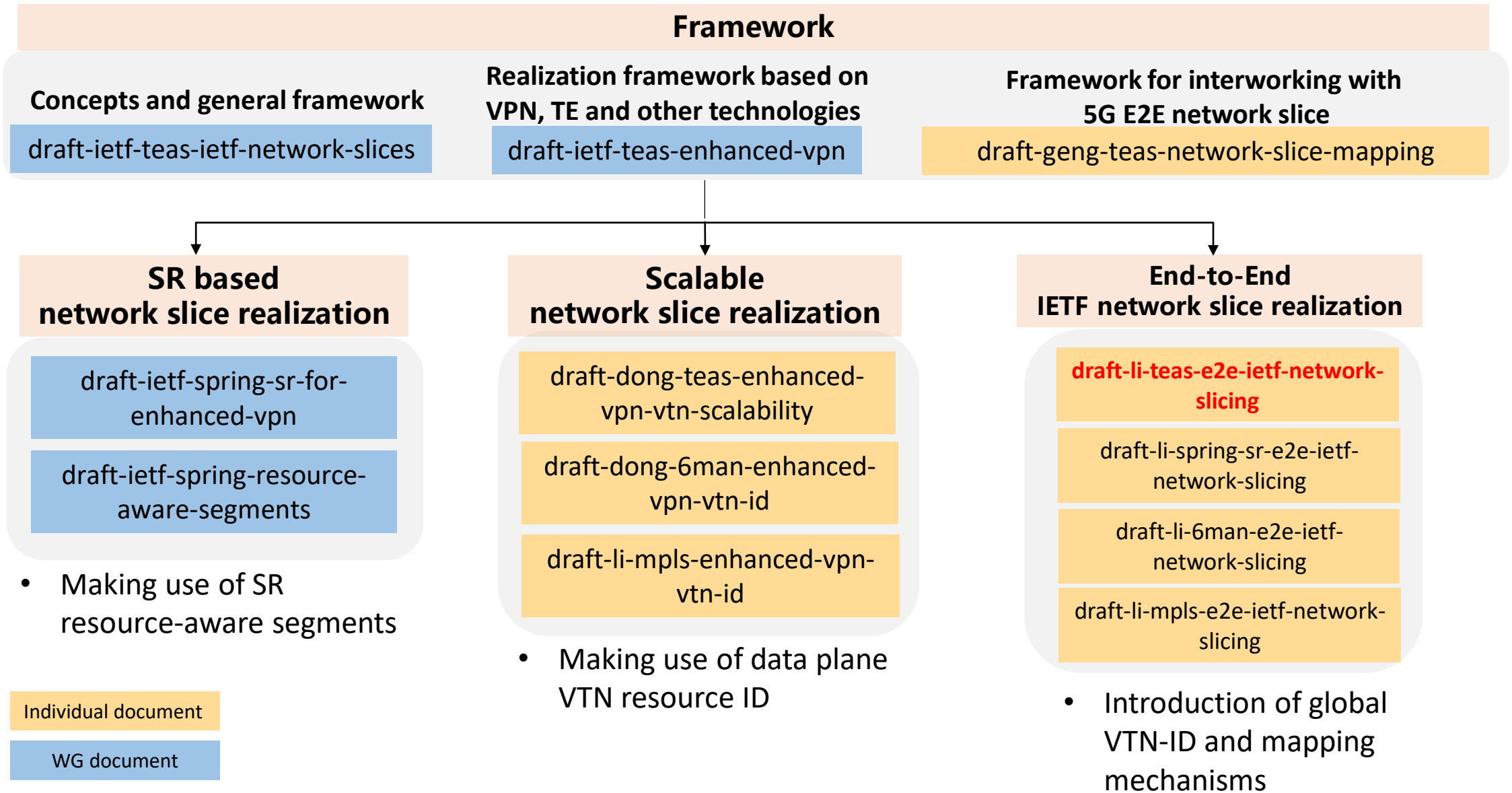
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Background

- Network slicing can be used to meet the connectivity and performance requirement of different services or customers in a shared network
  - draft-ietf-teas-ietf-network-slices defines the concepts and general framework of IETF network slice
- IETF network slices can be realized by mapping one or a group of overlay VPNs to an underlay VTN
  - The VPN+ framework is described in draft-ietf-teas-enhanced-vpn
  - SR based VPN+ mechanism is defined in draft-ietf-spring-sr-for-enhanced-vpn
- An end-to-end IETF network slice may span multiple network domains
  - In each domain, traffic of IETF network slice service is mapped to a local VTN
- This document describes the framework for realizing end-to-end IETF network slices.

IETF Network Slice Framework and VPN+/VTN Realization

Framework

Concepts and general framework

draft-ietf-teas-ietf-network-slices

Realization framework based on VPN, TE and other technologies

draft-ietf-teas-enhanced-vpn

Framework for interworking with 5G E2E network slice

draft-geng-teas-network-slice-mapping

SR based network slice realization

draft-ietf-spring-sr-for-enhanced-vpn

draft-ietf-spring-resource-aware-segments

- Making use of SR resource-aware segments

Scalable network slice realization

draft-dong-teas-enhanced-vpn-vtn-scalability

draft-dong-6man-enhanced-vpn-vtn-id

draft-li-mpls-enhanced-vpn-vtn-id

- Making use of data plane VTN resource ID

End-to-End IETF network slice realization

draft-li-teas-e2e-ietf-network-slicing

draft-li-spring-sr-e2e-ietf-network-slicing

draft-li-6man-e2e-ietf-network-slicing

draft-li-mpls-e2e-ietf-network-slicing

- Introduction of global VTN-ID and mapping mechanisms

Individual document

WG document

Framework of E2E IETF Network Slicing (1)

- The 5G end-to-end network slice is identified by the S-NSSAI (Single Network Slice Selection Assistance Information).

- In the transport network segment, the 5G network slice can be mapped to an IETF network slice, which can be realized with a multi-domain VPN+ service.

- In the underlay network, the multi-domain VPN+ service is supported by a multi-domain VTN, which is comprised by multiple intra-domain VTNs in different domains.
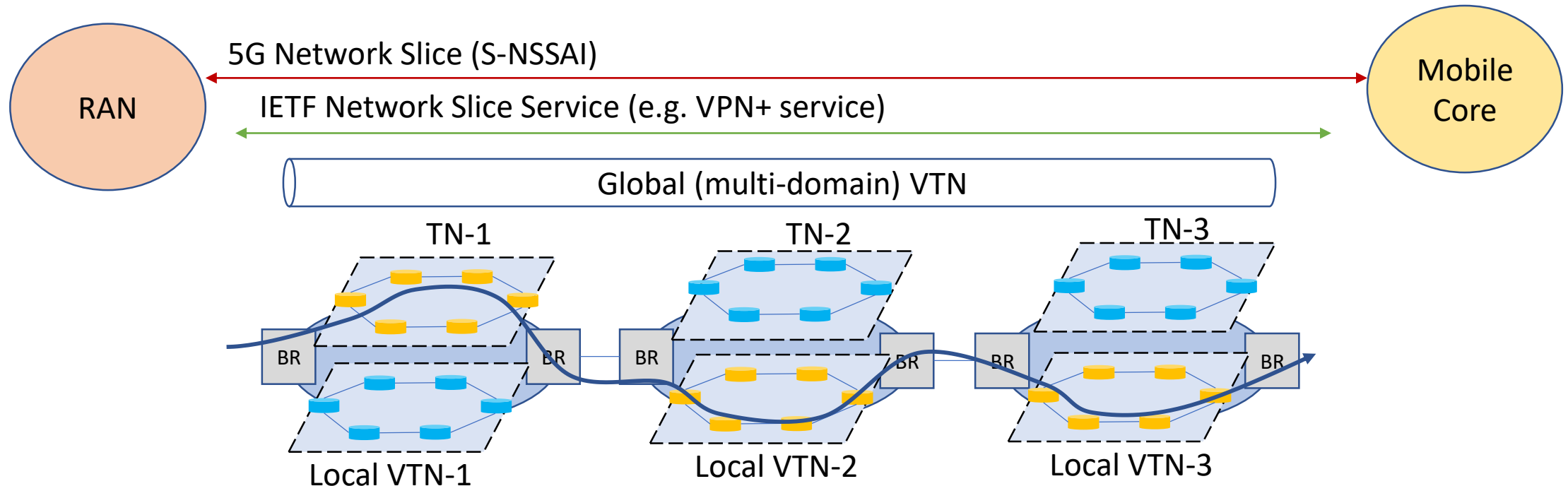
Framework of E2E IETF Network Slicing (2)

- **Local VTN ID:** In each domain, a local VTN-ID is carried in the packet to identify the set of network resource reserved for the VTN in the corresponding domain.

- **Global VTN ID:** In order to concatenate multiple local VTNs into a multi-domain VTN, the global VTN-ID can be carried in the packet, which is used by the network domain border routers to map to the local VTN-IDs in each domain.

- **5G end-to-end network slice ID (S-NSSAI):** In order to facilitate the network slice mapping between RAN, Core network and transport network, the S-NSSAI may be carried in the packet sent to the transport network, which can be used by the transport network to map the 5G end-to-end network slice to the corresponding IETF network slice.

- For the above network slice identifiers, the local VTN-ID is mandatory, the Global VTN-ID and the 5G S-NSSAI are optional. The existence of the Global VTN-ID depends on whether the VTN spans multiple network domains in the transport network. The existence of the 5G S-NSSAI depends on whether an IETF network slice is used as part of the 5G end-to-end network slice.

Requirements of E2E IETF Network Slicing

- Data Plane: To facilitate the mapping between 5G end-to-end network slice and IETF network slice, and the mapping between multi-domain IETF network slice and the intra-domain IETF network slice, different network slice related identifiers (e.g. S-NSSAI, Global VTN-ID, local VTN-ID) needs to be carried in the data plane.

- Management Plane/Control Plane
    - For multi-domain IETF network slice, a centralized IETF network slice controller is responsible for the allocation of the Global VTN-ID and the Local VTN-ID, and the provisioning of the mapping relationship of the Global VTN-ID and the Local VTN-IDs to the network edge nodes in different network domains.
    - For 5G end-to-end network slice, the edge node of transport network can derive the S-NSSAI from the packet sent by the RAN or Core network, and encapsulate it an outer packet header or tunnel information when traversing the transport network. The controller needs to be responsible for creating the mapping relationship and provisioning it to the edge nodes of the transport network.

Updates

- -00 version was submitted in April 2021.
- Updates of -01 version:
  - Refine the description of VPN+ and VTN in network slice realization
  - New co-authors are added: Ran Pang (China Unicom), Yongqing Zhu (China Telecom)
  - Editorial changes

Next-Step

- Align the terminologies according to the rough consensus in the WG

- Solicit comments and refine the draft

- Request for WG adoption

Thank You