

3GPP

# Discussion on New Rel-18 SID proposal: System Enabler for Service Function Chaining (SESFC)

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Date: 05/10/2021

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# Motivation

- Since Rel-15, 5G network supports traffic steering policy for enabling traffic steering to the N6-LAN, DN and/or DNAs associated with N6 traffic routing requirements provided by the AF.
- In Rel-18, SA1 miniWID: Service function chaining (SFChain) has been approved for the enhancement of service function chaining (SFC) for 5G networks in the following stage 1 specifications:
  - TS22.101 clause 30.1, TS22.261 clause 6.35, TS22.115 clause 5.2.14
- Considering stage 1 service requirements and different SFC deployments for 5G network including 5G core network and/or Edge Hosting Environment (EHE), this study proposed to investigate the architectural enhancements for enabling the 5G system support for the service function chaining.

# Justification (1/2)

- The following gaps are identified:
  - The definition of the service function chaining policy is needed for SFC processing in different SFC deployments, e.g. traffic classification/declassification, configure parameters of ordered service functions, and steer the traffic flow.
  - New northbound APIs for handling SFC processing are required for authorized AF to request a chain of service functions provided by the network operator.
  - For classifying traffic flows and applying SFC policy for SFC processing based on the request from the third parties and operator's policies, traffic detection functions with finer granularities are needed for the UPF with SFC capabilities. (Currently UPF is based on application ID and packet filter set for application detection and control).

# Justification (2/2)

- For continuing the SFC processing, some mechanisms and enhancement of the roaming interfaces are needed for UE mobility cases that result in the change of routing paths for user plane traffics requiring SFC including:
  - Upon UE moves within the same operator's network.
  - Upon UE moves with the changes of operator's networks.
- For handling SFC processing in different SFC deployments based on SFC policy, the SBA enhancement will be needed for some NFs and their services, e.g. PCF, NEF, UPF, SMF, etc., as well as the corresponding interfaces and procedures.

# Objective

- Considering different SFC deployments for the 5G network including 5G core network and/or Edge Hosting Environment and investigating the required coordination between the 5G Network and the Edge Hosting Environment for SFC processing.
- Providing a definition of SFC policies for the 5G network to classify/declassify traffic, configure parameters of SFC, e.g. service functions, and steer the traffic to a chain of ordered service functions for SFC processing based on operator's service function chaining policies and service level agreement with the third party.
- Enabling northbound APIs for allowing an AF to request network capability exposure functionalities, e.g. create/update/delete an SFC policy, monitoring and reporting status of the SFC processing, etc.
- Providing finer granularities of traffic detection functionalities to enable SFC policies enforcement and SFC processing based on the AF request and operator's policies. The traffic detection functionalities enable the UPF to identify traffic with enough granularity for the UPF to determine, on a per application basis, whether and how to steer a given piece of traffic.
- Identifying service-based architecture enhancement for NFs and their services for efficient configuration/provisioning/enforcing of SFC policies. For example:
  - Enabling flexible SFC configuration in UPF with SFC capabilities supporting different SFs for a PDU session when requiring different SFC processing for applications.
  - Enabling efficient interactions between UPF with SFC capabilities and other NFs for provisioning, enforcing SFC policies as well as controlling, monitoring, or reporting status of SFC processing.
- Investigating solutions for applying the same SFC policies to a UE when the UE moves and results in the traffic routing path changes for SFC processing in different SFC deployments scenarios.

**TU plan: estimate 8 TU (6 TUs for study and 2 TU for normative)**

# Backup Slides

- TS22.261 clause 6.35
- Challenges and example of Use Cases

# Rel-18 Stage 1 service requirements (TS 22.261)

## General:

A service function chain for 5G networks contains service functions such as firewall functions, NAT, antimalware, parental control, DDoS protection, TCP proxies, load balancers, KPI monitoring, and video optimization, etc.

NOTE: these are non-exhaustive examples of service functions. Other service functions can be provided by an operator.

- 001: The network operator shall be able to define and modify service function chaining policies for steering traffic on per application per UE basis through required service function chaining with ordered service functions to improve the user's QoE.
- 002: Service function chaining policies shall be able to distinguish between upstream and downstream traffic.
- 003: The coexistence of traffic with and without service function chaining shall be supported.
- 004: Service function chaining shall provide suitable means for authorized third parties to request a chain of service functions provided by the network operator based on operator's service function chaining policies.
- 005: In case of roaming, the HPLMN shall be able to apply traffic steering policies and service function chaining policies for home routed traffic.
- 006: In case of roaming with local breakout, the HPLMN shall be able to provide the traffic steering policies and service function chaining policies to the VPLMN providing local breakout with support of service function chaining.
- 007: Service function chaining shall support deployments where the Hosted Services are provided by the operator and deployments where the Hosted Services are provided by a third party.

## Service Function Management

- 008: The service function management shall allow the operator to create, modify, and delete a service function based on operator's service function chaining policies.
- 009: The service function management shall allow the operator to create, configure, and control a chain of service functions per application and its users on per UE basis based on operator's policy or request from third parties.
- 010: The service function management shall be able to manage service function chaining for deployments where the Hosted Services are provided by the operator and for deployments where the Hosted Services are provided by a third party.

## Charging Aspect

- 011: For service function chaining (see clause X) the collection of charging information associated to the use of service functions and the chain of service functions requested by third parties shall be supported.

# Challenges (S1-203161)

## 1. Potential interoperability issues:

- due to lack of consolidated network resource management of service chaining between 5GS and N6-LAN even within the mobile network of the same network operator, which results in uncoordinated and inefficient service function path settings for routing the E2E service with desired service functions;

## 2. Unexpected Latency in every hop of N6-LAN:

- due to lose control over the chained service functions in N6-LAN, which results in difficulties to achieve the latency requirement for some services targeting at ultra-reliable low-latency. For example, interactive AR/VR gaming, remote control of UAV, Audio-Visual Service Production, industrial automation, critical medical applications, self-driving vehicles, etc.

## 3. Compromised service experiences to the users requiring same service functions:

- upon UE moves between HPLMN and VPLMN, or between HPLMN and NPN.

## 4. Limitation on provisioning versatile vertical services:

- in different networks and services deployment scenarios and in fulfilling required KPIs for the services.

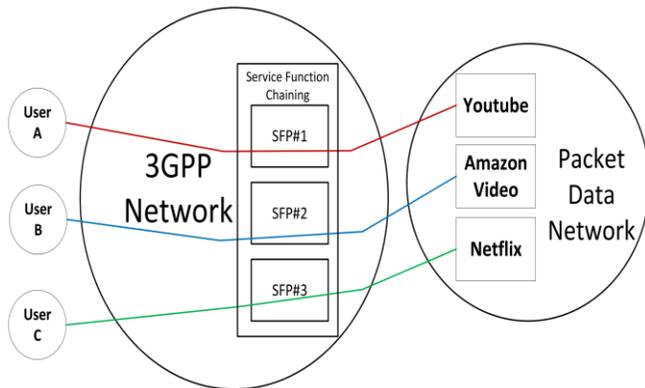
## 5. Missing consideration of many advanced features in 5G network

- network slicing, network function virtualization, non-public network, and edge computing, etc.

# Examples of Use Cases (S1-203161)

## Use Case1: Streaming video service

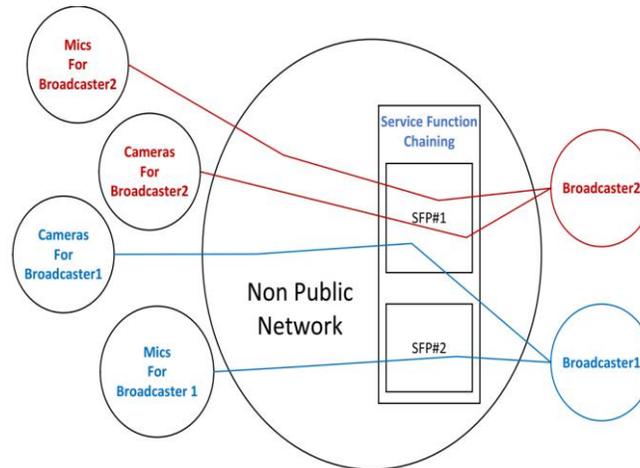
- Different content providers may need different service functions for video optimization and security functions based on user's subscription, network service subscription, etc.
- Currently, each content providers may deploy and configure their N6-LANs or provide the configuration of N6-LAN to network provider as part of service agreement.



With SFC service enabled in 5GS, the network operators can provision service function chaining services in 5G network to content providers

## Use Case2: AVPROD

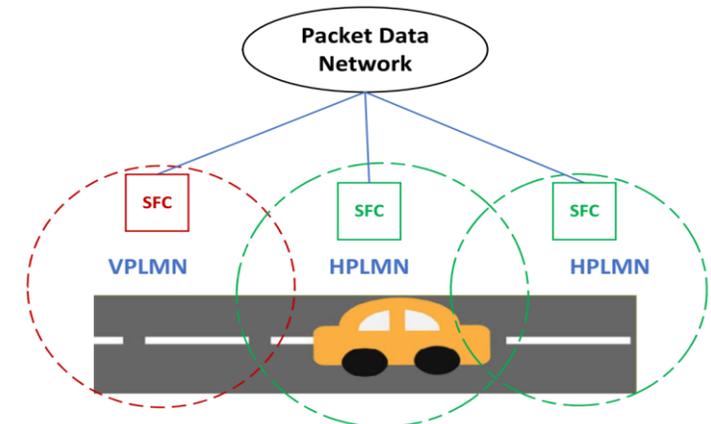
- Different broadcasters may need different service functions for their on-site 5G devices, e.g. camera and mics.
- Currently, each broadcasters need to manually configure their N6-LAN or provide the configuration of N6-LAN to NPN provider as part of service agreement.



With SFC service enabled at NPN, the network provider can exposure service function chaining service to third parties and allow them to configure required service function paths for their devices.

## Use Case 3: V2X services

- For V2X services, when a vehicle moves in its HPLMN or across different roaming networks, it is important that the same service functions, e.g. TCP proxies, transcoders, firewall, etc., are provided, configured, and managed by the 5G networks, e.g. TR22.886 clause 5.27.6: Support of automated driving in multi-PLMN environments.
- Currently, 5G network supports only home routed traffic steering.



With SFC service enabled in 5GS, it becomes possible to provision V2X services with consistent carrier grade performance in 5GS.

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