**SA WG2 Meeting #13S2-20xxxxx**

**Source: Apple**

**Title: Solution of Key Issue #3: Limitation of data rate per network slice in UL and DL per UE**

**Document for: Approval**

**Agenda Item: X.X**

**Work Item / Release: FS\_eNS\_Ph2 / Rel-17**

*Abstract: This contribution proposes a solution for Key Issue # 3 – Limitation of data rate per network slice in UL and DL per UE in TR 23.700-40.*

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Key issue #3 is about to study whether and how to limit the data rate of UE for a Network Slice, ensuring that the aggregate of the PDU sessions that use the slice are rate limited to the rate defined for the Network Slice in DL and UL.

*START of CHANGE (All text is new)*

## 6.X Solution #X: Limitation of data rate per network slice in UL and DL per UE without RAN involvement

### 6.X.1 Introduction

This solution addresses the Key Issue #3: limitation of data rate per network slice in UL and DL per UE.

It is based on the assumption that the data rate limit per network slice in UL and DL per UE, defined as Slice AMBR per UE, is stored in the UDM and can be retrieved by other NFs when needed.

### 6.X.2 High-level Description

In this solution, the enforcement happens each time when a new PDU Session associated with the network slice is established. The Slice AMBR per UE in UL and DL is compared with the accumulated Session AMBR across all the established PDU sessions associated with the same network slice per UE and the new PDU session to be established. If the accumulated Session AMBR exceeds the Slice AMBR per UE in either UL or DL:

Option 1: The PDU Session establishment shall be rejected; or

Option 2: Session AMBR for the new PDU session shall be capped such that accumulated Session AMBR across all the established PDU sessions associated with the same network slice per UE and the new PDU session does not exceed the Slice AMBR per UE.

In this solution, the actual active flow bit rate is not considered at any moment. This solution does not require any RAN or UE impacts.

### 6.X.3 Procedures

Since a network slice may include multiple PDU Sessions per UE, and different SMFs and UPFs may be selected to serve different PDU Sessions involved in a slice, a single UPF alone may not able to enforce the Slice AMBR per UE.

This solution proposes the AMF to enforce the Slice AMBR per UE comparison with accumulated Session AMBR across all established PDU sessions for the UE associated with the slice. The following changes to the existing procedures are necessary:



Figure 6.X.3-1: TS 23.502 Figure 4.2.2.2.2-1 Registration procedure

1. Step 14a-c: In addition to the existing registration procedure defined in 3GPP TS 23.502 [6] Figure 4.2.2.2.2-1, AMF shall retrieve the Slice AMBR per UE for all subscribed NSSAIs from UDM in step 14.



Step 4.a

Figure 6.X.3-2: TS 23.502 Figure 4.3.2.2.1-1 UE-requested PDU Session Establishment for non-roaming and roaming with local breakout

4a. Between step 4 and 5 as defined in 23.502 [6] Figure 4.3.2.2.1-1 during PDU Session establishment procedure, SMF shall send the Session-AMBR to AMF. AMF accumulates Session AMBR across all the established PDU sessions associated with the same slice for the UE as well as from the new PDU session to be established. AMF shall compare the accumulated Session AMBR with the Slice AMBR per UE. If the accumulated Session AMBR exceeds the Slice AMBR per UE, AMF shall indicate this back to SMF. SMF may decide either to:

**-** Reject the ongoing PDU Session establishment procedure; or

**-** Cap the Session AMBR for the new PDU session such that accumulated Session AMBR across all the established PDU sessions associated with the same network slice per UE and the new PDU session does not exceed the Slice AMBR per UE.

### 6.X.4 Impacts on existing entities and interfaces

**UDM:** Store the Slice AMBR value for all the subscribed NSSAIs per UE. Provide this information to AMF.

**AMF:** Retrieve the Slice AMBR per UE value from UDM during Registration procedure. Interacts with each SMF to indicate whether a new PDU session to be established will cause the Slice AMBR to be exceeded.

**SMF:** According to the indication from AMF,SMF may decide either to reject the PDU Session establishment procedure or to cap the Session AMBR for the PDU Session.

### 6.X.5 Evaluation

Editor's note: This clause provides an evaluation of the solution.