**SA WG2 Meeting #140 S2-2005736**

**19 August - 02 September 2020**

**Source: Nokia, Nokia Shanghai Bell**

**Title: KI #2: Evaluation and conclusion**

**Document for: Discussion/Approval**

**Agenda Item: 8.5**

**Work Item / Release: FS\_IIoT / Rel-17**

*Abstract of the contribution: This contribution gives the evaluations for the solutions of KI#2 and proposes the conclusion for KI#2.*

# 1 Discussion

This contribution proposes conclusions and way forward for Key Issue #2 for UE-UE TSC communication.

## 5.2 Key Issue #2: UE-UE TSC communication

### 5.2.1 Description

This Key issue aims to address UE-UE TSC communication if the network determines that the two UE(s) (including two DS-TT(s) within the same UE) are served by the same UPF.



Figure 5.1.1: UE-UE TSC communication

NOTE: In the above figure, the two UEs can be served by a single NG-AN node or two different NG-AN nodes.

For this Key Issue the following areas should be studied:

1. How the 5GS know the UE/DS-TT pairs which can perform UE-UE communication?

2. 5G System bridge delay determination considering UE-UE communication via same UPF.

a. How does the 5GS know whether to report the Bridge delay information for the port pair of two DS-TTs.

b. How does the 5GS calculate and report the Bridge delay information for the port pair of two DS-TTs.

3. Configuration of Deterministic QoS for the QoS Flows of the two UEs served by the same UPF.

a. The impact on the derivation and provision of QoS parameters and TSCAI in this scenario, if any.

Comparison between the solutions of KI #2 is provided in the following table:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Bullet point 1** | **Bullet point 2** | | | **Bullet point 3** | | |
|  | *Decision of DS-TT pairs* | *How 5GS reports the bridge delay per port pair* | *Bridge delay determination* | *TSCAI determination* | *Scope* | *Division of UE-UE communication* | *Correlation of deterministic QoS for UE-UE communications* |
| **Sol #2: Handling of UE to UE communication** | AF determines all available port pairs (including the port pair of two DS-TTs) | AF reports all potential ports after the PCF forwards the PMIC (in the PDU Session Modification Request the UE initiates) (route AMF – SMF -PCF - AF) | Determined at the AF as:  UE-DS-TT Residence Time for Port\_1 + PDB for PDU Sesion\_1 + UE-DS-TT Residence Time for Port\_2 + PDB for PDU Session\_2 | SMF calculates TSCAI as R16 mechanism | TSN | AF derives TSN QoS requirements based on TSN 802.1Qbv and PFSP | AF associates PDU Session 1 and PDU Session 2 using the TSN traffic forwarding information for the egress port and PFSP for ingress port |
| **Sol #3: UE-UE TSC communication with VN group** | SMF determines the port pair of two DS-TTs based on R16 5G VN group information  TSN AF determines the port pair of two DS-TTs based on R16 5G VN group information | After PDU Session establishment for a UE, the SMF updates the SM policy association with the PCF. The PCF reports the event to the TSN AF | Determined at the TSN AF | SMF calculates UL and DL during streams establishment | TSN | TSN AF derives TSN QoS requirements based on Traffic Forwarding information | TSN AF determines the two PDU Sessions using Traffic Forwarding information and 5G VN group information  SMF determines local switched forwarding rules on the UPF using PCC rules of the two ports of the same 5G VN group |
| **Sol #4: Deterministic QoS for UE-UE TSC communication** | SMF determines the port pair of two DS-TTs based on traffic description and PDU Session attributes or the TSN AF determines all available port combinations for the same TSN domain | After UE’s PDU Session Establishment/Modification, the SMF reports port pair to the TSN AF via PCF | Determined at the TSN AF  UE-DS-TT-1 residence time, PDB of QoS Flow-1, PDB of QoS Flow-2, and UE-DS-TT-2 residence time | SMF | TSC or TSN | AF or PCF together with SMF | PCF together with SMF based on UEs and AF requests |
| **Sol #10: UE-UE communication based on generalized Ethernet model** | Not specified | Not specified | Not specified | Not specified | TSN | Not specified | Not specified |
| **Sol #11: UPF triggered UE-UE TSC communication** | UPF determines port pair using the destination port number the UE includes within the PDU Session establishment | After PDU Session establishment for UE1 and UE2, SMF forwards the port pair (using UPF recomendations) and bridge information to AF via PCF/NEF | Determined at the TSN AF  UE1-DT-TT residence time + PDB of PDU session (1)] + [UE2-DS-TT residence time + PDB of PDU session (2) | TSN AF | TSN | AF derives QoS for the UL and DL links for UE-UE communications | AF determines PDU Session 1 and PDU Session 2 |
| **Sol #12: The bridge U-Plane model for UE-UE communication** | The solution can work with sol#2, sol#3, and sol#4 | | | | | | |

**Comparison of impacts:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **UE** | **UPF/NW-TT** | **SMF** | **PCF** | **AF (or TSN AF)** |
| **Sol #2** | No impacts | No impacts | No impacts | No impacts | Deduce all potential port pairs.  Derive TSN QoS parameters per PDU Session |
| **Sol #3** | No impacts | No impacts | In case SMF maintains the 5G VN Group information, the SMF determines the port pairs and reports to the AF via PCF | No impacts | In case AF maintains the 5G VN Group information, the AF determines the port pairs.  Derive TSN QoS parameters per PDU Session |
| **Sol #4** | No impacts | Detection of UE-UE traffic inspecting u-plane traffic and notification to SMF | Detection of UE-UE traffic using a) PDU Session attributes and packet filters from UEs requests, b) PCF indication within the PCC rules, and/or c) UPF reports of UE-UE peers. | Detection of UE-UE communication using a) UPF reports of UE-UE peers, b) correlating several AF requests or UEs (PDU Session attributes and packet filters).  Determination of UE-UE QoS parameters from E2E requirements | Derive TSN QoS parameters per PDU Session for TSN case.  Provides E2E or per PDU Session TSC QoS requeriments |
| **Sol #10** | No impacts | Extension of the static forwarding rules of the NW-TT for any two ports.  NW-TT the bridging function between logical ports and PDU Sessions (no need to extend PDRs) | No impacts | No impacts | No impacts |
| **Sol #11** | UEs include the destination address within the PDU Session Establishment request.  UEs can provide port pair suggestions during PDU Session establishment | UPF determines port pair | Reports UPF’s port pair suggestions to the AF via PCF | No impacts | Derive TSN QoS parameters per PDU Session |
| **Sol #12** | Same as sol#2, sol#3, or sol#4 | Introduces a forwarding process (FP) in the NW-TT to determine the forwarding of the packet | Same as sol#2, sol#3, or sol#4 | | |

# 2 Proposal

The following change is proposed for TR 23.700-20.

\* \* \* \* First change \* \* \* \*

## 7.X Key Issue #2: UE-UE TSC communication

Editor's note: This clause will provide a general evaluation and comparison of the solutions per Key Issue #2.

Solution #2 supports AF based on the collected port's DS-TT information, UE-DS-TT residence time, PDB, the AF calculate bridge delay for all port pairs. For QoS mapping, the AF can associate the egress port with ingress port (the two PDU Sessions) using static filtering entry for egress port and PFSP for ingress port. The solution does not rely on 5G VN mechanism.

Solution #3 supports the 5GS knowing the UE/DS-TT pairs which can perform the UE-UE TSC communication under condition that UEs/DS-TT pairs belong to the same 5G VN. SMF and optionally the AF can know the VN group information. SMF will pair the UEs and report the port pair numbers to the TSN AF. TSN AF determines UE-UE communications and divides the flow into two PDU Sessions.

Solution #4 supports the SMF determining the port pair of two DS-TTs based on traffic description and PDU Session attributes or the TSN AF determines all available port combinations for the same TSN domain. UE-UE TSC communications can be identified at the SMF or PCF using UPF reported UE-UE peers inspecting user plane traffic. The PCF coordinates the configuration of the QoS parameters for the UE(s) considering UE-UE TSC communication based on QoS requirements and traffic desciption information provided by the AF (or TSN AF) or UEs and/or dynamic policies. The solution does not rely on 5G VN mechanism.

Solution #10 supports UE-UE communication based on generalized Ethernet model. The CNC can configure static forwarding rules into the bridging function within the NW-TT not only in the uplink direction from a UE to the NW-TT ports, but also between any two ports. The NW-TT binds the port to the given PDU Session.

Solution #11 supports UPF triggered UE-UE TSC communication. The UPF provides the port-pair recommendation to the TSN AF via SMF and PCF.

Solution #12 supports a unified u-plane forwarding architecture. The Forwarding Process (FP) is introduced in the NW-TT and all UL/DL traffic is sent to the FP. This solution can work with solutions #2, #3, and #4

\* \* \* \* Second change \* \* \* \*

## 8.2 Key Issue #2: UE-UE TSC communication

Editor's note: This clause will capture conclusions for Key Issue #2.

The following is taken as the basis for the way forward:

- TSN AF or any AF provides information (e.g. QoS requirements such as delay, burst size, periodicity, burst arrival time) about a UE-UE TSC stream.

- TSN AF or any AF sends the request separately for talker (uplink traffic) and listeners (downlink traffic).

* SMF and/or PCF identify that UE-UE routing is performed based on UPF reporting. UE reports the Session ID of the target UE when it performs local switching for routing traffic from source UE to target UE.
* The PCF may determine a different QoS configuration per PDU Session considering the E2E TSC requirement, UEs’ connectivity status, and AF request(s).
* The SMF determines the forwading process (e.g. N4 rules or rely on UPF implementation) for the UE-UE TSC traffic using the UEs PDU Session attributes, the TSC PDU service type, and traffic filtering information.