**3GPP TSG-WG SA2 Meeting #152E e-meeting *S2-2205737***

**Elbonia, August 17 – 26, 2022 (revision of S2-2205737)**

**Source: Huawei, HiSilicon**

**Title: Update of solution #19: Support for controlling 5G time synchronization service based on subscription**

**Document for: Approval**

**Agenda Item: 9.7**

**Work Item / Release: FS\_5TRS\_URLLC / Rel-18**

# 1. Discussion

In SA2#151e, Solution #19 has been proposed to address KI#3 for controlling 5G time synchronization service based on subscription. This document provides further update of Solution#19. The main update of the document is to give more details about time service parameters in the UE subscription data.

# 2. Text proposal

It is proposed to capture the following changes vs. TR 23.700-25:

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

## 6.19 Solution 19: Support for controlling 5G time synchronization service based on subscription

### 6.19.1 Introduction

The solution enables the operator to control time synchronization service based on UE subscription for time critical services management.

### 6.19.2 General description

The following assumptions are made:

- For specific UEs which the holdover capability is not supported or supported badly, the operator should provide them reference time information continuously.

- UE subscription should be taken into account when TSCTSF chooses a time information provider in 5GS. The subscription data may include time synchronization enable parameters or timing resiliency services parameters. According to the subscription data, TSCTSF can determinate whether and which timing source to provide timing synchronization service.

- UEs get time synchronization service by receiving 5GS access stratum time or time-synchronized UPF/NW-TT. 5G GM may have different sources of time/frequency like GNSS signal, Synchronous Ethernet (Sync E), PTP transport network, PPS input, etc. Besides, 5G GM may collocate with UPF or RAN, not limited with the deployment.

Following are the principles for the solution:

- In order to provide continuous time synchronization service for targeted UEs, 5GC should be informed if the time synchronization status of those UEs change. The time status changes can be resulted from some unexpected cases, e.g. time sources failure or UE mobility.

- The AF could send a request to TSCTSF (directly or via NEF) to control the (g)PTP time synchronization service and may target to a set of AF-sessions with a UE or multiple UE(s). In addition, the AF may request time synchronization distribution method, such as a Boundary Clock, peer-to-peer Transparent Clock, or end-to-end Transparent Clock or as s PTP relay instance. For all the AF-request, TSCTSF should check targeted UE(s) subscription data from the UDM first before it invokes time synchronization service. If necessary, the SMF would check the per UE subscription data again when PDU session establishment.

- The AF may request to use the 5G access stratum timing information for UE(s) or the attached DS-TT(s). When TSCTSF receives the request, it should get the targeted UE subscription data from the UDM to authorize the request. If needed, the AMF is responsible to check the per UE subscription data when it controls 5G-AN to provide 5G access stratum timing information.

- A trusted AF can request a stringent/resilient time synchronization service for targeted UEs or DS-TTs if the UEs subscription supports.

. Time service parameters can be included in the UE subscription data:

1. Authorized time synchronization method: access stratum, gPTP, or both;
2. One or multiple authorized Uu error budget: e.g. 1us, 250ns, or other values. Multiple authorized Uu error budgets allows 5G network to select a certain Uu error budget, based on AF request. The enforced Uu error budget should not exceed the most stringent value.

### 6.19.3 Procedures

Below is the flow chart for AF requesting time synchronization service for targeted UE.

#### 6.19.3.1 AF requesting time synchronization service for targeted UE

Procedures of AF requesting time synchronization service for targeted UE are shown:



Figure 6.19.3-1: AF requesting time synchronization service based on subscription

0. UDM subscription data may include a new subscription type for time synchronization service or timing resiliency service. The subscription data indicates whether or not the UE support time synchronization service or timing resiliency services. The subscription data may also include 5GS clock properties, e.g. clock class, accuracy, etc. to reflect the possible selection of clock source e.g. during GNSS unavailability.

1. AF request for time synchronization service for the UE.

2. When receiving the time synchronization request for the UE, the TSCTSF will check with UDM, whether and what information the UE has the subscription for time synchronization service. The time service parameter of UE subscription data refers to the above description.

3. TSCTSF determinates a suitable time source to provide time synchronization service for the UE if the subscription data is satisfied.

4. TSCTSF may sends the determinate information (with 5GS clock properties including e.g. clock class, accuracy information) to UPF for time synchronization service, UPF initiates PTP or gPTP based distribution to the UE to provide timing synchronization. Or TSCTSF may send the determinate information to RAN for time synchronization service, RAN initiates access stratum distribution to the UE to provide timing synchronization.

### 6.19.4 Impacts on services, entities and interfaces

TSCTSF:

- Update the 5G time distribution indication based on UE subscription.

- Authorize time synchronization service request based on UE subscription.

- Providing time synchronization service based on UE subscription.

- Determining a suitable 5G timing source to provide time synchronization service for the UE.

AMF:

- Support to forward UE time synchronization service to targeted TSCTSF.

UDM:

- Support to perform the storage of UE subscription data including time synchronization parameters or timing resiliency parameters.

\* \* \* \* End of changes \* \* \* \*