**SA WG2 Meeting #S2-143E S2-21xxxxx**

**24 February – 9 March, 2021, Electronic (revision of S2-21xxxxx)**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **23.501** | **CR** | **<CR#>** | **rev** | **-** | **Current version:** | **16.7.0** |  |
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| *For* ***HE******LP*** *on using this form: comprehensive instructions can be found at http://www.3gpp.org/Change-Requests.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network | **X** |

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|  |
| ***Title:***  | KI#5 - Impact due to Survival Time |
|  |  |
| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | SA2 |
|  |  |
| ***Work item code:*** | IIoT |  | ***Date:*** | 2021-01-12 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP TR 21.900. | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)Rel-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
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| ***Reason for change:*** | Incorporate the agreed conclusions from TR 23.700-20 regarding Survival Time for deterministic communications to the specifications for Release 17. |
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| ***Summary of change:*** | Adding Survival time as new TSCAI, as agreed in TR 23.700-20.  |
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| ***Consequences if not approved:*** | Agreed conclusions from TR 23.700-20 on survival time support for deterministic communications is not included in Release 17. |
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| ***Clauses affected:*** | 5.27.2 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 23.502 CR ... TS 23.503 CR |
| ***affected:*** |  | **X** |  Test specifications | TS/TR… CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

**\* \* \* \* Start change \* \* \* \***

### 5.27.2 TSC Assistance Information (TSCAI)

NOTE 1: This clause assumes that PSFP information as defined in IEEE Std 802.1Q [98] and Table 5.28.3.1-1is provided by CNC. PSFP information may be provided by CNC if TSN AF has declared PSFP support to CNC. TSN AF indicates the support for PSFP to CNC only if all the DS-TT and NW-TT ports of the 5GS Bridge have indicated support of PSFP. Means to derive TSCAI if PSFP is not supported by 5GS and/or the CNC are beyond the scope of this specification.

TSC assistance information describes TSC traffic characteristics for use in the 5G System. The knowledge of TSN traffic pattern is useful for the gNB to allow it to more efficiently schedule periodic, deterministic traffic flows either via Configured Grants, Semi-Persistent Scheduling or with dynamic grants. TSC assistance information, as defined in Table 5.27.2-1, is provided from SMF to 5G-AN, e.g. upon QoS Flow establishment. The TSCAI parameters are set according to corresponding parameters obtained from the TSN AF or NEF for the case of generic TSC, when available. The TSN AF or NEF accordingly may be able to identify the ingress port and thereby the PDU session as described in clause 5.28.2.

The TSN AF interfaces towards the CNC for the PSFP (IEEE Std 802.1Q [98]) managed objects that correspond to the PSFP functionality implemented by the DS-TT and the NW-TT. Thus, when PSFP information is provided by the CNC, the TSN AF may extract relevant parameters from the PSFP configuration. The TSN AF calculates traffic pattern parameters (such as burst arrival time with reference to the ingress port and periodicity). TSN AF also obtains the flow direction as specified in clause 5.28.2. Survival time may be pre-configured in TSN AF. TSN AF is responsible for forwarding these parameters in TSC Assistance Container to the SMF (via PCF). TSN AF may enable aggregation of TSN streams if the TSN streams belong to the same traffic class, terminate in the same egress port and have the same periodicity and compatible Burst arrival time. When Survival Time information is provided for a TSN stream, then it should not be aggregated with other TSN streams into a single QoS flow, or if they are aggregated, then the Survival Time parameter shall not be provided. One set of parameters and one container are calculated by the TSN AF for multiple TSN streams to enable aggregation of TSN streams to the same QoS Flow.

Annex I describe how the traffic pattern information is determined.

NOTE 2: Further details of aggregation of TSN streams (including determination of burst arrival times that are compatible so that TSN streams can be aggregated) are left for implementation.

In this case, TSN AF creates one TSC Assistance Container for the aggregated TSN streams.

For TSC, the AF provides the traffic pattern parameters of a TSC stream (such as Burst Arrival Time with reference to the ingress port, Periodicity, Flow Direction and Survival Time) to the NEF. The NEF is responsible for forwarding these parameters in TSC Assistance Container to the SMF (via PCF).

The SMF will bind PCC rules with a TSC Assistance Container as described in clause 6.1.3.2.4 of TS 23.503 [45]. The SMF derives TSCAI on a per QoS Flow basis and sends it to 5G-AN. The Burst Arrival Time and Periodicity component of the TSCAI that the SMF signals to the 5G-AN are specified with respect to the 5G clock. The SMF is responsible for mapping the Burst Arrival Time, Periodicity, and Survival Time from a TSN/TSC clock to the 5G clock based on the time offset and cumulative rateRatio between TSN/TSC time and 5GS time as measured and reported by the UPF.

The TSCAI parameter determination in SMF is done as follows:

- For traffic in downlink direction, the SMF corrects the Burst Arrival Time in the TSC Assistance Container based on the latest received time offset measurement from the UPF and sets the TSCAI Burst Arrival Time as the sum of the corrected value and CN PDB as described in clause 5.7.3.4, representing the latest possible time when the first packet of the data burst arrives at the AN.

- For traffic in uplink direction, the SMF corrects the Burst Arrival Time in the TSC Assistance Container based on the latest received time offset measurement from the UPF and sets the TSCAI Burst Arrival Time as the sum of the corrected value and UE-DS-TT Residence Time, representing the latest possible time when the first packet of the data burst arrives at the egress of the UE.

- The SMF corrects the Periodicity in the TSC Assistance Container by the previously received cumulative rateRatio from the UPF and sets the TSCAI Periodicity as the corrected value.

- The SMF sets the TSCAI Flow Direction as the Flow Direction in the TSC Assistance Container.

- Survival Time may be provided by TSN AF/NEF either in terms of maximum number of messages or in time units, where a time unit is equivalent to the Periodicity. There is a single message per Periodicity. If Survival Time is provided in terms of maximum number of messages, the SMF coverts it into time units by multiplying its value by the Periodicity provided in the TSCAI Container. The SMF corrects the Survival Time in time units by the previously received cumulative rateRatio from the UPF and sets the TSCAI Survival Time as the corrected value.

NOTE 3: When Surival Time is given in terms of maximum number of messages and the Periodicity is not provided, then Survival Time cannot be translated into time units and hence it is not provided by SMF to 5G-RAN.

NOTE 4: In order for the TSN AF to get Burst Arrival Time, Periodicity on a per TSN stream basis, support for IEEE Std 802.1Q [98] (as stated in clause 4.4.8.2) Per-Stream Filtering and Policing (PSFP) with stream gate operation is a prerequisite.

In the case of drift between TSN GM clock and 5G clock, the UPF updates the offset to SMF using the N4 Report Procedure as defined in TS 23.502 [3] clause 4.4.3.4. In the case of change of cumulative rateRatio between TSN time and 5G time, the UPF updates the cumulative rateRatio to SMF using the N4 Report Procedure as defined in TS 23.502 [3] clause 4.4.3.4. The SMF may then trigger a PDU Session Modification as defined in TS 23.502 [3] clause 4.3.3 in order to update the TSCAI to the NG-RAN without requiring AN or N1 specific signalling exchange with the UE.

NOTE 5: In order to prevent frequent updates from the UPF, the UPF sends the offset or the cumulative rateRatio only when the difference between the current measurement and the previously reported measurement is larger than a threshold as described in TS 23.502 [3] clause 4.4.3.4.

The SMF may update the TSCAI to the NG-RAN as part of handover procedure as defined in TS 23.502 [3] clauses 4.9.1.2.2 and 4.9.1.3.2.

Table 5.27.2-1: TSC Assistance Information

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| --- | --- |
| Assistance Information | Description |
| Flow Direction | The direction of the TSC flow (uplink or downlink). |
| Periodicity | It refers to the time period between start of two bursts. |
| Burst Arrival time | The latest possible time when the first packet of the data burst arrives at either the ingress of the RAN (downlink flow direction) or egress interface of the UE (uplink flow direction). |
| Survival Time | As defined in Annex C.2.3, TS 22.104 [105].  |

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