**3GPP TSG-SA WG2 Meeting #143-e (e-meeting) *S2-210xxxx***

**24 February- 9 March 2021, Elbonia *(revision of S2-210xxxx)***

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

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|  | | | | | | | | | | |
| ***Title:*** | KI#1-4: Control of DS-TT (g)PTP functionality | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Qualcomm Incorprorated | | | | | | | | | |
| ***Source to TSG:*** | SA2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | IIoT | | | | |  | ***Date:*** | | | 2021-02-24 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **C** |  | | | | | ***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 can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | This CR introduces into TS 23.501 control of DS-TT (g)PTP functionality in line with the conclusions for Key Issue #3B in TR 23.700-20. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * Introduce clause 5.27.X.6 to capture how supported PTP functionality in DS-TT can be determined and controlled * Update Table 5.28.3.1-1 to include port management information for (g)PTP | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | No support for control of DS-TT (g)PTP functionality | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.27.1.X (new), 5.28.3.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\*\*\*\* First Change \*\*\*\*

#### 5.27.X.6 Control of PTP functionality in DS-TT

DS-TT may support the following PTP instance types:

- Time-aware system as described in IEEE Std 802.1AS [104],

- Boundary Clock as described in IEEE Std 1588-2019 [X],

- Peer-to-peer Transparent Clock as described in IEEE Std 1588-2019 [X],

- End-to-end Transparent Clock as described in IEEE Std 1588-2019 [X].

For operation as a Boundary clock DS-TT may support the following path and link delay measurement methods:

- Delay request-response mechanism as described in IEEE Std 1588-2019 [X] clause 11.3;

- Peer-to-peer delay mechanism as defined in IEEE Std 1588-2019 [X] clause 11.4.

TSN AF or NEF can determine the level of PTP functionality supported by DS-TT by querying the following port management information (if supported according to the port management capabilities indicated by the UE):

- supported PTP instance types;

- supported number of PTP instances;

- supported PTP delay mechanisms.

TSN AF or NEF can configure one or multiple PTP instances in a given DS-TT (limited by the number of PTP instances supported by that DS-TT) by sending PTP port management information (see Table 5.28.3.1-1) to DS-TT.

\*\*\*\* Next Change \*\*\*\*

#### 5.28.3.1 General

Port and bridge management information is exchanged between CNC and TSN AF. The port management information, is related to Ethernet ports located in DS-TT or NW-TT.

5GS shall support transfer of standardized and deployment-specific port management information transparently between TSN AF and DS-TT or NW-TT, respectively inside a Port Management Information Container. NW-TT may support one or more ports. In this case, each port uses separate Port Management Information Container. 5GS shall also support transfer of standardized and deployment-specific bridge management information transparently between TSN AF and NW-TT, respectively inside a Bridge Management Information Container. Table 5.28.3.1-1 and Table 5.28.3.1-2 list standardized port management information and bridge management information, respectively.

Table 5.28.3.1-1: Standardized port management information

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Port management information | Applicability (see NOTE 6) | | Supported operations by TSN AF | Reference |
|  | DS-TT | NW-TT | (see NOTE 1) |  |
| **General** |  |  |  |  |
| Port management capabilities (see NOTE 2) | X | X | R |  |
| **Bridge delay related information** |  |  |  |  |
| txPropagationDelay | X | X | R | IEEE Std 802.1Qcc [95] clause 12.32.2.1 |
| **Traffic class related information** |  |  |  |  |
| Traffic class table | X | X | RW | IEEE Std 802.1Q [98] clause 12.6.3 and clause 8.6.6. |
| **Gate control information** |  |  |  |  |
| GateEnabled | X | X | RW | IEEE Std 802.1Q [98] Table 12-29 |
| AdminBaseTime | X | X | RW | IEEE Std 802.1Q [98] Table 12-29 |
| AdminControlList | X | X | RW | IEEE Std 802.1Q [98] Table 12-29 |
| AdminCycleTime (see NOTE 3) | X | X | RW | IEEE Std 802.1Q [98] Table 12-29 |
| AdminControlListLength (see NOTE 3) | X | X | RW | IEEE Std 802.1Q [98] Table 12-28 |
| Tick granularity | X | X | R | IEEE Std 802.1Q [98] Table 12-29 |
| **General Neighbor discovery configuration**  **(NOTE 4)** |  |  |  |  |
| adminStatus | D | X | RW | IEEE Std 802.1AB [97] clause 9.2.5.1 |
| lldpV2LocChassisIdSubtype | D | X | RW | IEEE Std 802.1AB [97] Table 11-2 |
| lldpV2LocChassisId | D | X | RW | IEEE Std 802.1AB [97] Table 11-2 |
| lldpV2MessageTxInterval | D | X | RW | IEEE Std 802.1AB [97] Table 11-2 |
| lldpV2MessageTxHoldMultiplier | D | X | RW | IEEE Std 802.1AB [97] Table 11-2 |
| **NW-TT port neighbor discovery configuration** |  |  |  |  |
| lldpV2LocPortIdSubtype |  | X | RW | IEEE Std 802.1AB [97] Table 11-2 |
| lldpV2LocPortId |  | X | RW | IEEE Std 802.1AB [97] Table 11-2 |
| **DS-TT port neighbor discovery configuration** |  |  |  |  |
| lldpV2LocPortIdSubtype | D |  | RW | IEEE Std 802.1AB [97] Table 11-2 |
| lldpV2LocPortId | D |  | RW | IEEE Std 802.1AB [97] Table 11-2 |
| **Neighbor discovery information for each discovered neighbor of NW-TT** |  |  |  |  |
| lldpV2RemChassisIdSubtype |  | X | R | IEEE Std 802.1AB [97] Table 11-2 |
| lldpV2RemChassisId |  | X | R | IEEE Std 802.1AB [97] Table 11-2 |
| lldpV2RemPortIdSubtype |  | X | R | IEEE Std 802.1AB [97] Table 11-2 |
| lldpV2RemPortId |  | X | R | IEEE Std 802.1AB [97] Table 11-2 |
| TTL |  | X | R | IEEE Std 802.1AB [97] clause 8.5.4 |
| **Neighbor discovery information for each discovered neighbor of DS-TT**  **(NOTE 5)** |  |  |  |  |
| lldpV2RemChassisIdSubtype | D |  | R | IEEE Std 802.1AB [97] Table 11-2 |
| lldpV2RemChassisId | D |  | R | IEEE Std 802.1AB [97] Table 11-2 |
| lldpV2RemPortIdSubtype | D |  | R | IEEE Std 802.1AB [97] Table 11-2 |
| lldpV2RemPortId | D |  | R | IEEE Std 802.1AB [97] Table 11-2 |
| TTL | D |  | R | IEEE Std 802.1AB [97] clause 8.5.4.1 |
| **Stream Parameters**  **(NOTE 11)** |  |  |  |  |
| MaxStreamFilterInstances | X |  | R | IEEE Std 802.1Q [98]  clause 12.31.1.1 |
| MaxStreamGateInstances | X |  | R | IEEE Std 802.1Q [98]  clause 12.31.1.2 |
| MaxFlowMeterInstances | X |  | R | IEEE Std 802.1Q [98]  clause 12.31.1.3 |
| SupportedListMax | X |  | R | IEEE Std 802.1Q [98]  clause 12.31.1.4 |
| **Per-Stream Filtering and Policing information**  (NOTE 10) |  |  |  |  |
| Stream Filter Instance Table  (NOTE 8) |  |  |  | IEEE Std 802.1Q [98] Table 12-32 |
| > Stream Identification type | X | X | RW | IEEE 802.1CB [83] clause 9.1.1.6 |
| > Stream Identification Controlling Parameters | X | X | RW | IEEE 802.1CB [83] clauses 9.1.2, 9.1.3, 9.1.4  (NOTE 12) |
| > PrioritySpec | X | X | RW | IEEE Std 802.1Q [98] Table 12-32 |
| > StreamGateInstanceID | X | X | RW | IEEE Std 802.1Q [98] Table 12-32 |
| Stream Gate Instance Table  (NOTE 9) |  |  |  | IEEE Std 802.1Q [98] Table 12-33 |
| StreamGateInstance | X | X | R | IEEE Std 802.1Q [98] Table 12-33 |
| PSFPAdminBaseTime | X | X | RW | IEEE Std 802.1Q [98] Table 12-33 |
| PSFPAdminControlList | X | X | RW | IEEE Std 802.1Q [98] Table 12-33 |
| PSFPAdminCycleTime | X | X | RW | IEEE Std 802.1Q [98] Table 12-33 |
| PSFPTickGranularity | X | X | R | IEEE Std 802.1Q [98] Table 12-33 |
| **PTP information** |  |  |  |  |
| Supported PTP instance types (NOTE 13) | X |  | R |  |
| Supported number of PTP instances | X |  | R |  |
| Supported PTP delay mechanisms (NOTE 14) | X |  | R |  |
| PTP Instance ID | X |  | RW |  |
| defaultDS.instanceType | X |  | RW | IEEE Std 1588 [X] clause 8.2.1.5.5 |
| defaultDS.clockIdentity | X |  | RW | IEEE Std 1588 [X] clause 8.2.1.2.2 |
| defaultDS.instanceEnable | X |  | RW | IEEE Std 1588 [X] clause 8.2.1.5.2 |
| defaultDS.domainNumber | X |  | RW | IEEE Std 1588 [X] clause 8.2.1.4.3 |
| defaultDS.priority1 | X |  | RW | IEEE Std 1588 [X] clause 8.2.1.4.1 |
| defaultDS.priority2 | X |  | RW | IEEE Std 1588 [X] clause 8.2.1.4.2 |
| defaultDS.clockQuality.clockClass | X |  | RW | IEEE Std 1588 [X] clause 8.2.1.3.1.2 |
| defaultDS.clockQuality.clockAccuracy | X |  | RW | IEEE Std 1588 [X] clause 8.2.1.3.1.3 |
| defaultDS.clockQuality.offsetScaledLogVariance | X |  | RW | IEEE Std 1588 [X] clause 8.2.1.3.1.4 |
| portDS.portIdentity | X |  | RW | IEEE Std 1588 [X] clause 8.2.15.2.1 |
| portDS.portEnable | X |  | RW | IEEE Std 1588 [X] clause 8.2.15.5.1 |
| portDS.portState | X |  | RW | IEEE Std 1588 [X] clause 8.2.15.3.1 |
| portDS.versionNumber | X |  | RW | IEEE Std 1588 [X] clause 8.2.15.4.6 |
| portDS.minorVersionNumber | X |  | RW | IEEE Std 1588 [X] clause 8.2.15.4.7 |
| portDS.delayAsymmetry | X |  | RW | IEEE Std 1588 [X] clause 8.2.15.4.8 |
| portDS.delayMechanism | X |  | RW | IEEE Std 1588 [X] clause 8.2.15.4.4 |
| portDS.logAnnounceInterval | X |  | RW | IEEE Std 1588 [X] clause 8.2.15.4.1 |
| portDS.logSyncInterval | X |  | RW | IEEE Std 1588 [X] clause 8.2.15.4.3 |
| portDS.logMinDelayReqInterval | X |  | RW | IEEE Std 1588 [X] clause 8.2.15.3.2 |
| logMinPdelayReqInterval | X |  | RW | IEEE Std 1588 [X] clause 8.2.15.4.5 |
| timePropertiesDS.timeSource | X |  | RW | IEEE Std 1588 [X] clause 8.2.4.9 |
| NOTE 1: R = Read only access; RW = Read/Write access.  NOTE 2: Indicates which standardized and deployment-specific port management information is supported by DS-TT or NW-TT.  NOTE 3: AdminCycleTime and AdminControlListLength are optional for gate control information.  NOTE 4: If DS-TT supports neighbor discovery, then TSN AF sends the general neighbor discovery configuration for DS-TT Ethernet ports to DS-TT. If DS-TT does not support neighbor discovery, then TSN AF sends the general neighbor discovery configuration for DS-TT Ethernet ports to NW-TT using the Bridge Management Information Container (refer to Table 5.28.3.1-2) and NW-TT performs neighbor discovery on behalf on DS-TT. When a parameter in this group is changed, it is necessary to provide the change to every DS-TT and the NW-TT that belongs to the 5GS TSN bridge. It is mandatory that the general neighbor discovery configuration is identical for all DS-TTs and the NW-TTs that belongs to the bridge.  NOTE 5: If DS-TT supports neighbor discovery, then TSN AF retrieves neighbor discovery information for DS-TT Ethernet ports from DS-TT. If DS-TT does not support neighbor discovery, then TSN AF retrieves neighbor discovery information for DS-TT Ethernet ports from NW-TT, using the Bridge Management Information Container (refer to Table 5.28.3.1-2), the NW-TT performing neighbor discovery on behalf on DS-TT.  NOTE 6: X = applicable; D = applicable when validation and generation of LLDP frames is processed at the DS-TT.  NOTE 7: Void.  NOTE 8: There is a Stream Filter Instance Table per Stream.  NOTE 9: There is a Stream Gate Instance Table per Gate.  NOTE 10: TSN AF indicates the support for PSFP to the CNC only if each DS-TT and NW-TT of the 5GS bridge has indicated support of PSFP. DS-TT indicates support of PSFP using port management capabilities, i.e. by indicating support for the Per-Stream Filtering and Policing information and by setting higher than zero values for MaxStreamFilterInstances, MaxStreamGateInstances, MaxFlowMeterInstances, SupportedListMax parameters. When available, TSN AF uses the PSFP information for determination of the traffic pattern information as described in Annex I. The PSFP information can be used at the DS-TT (if supported) and at the NW-TT (if supported) for the purpose of per-stream filtering and policing as defined in IEEE Std 802.1Q [98] clause 8.6.5.1.  NOTE 11: TSN AF composes a Stream Parameter Table towards the CNC. It is up to TSN AF how it composes the Stream Parameter Table based on the numerical values as received from DS-TT and NW-TT port(s) and for the bridge for each individual parameter.  NOTE 12: The set of Stream Identification Controlling Parameters depends on the Stream Identification type value as defined in IEEE Std 802.1CB [83] Table 9-1 and clauses 9.1.2, 9.1.3, 9.1.4.  NOTE 13 Any combination of the following values is supported: Time-aware system, Boundary Clock, end-to-end transparent clock, peer-to-peer transparent clock.  NOTE 14 Any combination of the following values is supported: delay request/response, peer-to-peer. | | | | |

Table 5.28.3.1-2: Standardized bridge management information

|  |  |  |
| --- | --- | --- |
| Bridge management information | Supported operations by TSN AF  (see NOTE 1) | Reference |
| **Information for 5GS Bridge** |  |  |
| Bridge Address | R |  |
| Bridge ID | R |  |
| NW-TT port numbers | R |  |
| **Traffic forwarding information** |  |  |
| Static Filtering Entry (NOTE 3) | RW | IEEE Std 802.1Q [98] clause 8.8.1 |
| **General Neighbor discovery configuration**  **(NOTE 2)** |  |  |
| adminStatus | RW | IEEE Std 802.1AB [97] clause 9.2.5.1 |
| lldpV2LocChassisIdSubtype | RW | IEEE Std 802.1AB [97] Table 11-2 |
| lldpV2LocChassisId | RW | IEEE Std 802.1AB [97] Table 11-2 |
| lldpV2MessageTxInterval | RW | IEEE Std 802.1AB [97] Table 11-2 |
| lldpV2MessageTxHoldMultiplier | RW | IEEE Std 802.1AB [97] Table 11-2 |
| **DS-TT port neighbor discovery configuration for DS-TT ports (NOTE 4)** |  |  |
| **>DS-TT port neighbor discovery configuration for each DS-TT port** |  |  |
| >> DS-TT port number | RW |  |
| >> lldpV2LocPortIdSubtype | RW | IEEE Std 802.1AB [97] Table 11-2 |
| >> lldpV2LocPortId | RW | IEEE Std 802.1AB [97] Table 11-2 |
| **Discovered neighbor information for DS-TT ports**  **(NOTE 4)** |  |  |
| **>Discovered neighbor information for each DS-TT port**  **(NOTE 4)** |  |  |
| >> DS-TT port number | R |  |
| >> lldpV2RemChassisIdSubtype | R | IEEE Std 802.1AB [97] Table 11-2 |
| >> lldpV2RemChassisId | R | IEEE Std 802.1AB [97] Table 11-2 |
| >> lldpV2RemPortIdSubtype | R | IEEE Std 802.1AB [97] Table 11-2 |
| >> lldpV2RemPortId | R | IEEE Std 802.1AB [97] Table 11-2 |
| >> TTL | R | IEEE Std 802.1AB [97] clause 8.5.4.1 |
| **Stream Parameters (NOTE 5)** |  |  |
| MaxStreamFilterInstances | R | IEEE Std 802.1Q [98] |
| MaxStreamGateInstances | R | IEEE Std 802.1Q [98] |
| MaxFlowMeterInstances | R | IEEE Std 802.1Q [98] |
| SupportedListMax | R | IEEE Std 802.1Q [98] |
| NOTE 1: R = Read only access; RW = Read/Write access.  NOTE 2: General neighbor discovery information is included only when NW-TT performs neighbor discovery on behalf of DS-TT. When a parameter in this group is changed, it is necessary to provide the change to every DS-TT and the NW-TT that belongs to the 5GS TSN bridge.  NOTE 3: If the Static Filtering Entry information is present, NW-TT uses Static Filtering Entry information to determine the NW-TT egress port for forwarding UL TSC traffic. If the Static Filtering Entry information is not present, then the forwarding information as in clause 5.8.2.5.3 applies. This release of the specification does not support Static Filtering Entries in the downlink direction.  NOTE 4: DS-TT discovery configuration and DS-TT discovery information are used only when DS-TT does not support LLDP and NW-TT performs neighbor discovery on behalf of DS-TT.  NOTE 5: TSN AF indicates the support for PSFP to the CNC only if each DS-TT and NW-TT of the 5GS bridge have indicated support of PSFP. The support of PSFP at the NW-TT ports is expressed by setting higher than zero values for MaxStreamFilterInstances, MaxStreamGateInstances, MaxFlowMeterInstances, SupportedListMax parameters. | | |

Exchange of port and bridge management information between TSN AF and NW-TT or DS-TT allows TSN AF to:

1) retrieve port management information for a DS-TT or NW-TT Ethernet port or bridge management information for a 5GS TSN bridge;

2) send port management information for a DS-TT or NW-TT Ethernet port or bridge management information for a 5GS TSN bridge;

3) subscribe to and receive notifications if specific port management information for a DS-TT or NW-TT Ethernet port changes or bridge management information changes.

Exchange of port management information between TSN AF and NW-TT or DS-TT is initiated by DS-TT or NW-TT to:

- notify TSN AF if port management information has changed that TSN AF has subscribed for.

Exchange of bridge management information between TSN AF and NW-TT is initiated by NW-TT to:

- notify TSN AF if bridge management information has changed that TSN AF has subscribed for.

Exchange of port management information is initiated by DS-TT to:

- provide port management capabilities, i.e. provide information indicating which standardized and deployment-specific port management information is supported by DS-TT.

TSN AF indicates inside the Port Management Information Container or Bridge Management Information Container whether it wants to retrieve or send port or bridge management information or intends to (un-)subscribe for notifications.

\*\*\* End of Changes \*\*\*