Title: Response to *LS on TSN support in 3GPP Release-16 stage 2 completion*
From: IEEE 802.1
For: Information
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Dear Colleagues,

The IEEE 802.1 Working Group would like to thank 3GPP SA Working Group 2 (SA2) for the information provided in liaison statement S2-2003508 on the completion of the 5G Release-16 stage 2 specifications in support of IEEE 802.1 Time-Sensitive Networking (TSN).

We thank you for using our standards as normative references in the manner that they were intended. This has prompted us to make detailed comments in the spirit of cooperation. Our comments to the sections of the documents sent for review are attached.

We look forward to maintaining the dialogue and cooperation between our organizations.

Note that the IEEE 802 work is open and contribution-driven. Participation is on an individual basis and technical discussion can be conducted based on individual contributions. We have regular calls, details on TSN Task Group calls are available at https://1.ieee802.org/tsn-calls.

Respectfully submitted,
Glenn Parsons
Chair, IEEE 802.1 Working Group

Main Comments on 3GPP TS 23.501

1) Compliance to IEEE 802.1 standards

The targeted compliance to IEEE 802.1 standards and the functionality specified is not entirely clear in all cases. It would be good to be clear in all cases whether the externally-observable behavior is as specified by the IEEE 802.1 standards.

"*the 5GS to appear as any other TSN Bridge*" in clause 4.4.8.2 suggests that the TSN functionality supported by the 5GS is compliant to the relevant TSN standard(s).
Compliance to IEEE Std 802.1AS is made clear in 5.27.1.1: "*modelled as an IEEE 802.1AS [104] compliant entity*" in the title of Figure 5.27.1-1: "*5G system is modelled as IEEE 802.1AS compliant time aware system*", and in clause 5.27.1.3: "*5G system as an IEEE 802.1AS [104] compliant time-aware system*".
Compliance to IEEE Std 802.1AB is expressed in clause 4.4.8.2: "*DS-TT optionally supports link layer connectivity discovery and reporting as defined in IEEE 802.1AB [97]*" and "*NW-TT supports link layer connectivity discovery and reporting as defined in IEEE 802.1AB [97]*" meaning that the implementation of LLDP is mandatory for NW-TT and optional for DS-TT.

However, compliance to some TSN functionality specified in IEEE Std 802.1Q is not clear, in particular, PSFP and scheduled traffic.

The optional feature "*per-stream filtering and policing as defined in IEEE 802.1Q [98] clause 8.6.5.1*" in clause 4.4.8.2 suggests an IEEE Std 802.1Q compliant implementation of PSFP.

NOTE 2 in clause 5.27.2 suggests that if an implementation chooses to support the optional PSFP, then the stream gate operations are implemented:
"*In order to get Burst Arrival Time, Periodicity on a per TSN stream basis, support for IEEE 802.1Q [98] (as stated in clause 4.4.8.2) Per-Stream Filtering and Policing (PSFP) with stream gate operation is a prerequisite.*"
However, it is stated in clause 4.4.8.2: "*This release only supports interworking with TSN using IEEE 802.1Q [98] clause 8.6.8.4 based scheduled traffic and IEEE 802.1Q [98] clause 8.6.5.1 based per-stream filtering and policy.*" The phrase "*based*" suggests that only parts of scheduled traffic and PSFP as specified in IEEE Std 802.1Q are supported but potential changes have been made. It would be good to clarify what is supported exactly by 5G.
Also "*only*" seems to indicate that 5G supports "only" two of the many TSN features; however, this may not be exact either, as IEEE Std 802.1Qcc and IEEE Std 802.1CB are mentioned additionally to scheduled traffic and PSFP in the document.

5.28.1 uses the phrase "*support PSFP information*". If an implementation choses to support PSFP, i.e., implements it as specified by IEEE Std 802.1Q, then the phrase (in 5.28.1) should be: "support PSFP".

NOTE 10 in clause 5.28.3 states:
"*The use of PSFP information is mandatory at the TSN AF and is optional at both DS-TT and NW-TT.*"
The intention is not clear here. If supported, PSFP is implemented at the data plane of a bridge, e.g., stream gates etc. are part of the data plane not the control plane. The control/management plane is for the configuration of PSFP. Control and data planes are used together to support IEEE Std 802.1Q functionality like PSFP.

Clause 5.27.4 states:
"*DS-TT and NW-TT support a hold and forward mechanism to schedule traffic as defined in IEEE 802.1Q [98] if 5GS is to participate transparently as a bridge in a TSN network.*"

It is not clear what the hold and forward buffering mechanism is, what it does, and what it is for exactly. "to schedule traffic" and the reference to 802.1Q suggest that it is about subclause 8.6.8.4 *Enhancements for scheduled traffic* in IEEE Std 802.1Q-2018. The intention may be to provide up to eight queues (buffers) of 802.1Q bridges in support of eight traffic classes with transmission gates (subclause 8.6.8.4 in 802.1Q-2018). However, it is not clear whether or not the externally-observable behavior is as is specified for scheduled traffic in subclauses 8.6.8.4 and 8.6.9 of IEEE Std 802.1Q-2018. It would be good to clarify how many hold and forward buffers would be supported, e.g., whether or not they are per traffic class. It would be good to clarify whether scheduled traffic is supported as specified in IEEE Std 802.1Q, i.e., whether the externally-observable behavior is as specified in IEEE Std 802.1Q. If that is the case, then it would be better to use the terminology specified in IEEE Std 802.1Q, e.g., "transmission gates".

Clause 5.27.4 also states:
"*5GS provides AdminControlList and AdminBaseTime as defined in IEEE 802.1Q [98] on a per Ethernet port basis to DS-TT and NW-TT for the hold and forward buffer as described in clause 5.28.3.*"
Mentioning of AdminControlList and AdminBaseTime suggests that the intention of the hold and forward mechanism is to provide scheduled traffic specified in IEEE 802.1Q; however, it is not clear as pointed out above. If the goal is to support scheduled traffic specified by IEEE Std 802.1Q, then it would be good to clarify if there are any limitations or specialties in the 5G approach to scheduled traffic compared to the specification in IEEE Std 802.1Q, e.g., clarify whether or not the other parameters of scheduled traffic are supported as well.

The NOTE in Clause 5.27.4 states:
"*How Hold and Forward buffer is supported by the TSN Translator is up to implementation.*"
It is always up to an implementer how to implement a feature specified by a standard as long as it is conformant to the standard and the externally-observable behavior is according to the standard.
It would be good to clarify whether or not the hold and forward mechanism is to provide the externally-observable behavior as specified for scheduled traffic in IEEE Std 802.1Q.

NOTE 1 in Clause 5.28.2 states:
"*In this Release of the specification, only support simplified IEEE 802.1Q [98], Annex Q.2 for 5GS*"
Although, it is not entirely clear which IEEE Std 802.1Q functionality this note is about, Annex Q.2 suggests that it is about scheduled traffic. NOTE 1 suggests that a subset of scheduled traffic per IEEE Std 802.1Q is supported, and only in a specific way. If the intention is to express that this release of the specification only supports scheduled traffic with protected windows, then that could be expressed more clearly, in the main text rather than in a note. (For instance: "This release of the specification only supports scheduled traffic (8.6.8.4 in IEEE Std 802.1Q-2018) with protected windows (Annex Q.2 in IEEE Std 802.1Q-2018).")

Overall, as the intention is to place 5G into a TSN bridged network, 5G supporting generic bridging and TSN functionality as specified by IEEE 802.1 standards may be beneficial. This goal is clearly expressed for some of the features (e.g., LLDP and gPTP) however is not clear for some other features, (e.g., PSFP and scheduled traffic) which should be further clarified.

2) Loop prevention (active topology enforcement)

Loop prevention is a must in a bridged network because a forwarding loop may cause a network meltdown. Note that the IEEE Std 802.1Q term "active topology enforcement" includes loop prevention as active topology enforcement makes the active topology (forwarding topology) loop free.
NOTE 9 in 5.6.10.2 states: "*This Release of the specification does not guarantee that the Ethernet network remains loop-free. Deployments need to be verified on an individual basis that loops in the*

Ethernet network are avoided."
If the physical topology is guaranteed to remain loop free all the time, then active topology enforcement may not be needed. Perhaps this is involved in the verification of the deployments.
Going beyond always loop-free physical topologies, support some kind of an active topology enforcement mechanism would be required.

3) Frame forwarding mechanisms

There seems to be some unclarity related to frame forwarding. In case of 5G support for Ethernet forwarding (clauses 5.6.10.2, 5.7.6.3, 5.8.2.5.3), learning VLANs are supported, i.e., MAC learning from data frames is applied. However, non-learning VLANs are applied for some streams in some TSN deployments, in particular for streams transferred via disjoint paths and protected by IEEE Std 802.1CB Frame Replication and Elimination for Reliability (FRER). Such non-learning VLANs can be controlled by SDN, i.e., via Static Filtering Entries (subclause 8.8.1 in IEEE Std 802.1Q-2018). It is not entirely clear whether or not such set-up is supported.

NOTE 7 in 5.28.3.1 states:
"*NW-TT uses Static Filtering Entry information to determine the NW-TT egress port for forwarding UL TSC traffic.*"
It seems that Static Filtering Entries are only supported in one direction, i.e., uplink. However, some VLANs in support of TSN streams use FRER over redundant paths, see, e.g., item 7) in Annex U.2 in IEEE Std 802.1Qcc. These VLANs are allocated to the TE-MSTID, which selects the control plane operation mode for a VLAN (see, e.g., see 12.32.3.1 in IEEE Std 802.1Qcc). That is, Static Filtering Entries specify frame forwarding and filtering for these VLANs, see subclause 12.32.3.1 in IEEE Std 802.1Qcc. This enables the CNC to configure static forwarding trees.
It is not clear how such operation is supported. Clause 5.8.2.5.3 describes the operations for learning VLANs where MAC addresses are learnt from the source address of data frames. However, clause 5.8.2.5.3 does not describe the operations for static forwarding.

NOTE 2 in 5.8.2.5.3 states:
"*This release of the specification supports only a single N6 interface in a UPF associated with the N6 Network Instance.*"
A single N6 interface seems to be supported for Ethernet forwarding. However, it seems that multiple N6 interfaces are supported for the support of TSN. This may be a mismatch. It is not entirely clear what is then available when it comes to the forwarding of Ethernet frames especially given that the data of TSN streams are also forwarded in Ethernet frames.

Further Comments

3GPP TS 23.501

Clause 4.4.8.1

"*Time sensitive communication as defined in IEEE P802.1Qcc [95].*"
Please note that IEEE Std 802.1Qcc-2018 does not define "Time sensitive communication". A key contribution of IEEE Std 802.1Qcc-2018 is that it defines TSN configuration including TSN configuration models. As described later in 4.4.8.1, TSN is a set of standards. Perhaps, "IEEE P802.1Qcc [95]" could be replaced with "IEEE 802.1 Time-Sensitive Networking (TSN) standards." (Note that "P" upfront of the "802" project identifier indicates an ongoing IEEE 802 project and "Std" indicates a published IEEE 802 standard: IEEE Std 802.1Qcc was published in 2018.)

"*IEEE TSN*" is used in multiple places. TSN is defined by the IEEE 802.1 Working Group, therefore, each occurrence should read "IEEE 802.1 TSN".

"*In this Release of the specification, integration of 5G System with TSN networks that are based on IEEE TSN (IEEE P802.1Qcc [95]) is supported.*"
TSN networks are comprised of devices that are compliant to the IEEE 802.1 TSN standards. Such high-level statement could be omitted. 4.4.8.2 describes that the fully centralized model is supported in this Release. If that statement is intended to be made in 4.4.8.1, then the sentence could be updated to: "This Release of the specification supports integration of the 5G System with IEEE 802.1 TSN networks that apply the fully centralized configuration model (IEEE Std 802.1Qcc [95])."

Clause 4.4.8.2

"*TSN System*"
It is not entirely clear what is meant by "TSN System". Unfortunately, "System" is an overloaded term, especially considering the term "time-aware system" defined by IEEE Std 802.1AS.

The second sentence explains: "*TSN Translator functionality for interoperation between TSN System and 5G System both for user plane and control plane*."
The third sentence explains the translator functionality on user plane; however, it does not make it clear that it is user plane: "*5GS TSN translator functionality consists of Device-side TSN translator (DS-TT) and Network-side TSN translator (NW-TT).*" ("on user plane" could be added right after "functionality" for clarity.)
Nonetheless, there is no explanation on the translator functionality on control plane. It could be useful to add such explanation.

"*TSN AF*"
Out of the three new functionality added for the integration with TSN, DS-TT and NW-TT are described in the text; however, TSN AF is not. An explanation or a reference to an explanation should be provided.

"*hybrid model*"
It is not clear what hybrid means as there is no hybrid model defined in IEEE Std 802.1Qcc. The third model is "centralized network/distributed user model". Perhaps it would be better to use the terminology of the 802.1 standard.

Clause 5.8.2.5.3

"*if the traffic is received with a VLAN ID, the above criteria apply only towards the N6 interface or PDU session matching the same VLAN ID*"
Does it imply that only Independent VLAN Learning (IVL, per 3.109 in IEEE Std 802.1Q) is supported and Shared VLAN Learning (SVL, per 3.232 in IEEE Std 802.1Q) is not? Perhaps, it would be useful to have an explicit statement on whether IVL, or SVL, or both are supported.
It is not clear whether "*towards the N6 interface*" is intended to define a traffic direction or the meaning is "on the N6 interface" or "to the N6 interface".

"*if the destination MAC address of traffic refers to the same N6 interface or PDU session on which the traffic has been received, the frame should be dropped*"
"shall" would be expected instead of "should" here and using "shall" would be recommended.

Clause 5.27.5

"*The TSN AF deduces the related port pair(s) from the port number of the DS-TT Ethernet port and port number of the serving NW-TT Ethernet port(s)*"
"serving NW-TT Ethernet port(s)" is not specified in the document. Actually, this is the single occurrence.

Clause 5.27.1.1

"*fulfil all functions related to IEEE 802.1AS [104], e.g. (g)PTP support*"
As compliance to IEEE Std 802.1AS is claimed, gPTP is expected here, not PTP. "*(g)PTP*" should be replaced with "gPTP".

"*TSN working domain*"
It is not clear what "TSN working domain" means. No definition and no reference to a definition in another document are provided. Perhaps it would be better to use "gPTP domain" throughout the document, given the compliance claimed to IEEE Std 802.1AS.

"*TSN domain*"
The definition of TSN domain is ongoing work in IEEE 802.1. With respect to time synchronization, it would be better to use "time domain" or "gPTP domain" (which fit better) related to time synchronization.

"*To enable TSN synchronization*"
Perhaps, "gPTP-based synchronization" would be a more precise term.

"*The TTs located at the edge of 5G system fulfil all functions related to IEEE 802.1AS [104], e.g. (g)PTP support, timestamping, Best Master Clock Algorithm (BMCA), rateRatio. Figure 5.27.1-1 illustrates the 5G and TSN clock distribution model via 5GS.*"

BMCA support is mentioned, but there is no mention of how this is done. The BMCA specifications of IEEE Std 802.1AS-2020, subclause 10.3.3 include state machines that operate within a single PTP Instance. In the current document, the gPTP Instance is distributed across the 5GS. The per PTP port operations of the BMCA must occur at each DS-TT and the NW-TT, and the per PTP Instance operations must occur centrally. Furthermore, many of the BMCA operations are atomic. If interoperability among the different 5GS components is desired, then it would be desirable to have

specifications on how the BMCA information is communicated among the various 5GS components (e.g., the various DS-TTs and NW-TT), e.g., state machines. But, there should at least be some statement that the specifications of 10.3.3 of 802.1AS-2020 must be implemented in a distributed manner when implementing the BMCA.

In summary, if an IEEE Std 802.1AS time-aware system is distributed across devices from multiple vendors, then providing the BMCA requires further standardization effort in 3GPP.

Clause 5.27.1.2.2

"*TSN clock*"
"TSN clock" does not seem to be precise. (Each TSN bridge or end station may have a clock. It is not clear which clock "TSN clock" refers to.)
"gPTP Grandmaster Clock" would be more precise if that is what is meant. (Alternatively, "Grandmaster Clock" or "TSN Grandmaster Clock".)
It would be good to replace "TSN clock" with the appropriate precise term throughout the document.

"*Upon reception of a downlink gPTP message the NW-TT makes an ingress timestamping (TSi) for each gPTP event (Sync) message and uses the cumulative rateRatio received inside the gPTP message payload (carried within Sync message for one-step operation or Follow_up message for two-step operation) to calculate the link delay from the upstream TSN node (gPTP entity) expressed in TSN GM time as specified in IEEE 802.1AS [104].*"
Presumably, the intent here is to convert the computed propagation time (mean link delay) on the upstream link to the grandmaster time base, as the MDPdelayReq state machine of IEEE Std 802.1AS-2020 computes mean link delay in the time base of the PTP Instance at the other end of the link. Note 2 of subclause 11.2.19.3.4 of IEEE Std 802.1AS-2020 states that the difference between the mean link delay value in the GM time base versus upstream PTP Instance time base is usually negligible. Nonetheless, the effective conversion of this mean link delay to the GM time base occurs when computing upstreamTxTime by the MDSyncReceive state machine (in the function setMDSyncReceiveMDSR()), and then in the setFollowUp() [Item a)2)] or modifySync() functions of the MDSynceSend state machine (depending on whether the transmission is one-step or two-step, respectively). If the operations of Clause 5.27.1.2.2 are performed, and in addition the MDSyncSend() and MDSyncReceive() state machines are invoked exactly as specified in IEEE Std 802.1AS-2020, the results will not be correct; some operations will have been done twice. It would be desirable to either
a) indicate what aspects of the IEEE Std 802.1AS-2020 state machines are changed, or
b) provide revised MDSyncSend() and MDSyncReceive() state machines for the case here.

Clause 16 "Coordinated Shared Network (CSN)" of IEEE Std 802.1AS-2020 may be useful to address this situation. We would in particular draw your attention to the case of a common CSN network clock.

"*Removes TSi from the Suffix field*"
Actually, the entire suffix field (i.e., the TLV is removed; presumably it is not attached to the Sync or Follow_Up message transmitted downstream from the DS-TT).

Clause 5.27.1.3
"*propagate the 5G clock using the 802.1AS profile*"
"profile" is an overloaded term. Furthermore, it is not explained in this document (and need not be) that IEEE Std 802.1AS is a profile of IEEE Std 1588. So, it is better to avoid the term "profile", e.g., update the quoted text to read: "propagate the 5G clock via gPTP messages".

"*i.e. the 5G system as an IEEE 802.1AS [104] compliant time-aware system*"
A verb seems to be missing. Perhaps update to read: "i.e., the 5G system acts as an IEEE Std 802.1AS [104] compliant time-aware system, and in this case is the grandmaster for all the gPTP domains.".

NOTE 3:
"*In this Release of specification, support for multiple TSN working domains is limited related to IEEE 802.1AS [104] for time synchronization procedure*"
IEEE Std 802.1AS-2020 is not limited to a single time domain but supports multiple time domains, i.e., gPTP domains. Perhaps the text could be updated to read: "This Release of the specification supports multiple gPTP domains."

NOTE 3:
"*it does not apply to interaction involving TSN AF and CNC*"
The intention with this statement is not clear.
If the intention is to make it clear that TSN AF does not act as a time-aware system, then perhaps the text could be updated to read: "The TSN AF does not participate in the gPTP time synchronization process."

NOTE 3:
"*The corresponding IEEE specifications (i.e. IEEE 802.1Q [98]) are supported only for one specific gPTP Domain and it is assumed that specific gPTP Domain is associated with IEEE 802.1Q [98].*"
It is not clear what this sentence means as IEEE Std 802.1Q does not select any specific gPTP domain. It is not clear either which part of IEEE Std 802.1Q is referred to here. If the intention is to refer to transmission gates and stream gates operating based on a single time scale, then the sentence could be updated to: "If the 5GS supports transmission gates or the stream gates, then they operate based on a single given gPTP domain."

Clause 5.27.1a

"*Support for hold & forward buffering mechanism*"
Adding a reference to 5.27.4 may be useful.

Clause 5.27.2

"*TSC assistance information describes TSC traffic characteristics for use in the 5G System.*"
There doesn't seem to be an explanation that the only TSC traffic type considered is constant bit rate periodic traffic (where periodic means: repeating continuously, with a constant time (the period) between each occurrence) also further assuming that there is a single burst of back-to-back packets in each period.

"*TSN stream traffic characteristics according to IEEE 802.1Q [98] clause 8.6.5.1"*
It is not clear what is meant here because TSN stream traffic characteristics are not specified in subclause 8.6.5.1 of IEEE Std 802.1Q.

"The TSN AF is responsible for obtaining PSFP (IEEE 802.1Q [98]) parameters"
It is not clear how TSN AF obtains PSFP parameters. (It is not entirely clear which PSFP parameters are relevant.) Note that the CNC is in control of a network not a bridge. That is, the CNC explores the capabilities and characteristics of the bridges and then configures them as needed for the support of the TSN streams. It is not a bridge that requests configuration, but the CNC invokes configuration when needed. So, if a 5G logical bridge claims support of PSFP, then the CNC decides how to use it and

configure it for the support of streams (e.g., based on policies provided by engineering, the streams to be supported, topology, etc.).

"*TSCAI Burst Arrival Time as the sum of TSN QoS Burst Arrival Time*"
TSCAI Burst Arrival Time and TSN QoS Burst Arrival Time are distinguished, however, it is not clear what they are, what is the difference between them.

"*In the case of drift between TSN time and 5G time*"
Perhaps both TSN time and 5G time could be more precise. Neither one is defined in the document.

"*Periodicity: It refers to the time period between start of two bursts.*"
Is "burst" a burst of back-to-back packets? Or can there be any gap between two consecutive packets belonging to the same burst? Perhaps "burst of back-to-back packets" would be more precise. Note that "start of burst" is not precise either. It is not clear what is exactly the "start". It may be good to clarify what is the start of a burst, e.g., the first bit of the first packet of the burst.

"*The arrival time of the data burst*"
This could be more precise, e.g.: "the time of arrival of the first bit of the first packet of a data burst". It could be also added which time scale is considered.

Clause 5.27.3
"*bridge delay capabilities reported for the corresponding traffic class*"
This is the first occurrence of "bridge delay." Perhaps it would be useful to add a reference to where it is explained more in detail.

Clause 5.27.5

"*5G System to participate as a TSN bridge according to gate schedules specified*"
It is not entirely clear whether "gate" refers to transmission gate or stream gate. It may be good to use the IEEE Std 802.1Q terms "transmission gate" and "stream gate" throughout the document.

Clause 5.28.1

"*In order to support TSN traffic scheduling over 5GS Bridge*"
It is not entirely clear whether "TSN traffic scheduling" refers to scheduling of TSN traffic on the radio or "scheduled traffic" as specified by 8.6.4.8 in IEEE Std 802.1Q. If it is the latter, then it could be clarified by using the term "scheduled traffic" used in IEEE Std 802.1Q and adding a reference to the appropriate subclause of IEEE Std 802.1Q.

"*Maximum number of filters, which defines the maximum number of streams that the bridge can handle*"
It may be better to use the IEEE Std 802.1Q specification:
MaxStreamFilterInstances: The maximum number of Stream Filter instances supported by the bridge

"*Maximum number of gates , which can be equal or less than the maximum number of filters*"
It may be better to use the IEEE Std 802.1Q specification:
MaxStreamGateInstances: The maximum number of Stream Gate instances supported by the bridge

"*Maximum number of meters (optional) if meassurements are required*"
It may be better to use the IEEE Std 802.1Q specification:

MaxFlowMeterInstances: The maximum number of Flow Meter instances supported by the bridge

"*Maximum length of the PSFPAdminControlList parameter that can be handled*"
It may be better to use the IEEE Std 802.1Q specification:
SupportedListMax: The maximum value supported by this Bridge component of the AdminControlListLength and OperControlListLength parameters. It is available for use by schedule computation software to determine the Bridge component's control list capacity prior to computation.

"*The SMF report the MAC address of the DS-TT port of the related PDU Session to TSN AF*"
This text suggests that each DS-TT (DS-TT port?) has its own MAC address. Is it really necessary? DS-TT seems to be just a transit functionality, neither destination nor source. Perhaps it may be good to explain the need for individual MAC addresses for DS-TTs.

"*With the Traffic forwarding information as defined in IEEE 802.1Q [98] clause 8.8.1 and PSFP information as defined in IEEE 802.1Q [98] clause 8.6.5.1*"
It is not clear what PSFP information is meant here. PSFP includes multiple components, e.g., stream filter, stream gate, etc. It is not clear here which functionality of PSFP the text is about.

"*TSN AF identifies the ingress port and egress port for a stream*"
It is not explained how ingress port and egress port are identified for a stream. Note that IEEE Std 802.1CB defines multiple stream identification possibilities.

"*derives the DS-TT MAC*"
It is not clear how DS-TT MAC address could be determined from the information available.

"*The TSN AF uses PSFP information as defined in IEEE 802.1Q [98] clause 8.6.5.1 to derive the TSN QoS information for UL traffic*"
It is not clear what is meant by PSFP information (given the multiple components of PSFP) or by TSN QoS. In other words, it is not clear what information is derived from what other information, and how.

Clause 5.28.3.1

NOTE 10:
"*TSN AF uses the PSFP information at TSN bridge configuration time to identify the DS-TT MAC address of the PDU Session*"
It is not clear how the DS-TT MAC address is retrieved from PSFP. PSFP may include the MAC address as part of stream identification. However, this MAC address is likely not the MAC address of the DS-TT.

Clause 5.28.4

"*Traffic Class Table"*
Perhaps more specific references may be useful, e.g., subclause 12.6.3 in IEEE Std 802.1Q for Traffic Class Table.

"*Once the CNC has received the necessary information*"
CNC rather retrieves the information from bridges than receives it. As its name suggests, CNC is in charge of the control of the network, not of the bridges.

"*the traffic class of the port*"

A port has no specific traffic class. A port supports up to eight traffic classes.

"*If the Maximum Burst Size of the aggregated TSC streams in the traffic class is provided by CNC*"
It is not clear how the CNC would provide the Maximum Burst Size. Maximum Burst Size is not specified in IEEE Std 802.1Qcc.

References

"*[95] IEEE P802.1Qcc: "Standard for Local and metropolitan area networks - Bridges and Bridged Networks - Amendment: Stream Reservation Protocol (SRP) Enhancements and Performance Improvements".*
It is an outdated reference. It should be updated to:
[95] IEEE Std 802.1Qcc-2018: "IEEE Standard for Local and metropolitan area networks - Bridges and Bridged Networks - Amendment: Stream Reservation Protocol (SRP) Enhancements and Performance Improvements".

"*[98] IEEE P802.1Q: "Standard for Local and metropolitan area networks--Bridges and Bridged Networks*"
It is an outdated reference. It should be updated to:
"[98] IEEE Std 802.1Q-2018: "IEEE Standard for Local and metropolitan area networks--Bridges and Bridged Networks"."

"*[104] IEEE Std 802.1AS-Rev/D7.3, August 2018: "IEEE Standard for Local and metropolitan area networks--Timing and Synchronization for Time-Sensitive Applications".*"
It is an outdated reference. It should be updated to:
[104] IEEE Std 802.1AS-2020: "IEEE Standard for Local and metropolitan area networks--Timing and Synchronization for Time-Sensitive Applications".

3GPP TS 23.502

Clause 4.3.2.2.1

"*serving NW-TT Ethernet port(s)*"
"serving NW-TT Ethernet port(s)" is defined neither in this document nor in 3GPP TS 23.501. "serving NW-TT Ethernet port(s)" appears four times in this document, but it is not clear what it means.

F2

The comments made on "TSN clock" in 3GPP TS.23.501 are applicable here too.

Item 1.:
The comments made on the same text in 3GPP TS.23.501 are applicable here too.

Item 5.:
"*If needed, the TSN CP provides additional information (e.g. the gate control list as defined in IEEE 802.1Qbv [67]) to the TSN AF.*"
It is not clear what is meant by "If needed": perhaps if transmission gates are supported. If that is the case, then the sentence could be updated, e.g., to: "If transmission gates are supported by the 5GS, then

the CNC configures the transmission gates, e.g., provides the gate control list as specified in subclause 8.6.8.4 in IEEE Std 802.1Q-2018."

3GPP TS 23.503

Clause 6.1.3.23

"*virtual TSN bridge*"
3GPP TS 23.501 uses "logical bridge".

"*The TSN AF may use this information to construct IEEE managed objects, to interwork with IEEE TSN networks.*"
IEEE is broad. It would be more precise to say: "The TSN AF may use this information to construct IEEE 802.1 managed objects, to interwork with IEEE 802.1 TSN networks."

References:
[104] points to IEEE Std 802.1AS-Rev/D7.3. This should be updated to 802.1AS-2020 (currently in the IEEE publishing process).

[107] points to IEEE Std 1588-2008. If desired, this could be updated to point to IEEE Std 1588-2019 (currently in the IEEE publishing process).