**3GPP TSG-CT3 Meeting #135C3-243380**

**Hyderabad, India, 27 - 31 May, 2024**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **29.513** | **CR** | **0553** | **rev** |  | **Current version:** | **18.5.0** |  |
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| *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:*** | Corrections to the conditions for reporting of the MTU size | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Intel | | | | | | | | | |
| ***Source to TSG:*** | CT3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | DetNet, IIoT | | | | |  | ***Date:*** | | | 2024-05-20 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | TS 29.512 clause 4.2.4.23 specifies that reporting of the MTU size within TSC user plane node management information is only applicable if the PCF supports the feature "MTU\_Size":  *"The Policy Control Request Trigger condition "TSN\_BRIDGE\_INFO" is met when:*   1. *the SMF detects new TSC user plane node port (the UE has indicated support of transferring Port Management Information Containers, or SMF local configuration for the given DNN, S-NSSAI indicates support for Deterministic Networking). The SMF shall send to the PCF, if available:*   *[..]*  *- in case of Deterministic Networking, for the device side port number of the PDU session, and when the feature "MTU\_Size" is supported, the MTU size (as specified in IETF RFC 8344 [56]) for IPv4 and/or IPv6 encoded in the "mtuIpv4" and/or "mtuIpv6" attributes respectively,*  *within the SmPolicyUpdateContextData structure encoded in the "tsnBridgeInfo" attribute of the TsnBridgeInfo data type; and/or [..]"*  Accordingly, this CR proposes to update the condition for the reporting of the MTU size. Furthermore it is proposed to only use the term "TSN\_BRIDGE\_INFO" event instead of BRIDGE\_INFO in alignment with TS 29.512. | | | | | | | | |
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| ***Summary of change:*** | | Update the condition for the reporting of the MTU size. Use of the term "TSN\_BRIDGE\_INFO" event instead of BRIDGE\_INFO in alignment with TS 29.512. | | | | | | | | |
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| ***Consequences if not approved:*** | | Inconsistent specification. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.2.2.3, 5.5.11.2, 5.5.12.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 \* \* \* \*

#### 5.2.2.3 SM Policy Association Modification initiated by the SMF

This procedure is performed when the SMF observes some policy control trigger condition is met or a PCC rule error is reported.

For the integration with TSC networks the AF represented in the figures is either the TSN AF (integration with IEEE TSN networks) or the TSCTSF (integration with other TSC networks than IEEE TSN).



Figure 5.2.2.3-1: SMF-initiated SM Policy Association Modification procedure

1. The SMF detects a policy control request trigger condition is met or an error is reported.

2. The SMF invokes the Npcf\_SMPolicyControl\_Update service operation to the PCF by sending the HTTP POST request to the "Individual SM Policy" resource with information on the conditions that have changed or a PCC rule error occurs.

If the feature "TimeSensitiveNetworking" or "TimeSensitiveCommunication" is supported and the "TSN\_BRIDGE\_INFO" policy control request trigger is provisioned in the SMF, the SMF may provide during PDU session establishment TSC user plane node information (port number for the device side corresponding to the PDU session, DS-TT MAC address, if applicable, TSC user plane node Id and UE-DS-TT residence time, if available), and, if available, a UMIC and/or one or more PMIC(s) to the PCF, or, during PDU session modification procedures, updated UMIC and/or PMIC(s). In case of Deterministic Networking and if the feature "MTU\_Size" is supported, the SMF may also provide the MTU size for IPv4 and the MTU size for IPv6 as part of TSC user plane node information.

3. If the (H-)PCF requires subscription-related information and does not have it, the (H-)PCF invokes the Nudr\_DataRepository\_Query service operation to the UDR by sending the HTTP GET request to the "SessionManagementPolicyData" resource to fetch the information. When the "NetSliceRepl" feature defined in 3GPP TS 29.512 [9] is supported and the Alternative S-NSSAI is received in the request, the PCF may also retrieve the subscription data for the Alternative S-NSSAI, when applicable.

If the AfGuideTNAPs feature defined in 3GPP TS 29.512 [9] is supported and the (H-)PCF requires Service Parameter data and does not have it, the (H-)PCF invokes the Nudr\_DataRepository\_Query service operation to the UDR by sending the HTTP GET request to the "Service Parameter Data" resource to fetch the information.

Additionally, when network slice data rate related policy control is supported by the PCF, the PCF may invoke the Nudr\_DataRepository\_Query service operation towards the UDR by sending an HTTP GET request targeting the "SlicePolicyControlData" resource.

Additionally, when group data rate related policy control is supported by the PCF for the 5G VN Group:

- if the Maximum Group Data Rate information for the 5G VN Group is provisioned by the AF, the PCF may receive the newly provisioned or updated Maximum Group Data Rate information of the 5G VN Group from the UDR (for "Subscription Data") as part of the 5G VN Group configuration information, using the same mechanism as the one defined for UE Policy Control procedures in steps 2-3 of clause 5.6.1.2; and

- the PCF may invoke the Nudr\_DataRepository\_Query service operation of the UDR (for "Policy Data") by sending an HTTP GET request, targeting the "GroupPolicyControlData" resource, to retrieve the Remaining Maximum Group Data Rate information for the concerned 5G VN Group, as specified in clause 5.2.19 of 3GPP TS 29.519 [12].

4. The UDR sends an HTTP "200 OK" response to the PCF with the subscription related information containing the information about the allowed service(s) and PCC Rules information.

NOTE 1: If the Npcf\_SMPolicyControl\_Update message of step 2 includes usage report(s), the (H-)PCF can also invoke the Nudr\_DataRepository\_Update service operation by sending an HTTP PATCH request to the "SessionManagementPolicyData" resource in order to update the usage monitoring information according to the received usage report(s). If "NetSliceRepl" feature defined in 3GPP TS 29.512 [9] is supported and the PCF received the "NET\_SLICE\_REPL" policy control request trigger in step 2, the (H-)PCF can invoke the Nudr\_DataRepository\_Update service operation to store the remaining usage allowance for either the initial S-NSSAI or the Alternative S-NSSAI.NOTE 2: If the Npcf\_SMPolicyControl\_Update message of step 2 includes the outcome of the resource allocation and network slice data rate policy control is supported, the (H-)PCF can also invoke the Nudr\_DataRepository\_Update service operation by sending an HTTP PATCH request targeting the "SlicePolicyControlData" resource in order to update the Remaining Maximum Slice Data Rate information.

NOTE 3: If the Npcf\_SMPolicyControl\_Update message of step 2 includes the outcome of the resource allocation and group data rate policy control is supported and shall apply for a 5G VN Group, the (H-)PCF can also invoke the Nudr\_DataRepository\_Update service operation by sending an HTTP PATCH request targeting the "GroupPolicyControlData" resource in order to update the Remaining Maximum Group Data Rate information.

5. If the feature "EpsUrsp" is supported:

a. if the PCF received in step 1 a UE Policy Container as described in 3GPP TS 29.512 [9], and:

i. there is no UE Policy Association established for the UE, the PCF triggers a UE Policy Association Establishment procedure as described in clause 5.6.1; or

ii. there is a UE Policy Association established for the UE, the PCF triggers a UE Policy Association Update procedure as described in clause 5.6.2.1; or

b. if the PCF received in step 1 a RAT type and/or Access Type change event as described in 3GPP TS 29.512 [9], and:

i. the PCF determines that 5GS to EPS mobility applies as described in 3GPP TS 29.525 [31], the PCF retrieves from the BSF the PCF for the UE handling the UE policy association with the source AMF and triggers a UE Policy Association Establishment procedure as described in clause 5.6.1; or

ii. the PCF determines that EPS to 5GS mobility applies, the PCF triggers a UE Policy Association Termination procedure as described in clause 5.6.3.2.

NOTE 4: In the Home Routed case, the PCF interacts with the H-PCF for the UE and, in the LBO case, the PCF in the V-PLMN interacts with the V-PCF for the UE as described in clause 4.2.2.1 of 3GPP TS 29.525 [31].

6. The PCF invokes the Npcf\_PolicyAuthorization\_Notify service operation to indicate that an event for which the AF requested a notification has occurred by sending the HTTP POST request with "{notifUri}/notify" as the callback URI to the AF or to request to the AF the deletion of the active application session if all the service data flows for the AF session are deleted by sending the HTTP POST request with "{notifUri}/terminate" as the callback URI to the AF.

If the feature "TimeSensitiveNetworking" or "TimeSensitiveCommunication" is supported:

- When the PCF detects that there is no Individual Application Session Context resource bound to the Individual SM Policy resource the PCF shall provide the new TSC user plane node information received in step 2 to the TSN AF or TSCTSF by sending an HTTP POST request to the "{notifUri}/new-bridge" request URI, where the "{notifUri}" value is pre-configured in the PCF or, if not pre-configured, discovered by invoking the Nnrf\_NFDiscovery service as defined in 3GPP TS 29.510 [51].

NOTE 5: The TSCTSF registers in the NRF the notification URI within the default notification subscription for time sensitive communication, time synchronization and deterministic networking notifications as described in 3GPP TS 29.510 [51].

- When the PCF detects that there is an Individual Application Session Context resource bound to the Individual SM Policy resource, the PCF shall provide the received UMIC and/or PMICs to the AF by sending an HTTP POST request to the "{notifUri}/notify" callback URI.

When the PCF as a PCF for a PDU session becomes aware that a SM Policy Association that is being modified is receiving the callback URI of the PCF for a UE in step 2, the PCF shall send the event of PDU session established to the PCF for a UE by sending an HTTP POST request to the "{notifUri}/pdu-session" callback URI as defined in subclause 4.2.5.22 of 3GPP TS 29.514 [10].

6a. If the AF requested a notification of the corresponding event, the PCF sends a Diameter RAR with the Specific-Action AVP set to indicate the event that caused the request. If all service data flows for an AF session are deleted, the PCF sends a Diameter ASR to request to the AF the termination of the active session.

7. The AF sends an HTTP "204 No Content" response to the PCF.

If the feature "TimeSensitiveNetworking" or "TimeSensitiveCommunication" is supported and the TSN AF or TSCTSF received the notification of new TSC user plan node information over the "{notifUri}/new-bridge" request URI, the TSN AF or TSCTSF shall trigger the Npcf\_PolicyAuthorization\_Create service operation as described in clause 5.2.2.2.2.1, to request the creation of a new Individual Application Session Context resource specific to the PDU session identified by, for Ethernet type of PDU sessions, the received MAC address of the DS-TT port and for IP type of PDU sessions, the received UE IP address.

NOTE 6: For the time synchronization service, the AF subscription to UE availability for time-synchronization service can occur after the PDU Session establishment has been completed in 5GS. Similarly, for the AF session with required QoS, the indication of the required QoS and TSC Assistance Container information can occur after the completion of the PDU session establishment. In such cases, the PCF sends the notification to the TSCTSF about the detection of a TSC user plane node information during PDU session establishment, but the TSCTSF doesn't have the time synchronization or required QoS available for the PDU session. In this case, the TSCTSF could defer the invocation of the Npcf\_PolicyAuthorization\_Create service operation till the reception of the subscription to UE availability for time synchronization or the AF session with required QoS occurs.

If the PCF for a UE receives the notification of PDU session establishment over the "{notifUri}/pdu-session" request URI and if the "ApplicationDetectionEvents" feature is supported, the PCF for a UE may trigger the Npcf\_PolicyAuthorization\_Subscribe service operation described in clause 4.2.6.9 to subscribe to the notification of the application detection;

7a. If the AF receives an event notification, the AF replies with a Diameter RAA and may provide within it updated service information. If the AF receives an indication that all service data flows for an AF session are deleted, the AF replies with a Diameter ASA.

8. If the PCF indicates in step 5 that an event for the active application session has occurred, the AF may invoke the Npcf\_PolicyAuthorization\_Update service operation to the PCF by sending the HTTP PATCH request to the "Individual Application Session Context" resource including the modified service information.

8a. If the PCF indicates in step 5a that an event for the active application session has occurred, the AF may send a Diameter AAR to the PCF including the modified service information.

9. The PCF sends an HTTP "200 OK" or an HTTP "204 No Content" response to the AF.

8a, The AF responds by sending a Diameter AAA to the PCF.

10. If the PCF indicates in step 5 that there are no transmission resources for the service, the AF may terminate the AF session by invoking the Npcf\_PolicyAuthorization\_Delete service operation by sending the HTTP POST request to the "Individual Application Session Context" resource to terminate the AF session. The request may include the events to subscribe to.

10a. The AF sends a Diameter STR message to the PCF to indicate that the AF session is terminated.

11. The PCF removes the AF application session context and sends an HTTP "204 No Content". If the PCF need to include the notification of event, it sends an HTTP "200 OK" response.

11a. The PCF responds by sending a Diameter STA message to the AF and the AF session is terminated.

12. If the PCF determines that the policy decision depends on the status of the policy counters available at the CHF and such reporting is not established for the subscriber, the PCF initiates an Initial Spending Limit Report as defined in clause 5.3.2. If policy counter status reporting is already established for the subscriber, and the PCF decides to modify the list of subscribed policy counters, the PCF sends an Intermediate Spending Limit Report as defined in clause 5.3.3. If the PCF decides to unsubscribe any future status notification of policy counters, it sends a Final Spending Limit Report Request to cancel the request for reporting the change of the status of the policy counters available at the CHF as defined in clause 5.3.4.

13. The PCF makes a policy decision. The PCF may determine that updated or new policy information needs to be sent to the SMF in step 22.

When group data rate related policy control is supported by the (H-)PCF and shall apply for a 5G VN Group and the Maximum Group Data Rate information for the 5G VN Group is provisioned by the AF, the (H-)PCF may receive the updated Maximum Group Data Rate information of the 5G VN Group from the UDR (for "Subscription Data") as part of the 5G VN Group configuration information, using the same mechanism as the one defined for UE Policy Control procedures as defined in steps 2-3 of clause 5.6.1.2.

14-15. If network slice data rate related policy control applies, the (H-)PCF may invoke the Nudr\_DataRepository\_Update service operation by sending an HTTP PATCH request targeting the "SlicePolicyControlData" resource in order to update the Remaining Maximum Slice Data Rate information.

Additionally, when group data rate related policy control is supported by the (H-)PCF and shall apply for the 5G VN Group, the (H-)PCF may invoke the Nudr\_DataRepository\_Update service operation of the UDR (for "Policy Data") by sending an HTTP PATCH request, targeting the "GroupPolicyControlData" resource, to update the Remaining Maximum Group Data Rate information for the 5G VN Group, as specified in clause 5.2.19 of 3GPP TS 29.519 [12].

If the BindingUpdate feature defined in 3GPP TS 29.521 [22] is supported, the steps 16 to 17 will be performed, otherwise the steps 18 to 21 will be performed.

16. If the UE address changes and the binding information has been previously registered in the BSF, or if the "ExtendedSamePcf" feature is supported, and the PCF registered binding information without including the UE address and UE address is received in step 2 and required for the retrieval of binding information by any NF (e.g. for PDU session binding), the PCF invokes the Nbsf\_Management\_Update service operation by sending an HTTP PATCH request to update the binding information in the BSF as detailed in clause 8.5.7.

17. The PCF receives an HTTP "200 OK" response from the BSF.

18. If the IP address is released for the IP PDU session or the MAC address is not used anymore for the Ethernet PDU session and the binding information has been previously registered in the BSF, the PCF invokes the Nbsf\_Management\_Deregister service operation by sending an HTTP DELETE request to the BSF to delete binding information as detailed in clause 8.5.3.

19. The PCF receives an HTTP "204 No Content" response from the BSF as detailed in clause 8.5.3.

20. If a new IP address is allocated for the IP PDU session or a new MAC address is used for the Ethernet PDU session and the BSF is to be used, or if the "ExtendedSamePcf" feature is supported, and the PCF registered binding information without including the UE address and UE address is received in step 2 and required for the retrieval of binding information by any NF, the PCF invokes the Nbsf\_Management\_Register service operation by sending an HTTP POST request to create the binding information in the BSF as detailed in clause 8.5.2.

21. The PCF receives an HTTP "201 Created" response from the BSF with the created binding information as detailed in clause 8.5.2.

22. The PCF sends an HTTP "200 OK" response to the SMF with updated policy information about the PDU Session determined in step 13.

If the feature "EpsUrsp" is supported, the PCF sends in the HTTP "200 OK" response to the SMF the UE policy container and/or the UE policy association triggers received from the PCF for the UE in step 5, if applicable.

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

#### 5.5.11.2 Exposure of UE availability and capabilities for Time Synchronization service

The procedure is used by the AF to subscribe to notifications and to explicitly cancel a previous subscription for UE availability for time synchronization service.



Figure 5.5.11.2-1: Exposure of UE availability and capabilities for Time Synchronization service

0. During SM Policy Association establishment, the PCF determines if the PDU Session is potentially impacted by time synchronization service (based on local configuration) and provides the "TSN\_BRIDGE\_INFO" policy control request trigger to the SMF as described in figure 5.2.1-1, step 11. During SM Policy Association modification (triggered during PDU session establishment), the SMF may report it to the PCF to provide TSC user plane node information (device side port number, DS-TT MAC address (to identify the PDU session), if applicable, TSC user plane node Id and UE-DS-TT residence time, if available), and, if available, a UMIC and/or one or more PMIC(s), as described in figure 5.2.2.3-1, step 2. For IP PDU sessions, the PCF uses the UE IP address to identify the PDU session. The PCF invokes the Npcf\_PolicyAuthorization\_Notify service operation to notify to the TSCTSF the received TSC user plane node information for the PDU session, and, if available, the received UMIC/PMIC(s), as described in figure 5.2.2.3-1, step 5.

The TSCTSF retrieves the UE SUPI from the BSF using the UE IP address, and may get from UDM Time Synchronization Subscription Data, that may contain either one or more subscribed time synchronization service Id(s) (that map to a PTP instance configuration in the TSCTSF for the DNN/S-NSSAI) or an indication that an AF-requested (g)PTP time synchronization service is allowed for the given UE and DNN/S-NSSAI.

If an AF-requested (g)PTP time synchronization service is allowed for the UE and DNN/S-NSSAI, the TSCTSF then invokes the Npcf\_PolicyAuthorization\_Create request message to the PCF as described in clause 5.2.2.2.2.1 to create an AF-session. The TSCTSF may subscribe with the PCF to the "TSN\_BRIDGE\_INFO" event, to get notifications abut PMIC/UMIC updates as specified in 3GPP TS 29.514 [10]. For IP PDU sessions, the TSCTSF stores the DNN, S-NSSAI and IP address as received from PCF and SUPI as received from BSF and associates them with the AF-session, as described in 3GPP TS 29.565 [60].

The received PMIC(s)/UMIC, if available, may contain (g)PTP instance configuration for the reported DS-TT/NW-TT.

If the TSCTSF retrieves from UDM one or more time synchronization service Id(s) matching PTP instance configuration for the DNN/S-NSSAI, the TSCTSF distributes the PTP instance configuration as described in clause 5.5.11.3.

1. To subscribe to notifications of the UE availability for time synchronization service, the AF invokes the Nnef\_TimeSynchronization\_CapsSubscribe service operation to the NEF by sending the HTTP POST request to the "Time Synchronization Exposure Subscriptions" resource as defined in 3GPP TS 29.522 [24].

To unsubscribe to the UE availability for time synchronization for a list of UE(s), the AF invokes Nnef\_TimeSynchronization\_CapsUnsubscribe service operation to the NEF by sending the HTTP DELETE request to the "Individual Time Synchronization Exposure Subscription" resource as defined in 3GPP TS 29.522 [24].

2. The NEF selects the TSCTSF and maps the received parameters to 5GC parameters, if applicable, as described in 3GPP TS 29.522 [24] and invokes the Ntsctsf\_TimeSynchronization\_CapsSubscribe service operation by sending the HTTP POST request to the "Time Synchronization Exposure" resource as described in 3GPP TS 29.565 [60].

In the case of Ntsctsf\_TimeSynchronization\_CapsUnsubscribe, the NEF interacts with the TSCTSF by sending an HTTP DELETE request to the "Individual Time Synchronization Exposure Subscription" resource as described in 3GPP TS 29.565 [60].

The AF that is part of operator's trust domain may invoke the requests directly to the TSCTSF.

3. If the request includes GPSI(s), an External Group Identifier or an Internal Group Identifier, the TSCTSF uses the Nudm\_SDM\_Get request as described in 3GPP TS 29.503 [61] to retrieve the subscription information for the target UEs (i.e., to retrieve the SUPI(s)) from the UDM, using each GPSI or the External Group Identifier as received from the NEF, or an Internal Group Identifier as provided directly by the AF).

For the retrieved SUPI(s), the TSCTSF requests the Time Synchronization Subscription Data from the UDM if not previously retrieved in step 0, to validate whether the AF request for (g)PTP-based time distribution for the DNN and S-NSSAI is allowed by the UE subscription.

4. The TSCTSF uses the parameters received in step 2 and step 3 (i.e. DNN, S-NSSAI and SUPI(s)) to find matching AF-session(s) as described in 3GPP TS 29.565 [60].

If the subscription data for the UE indicates that the AF is not allowed to request (g)PTP-based time synchronization for this UE, DNN and S-NSSAI combination, the corresponding AF-session is excluded from the list of matching AF-sessions.

For any AF-session in the list of matching AF-session(s), the TSCTSF interacts with the PCF by triggering a Npcf\_PolicyAuthorization\_Update request message as specified in 3GPP TS 29.514 [10], to provide/retrieve UMIC/PMIC information, if not available in the TSCTSF, from the NW-TT/DS-TT to read the (g)PTP capabilities as specified in 3GPP TS 23.501 [2], K.2.2.1

In the case of Ntsctsf\_TimeSynchronization\_CapsUnsubscribe, the TSCTSF, for the AF-session(s) in the list of matching AF-session(s), triggers a Npcf\_PolicyAuthorization\_Delete request message as specified in 3GPP TS 29.514 [10], deletes the corresponding "Individual Time Synchronization Exposure Subscription" resource and responds to the NEF (or AF) with a "204 No Content" status code. Steps 4-5 and 8-16 are skipped.

5. The PCF responds with a "200 OK" or "204 No Content" status code to the received PATCH request.

6. TSCTSF acknowledges the execution of Ntsctsf\_TimeSynchronization\_CapsSubscribe to the requester that initiated the request (NEF or AF) by sending a "201 Created" status code.

When the request was to unsubscribe to the UE availability for time synchronization, the TSCTSF deletes the corresponding "Individual Time Synchronization Exposure Subscription" resource and responds to the NEF with a "204 No Content" status code.

7. NEF acknowledges the execution of Nnef\_TimeSynchronization\_CapsSubscribe to the AF by sending a "201 Created" status code.

When the request was to unsubscribe to the UE availability for time synchronization, the NEF deletes the corresponding "Individual Time Synchronization Exposure Subscription" resource and responds to the AF with a "204 No Content" status code.

8 For each AF-session for which the TSCTSF triggered the Npcf\_PolicyAuthorization\_Update request as described in step 4, the PCF provides to the SMF the UMIC/PMIC information received from the TSCTSF and for the concerned PDU session as described in clause 5.2.2.2.2.2.

9 When the SMF detects UMIC/PMIC changes for the NW-TT/DS-TT for each concerned PDU sessions, the SMF provides the updated UMIC/PMIC information to the PCF as described in clause 5.2.2.3.

10. The TSCTSF receives UMIC/PMIC information from NW-TT/DS-TT ports from the PCF, with the notification of the "TSN\_BRIDGE\_INFO" event as specified in 3GPP TS 29.514 [10]. The PCF invokes the Npcf\_PolicyAuthorization\_Notify service operation by sending an HTTP POST request to the callback URI as specified in clause 5.2.2.3.

11. The TSCTSF responds to the PCF with a "204 No Content" status code.

12. The TSCTSF uses the procedures described in clause K.2.1 of TS 23.501 [2] to determine the (g)PTP capabilities from the DS-TT and, if not previously determined, the (g)PTP capabilities from the NW-TT.

The TSCTSF composes the time synchronization capabilities for the DS-TT/UE(s) connected to the NW-TT based on the capability information received from the DS-TT(s) and NW-TT for each AF-session. If the Ntsctsf\_TimeSynchronization\_CapsSubscribe request included an Event Filter with one or more of the requested PTP instance type, requested transport protocol for PTP, or requested PTP Profile, the TSCTSF considers only the DS-TT(s) and NW-TT(s) with these capabilities as part of the time synchronization capability set that is reported to the NEF (or AF).

The TSCTSF maintains, for the "Individual Time Synchronization Exposure Subscription" resource, the association between the user-plane Node ID, the time synchronization capabilities, the Event Filter(s) (if available), the NEF or AF Notification Target Address and list of the matching AF-sessions with PCFs with this user-plane Node ID.

13. The TSCTSF sends Ntsctsf\_TimeSynchronization\_CapsNotify to the NEF by invoking the HTTP POST request, as described in 3GPP TS 29.565 [60]. The message includes the time synchronization capabilities as composed for all the matching AF-sessions in step 12. The message contains one or more user-plane Node ID(s), a list of UE identities associated to each user-plane Node ID and time synchronization capabilities for each set of DS-TTs (UEs) connected to given user-plane Node ID. The user-plane Node ID identifies the NW-TT to where the UE/DS-TT(s) are connected to.

14. The NEF responds to the PCF with a "204 No Content" status code.

15. The NEF forwards the Nnef\_TimeSynchronization\_CapsNotify with Time Synchronization capability event to the AF by invoking the HTTP POST request as described in 3GPP TS 29.522 [24].

16. The AF responds the NEF with a "204 No Content" status code.

At PDU Session Establishment as defined is step 0, steps 3-5 and steps 8-16 are repeated for the new PDU Session/AF-session and the TSCTSF may notify the NEF (or AF) for the Time Synchronization capability event, optionally with the updated time synchronization capabilities.

Upon PDU Session release indication from a PCF, the TSCTSF removes the corresponding AF-session from the list of AF-sessions associated with the time synchronization exposure subscription resource, once the corresponding AF-session is removed from the list of AF-sessions associated with the time synchronization configuration, as described in clause 5.5.11.3. The changes in the set of capabilities are notified to the NEF and AF as described in steps 13 to 16.

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

#### 5.5.12.2 5GS DetNet node information reporting

The TSCTSF may provide exposure information to the DetNet controller using information collected from the UPF/NW-TT via parameters in PMIC, and for the device side ports, using parameters provided from the SMF to the TSCTSF via PCF, as described in figure 5.5.12.2-1.



Figure 5.5.12.2-1: 5GS DetNet node information reporting

1. During SM Policy Association establishment, if the feature "TimeSensitiveCommunication" is supported, the PCF based on local configuration for the DNN and S-NSSAI determines that the SM Policy Association enables Deterministic Networking and provides to the SMF the "TSN\_BRIDGE\_INFO" policy control request trigger as described in figure 5.2.1-1, step 11.

When the trigger is met, the PCF receives the TSC User Plane information from the SMF (for DetNet it represents 5GS Router information) and the device side information: port number, User Plane node ID and, if available and the feature "MTU\_Size" is supported, MTU size for IPv4 and MTU size for IPv6 as described in figure 5.2.2.3-1, step 2. The PCF may also receive NW-TT PMIC (with network side interface configuration information). The PCF invokes the Npcf\_PolicyAuthorization\_Notify service operation to notify to the TSCTSF the received TSC User Plane information and the device side information, and if available, NW-TT PMIC(s)/UMIC, as described in figure 5.2.2.3-1, step 5 and includes the UE IP address to identify the PDU session.

During SM Policy Association establishment (clause 5.2.1), and when Framed Routes applies, the PCF receives Framed Route information from the SMF during SM Policy Association creation. During SM Policy Association update (figure 5.2.2.3), and when prefix delegation applies, the SMF reports to the PCF the prefix delegated to the UE by IPv6 prefix delegation.

2. The TSCTSF then invokes the Npcf\_PolicyAuthorization\_Create request message to the PCF as described in clause 5.2.2.2.2.1 to create an AF-session. The TSCTSF shall subscribe with the PCF to the "TSN\_BRIDGE\_INFO" event, to get notifications about NW-TT PMIC(s)/UMIC updates as specified in 3GPP TS 29.514 [10].

If the "ExtraUEaddrReport" feature is supported, the TSCTSF shall subscribe to the "EXTRA\_UE\_ADDR" event to receive information about the one or more Framed Routes available for the PDU session or about the IPv6 prefixes delegated to the UE by IPv6 Prefix Delegation.

Using the User Plane node Id received in step 1, the TSCTSF may subscribe with the NW-TT to receive UMIC information for the indicated User Plane node Id, if not previously received, by provisioning the concerned UMIC container.

3. If the information is available in the PCF, the PCF returns the event related information in the Npcf\_PolicyAuthorization\_Create response (e.g. framed route information, if the TSCTSF subscribed to notifications on reporting of extra addresses, and frame routes are available).

The TSCTSF stores the DNN, S-NSSAI and IP address(es) as received from PCF and associates them with the AF-session, as described in 3GPP TS 29.565 [60].

If the TSCTSF determines the interface configuration information for the created AF-session is complete, the TSCTSF may report to the DetNet controller the collected interface(s) information as described in step 12.

4. The PCF subscribes to UMIC changes with the SMF:

4.1 The PCF provides to the SMF the UMIC information received from the TSCTSF as described in clause 5.2.2.2.2.2, and the SMF sends the received UMIC to the NW-TT/UPF.

4.2 When the SMF receives the UMIC reported from the UPF/NW-TT, the SMF provides the received UMIC information to the PCF as described in clause 5.2.2.3.

5. The TSCTSF receives from the PCF the notification of the "TSN\_BRIDGE\_INFO" event, as specified in 3GPP TS 29.514 [10], containing the UMIC information with the NW-TT ports of the indicated User Plane node Id. The PCF invokes the Npcf\_PolicyAuthorization\_Notify service operation by sending an HTTP POST request to the callback URI as specified in clause 5.2.2.3.

6. The TSCTSF responds to the PCF with a "204 No Content" status code.

7. The TSCTSF shall request PMIC information from the NW-TT using the User Plane node Id received in step 1 and the port number(s) received in step 5, to read network interface configuration for the indicated ports, as specified in 3GPP TS 23.501 [2]. The TSCTSF interacts with the PCF by triggering a Npcf\_PolicyAuthorization\_Update request message as specified in 3GPP TS 29.514 [10].

8. The PCF responds with a "200 OK" or "204 No Content" status code in response to the Npcf\_PolicyAuthorization request.

9. The PCF subscribes to PMIC changes from the SMF:

9.1. The PCF provides to the SMF the PMIC information received from the TSCTSF as described in clause 5.2.2.2.2.2, which sends the received PMIC to the NW-TT/UPF.

9.2 When the SMF detects PMIC changes for the NW-TT, the SMF provides the received PMIC information to the PCF as described in clause 5.2.2.3.

10. The TSCTSF receives the PMIC information from the NW-TT ports via the PCF with the notification of the "TSN\_BRIDGE\_INFO" event, as specified in 3GPP TS 29.514 [10]. The PCF invokes the Npcf\_PolicyAuthorization\_Notify service operation by sending an HTTP POST request to the callback URI as specified in clause 5.2.2.3.

11. The TSCTSF responds to the PCF with a "204 No Content" status code.

12. After the TSCTSF determines that the interface information for the AF session is complete, the TSCTSF may provide the collected network and device side interface configuration to the DetNet controller as defined in 3GPP TS 23.501 [2].

When both, the TSCTSF and the DetNet controller support the 3GPP Extension 3gpp-5gs-detnet-node as specified in 3GPP TS 29.565 [60], the TSCTSF may use the user-plane node ID received in step 1 to generate an identifier of the 5GS DetNet node and provide it to the DetNet controller.

NOTE: The 5GS node identification can be realized by providing an identifier of the 5GS DetNet node to the DetNet controller using the exposure of 5GS DetNet node identification specified in the 3GPP Extension 3gpp-5gs-detnet-node in 3GPP TS 29.565 [60], or the TSCTSF can provide different termination points (addresses) for the signalling between the DetNet controller and the TSCTSF, each one representing different 5GS nodes.

\* \* \* End Change \* \* \* \*