**3GPP TSG-CT3 Meeting #113e C3-210207r1**

**E-Meeting, 25th – 29th January 2021**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **29.513** | **CR** | **0234** | **rev** | **1** | **Current version:** | **17.1.0** |  |
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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:*** | Removal of resource URI from Notify service operations | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | C3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | SBIProtoc17 | | | | |  | ***Date:*** | | | 2021-01-07 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | In some procedures describing Notify service operations it is specified that a Notify service operation is invoked by sending HTTP POST request to a resource URI which is wrong and needs to be corrected.  TS 29.501, clause 4.4.3 specifies:  "*The purpose of the callback URI is to enable NF service consumer to provide the URI to be used by an NF Service Producer to send notification or callback requests.*"  Also in CT3 SBI TSs in tables describing notifications a callback URI is used.  Therefore in steps describing Notify service operations the resource URI should be replaced with the callback URI. | | | | | | | | |
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| ***Summary of change:*** | | In steps describing Notify service operations the resource URI is replaced with the callback URI. | | | | | | | | |
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| ***Consequences if not approved:*** | | Incorrect specification. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.1.2.2, 5.1.3.2, 5.2.2.2.1, 5.2.2.3, 5.2.3.2, 5.5.3.2, 5.5.3.3, 5.5.5, 5.5.6, 5.5.7, 5.5.8, 5.6.2.2.2, 5.6.2.2.3, 5.6.3.2.2, 5.6.3.2.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | | Description of steps 7-8 from clause 5.5.5 is not corrected since these steps are deleted by CR #0231. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**Additional discussion(if needed):**

**…**

**Proposed changes:**

\*\*\* 1st Change \*\*\*

#### 5.1.2.2 AM Policy Association Modification initiated by the PCF

This procedure is performed when the Access and Mobility control policies are changed.



Figure 5.1.2.2-1: PCF-initiated AM Policy Association Modification procedure

This procedure concerns both roaming and non-roaming scenarios.

In the non-roaming case the role of the V-PCF is performed by the PCF. For the roaming scenarios, the V-PCF interacts with the AMF.

1. The (V-) PCF receives an external trigger, e.g. the subscriber policy data of a UE is changed, or the (V-)PCF receives an internal trigger, e.g. operator policy is changed, to re-evaluate Access and Mobility control policy for a UE.

2. The (V-)PCF makes the policy decision including, Access and Mobility control policy, and may determine applicable Policy Control Request Trigger(s).

3. The (V-)PCF invokes the Npcf\_AMPolicyControl\_UpdateNotify service operation by sending the HTTP POST request with "{notificationUri}/update" as the callback URI to the AMF that has previously subscribed, as described in subclause 4.2.4.2 of 3GPP TS 29.507 [7].

4. The AMF sends an HTTP "204 No Content" response the PCF.

5. The AMF deploys the Access and Mobility control policy information if received which includes storing the Service Area Restrictions, provisioning the Service Area Restrictions to the UE and/or provisioning the RFSP index and Service Area Restrictions to the NG-RAN.

\*\*\* 2nd Change \*\*\*

#### 5.1.3.2 AM Policy Association Termination initiated by the PCF

This procedure is performed when the UDR notifies the PCF that the policy profile is removed or when the PCF decides to terminate the AM Policy Association based on the internal logic, e.g. UE movement triggers a geo-fencing rule.



Figure 5.1.3.2-1: PCF-initiated AM Policy Association Termination procedure

This procedure concerns both roaming and non-roaming scenarios.

In the non-roaming case the role of the V-PCF is performed by the PCF. For the roaming scenarios, the V-PCF interacts with the AMF.

Step 1, step 2 and step 3 are not executed in the roaming case or in the case that the PCF decides to terminate the AM Policy Association based on the internal logic.

1. The subscriber policy control data is removed from the UDR.

2. The UDR invokes the Nudr\_DataRepository\_Notify service operation to notify the PCF that the policy profile is removed if PCF has subscribed such notification by sending the HTTP POST request to the callback URI "{notificationUri}" as specified in 3GPP TS 29.519 [12].

3. The PCF sends the response to the Nudr\_DataRepository\_Notify service operation.

4. The (V-)PCF decides to terminate the AM Policy Association based on step 2 or an internal trigger, e.g. operator policy is changed, to re-evaluate Access and Mobility control policy for a UE.

5. The (V-)PCF may, depending on operator policies, invoke the Npcf\_AMPolicyControl\_UpdateNotify service operation towards the AMF to notify it of the removal of the Access and Mobility control policy control information by sending an HTTP POST request to the request URI "{notificationUri}/terminate" as described in subclause 4.2.4.3 of 3GPP TS 29.507 [7].

Alternatively, the (V-)PCF may decide to maintain the Policy Association if a default profile is applied, and then step 4 through 6 are not executed.

6. The AMF sends an HTTP "204 No Content" response to the PCF.

7. Step 1 through step 3 as specified in Figure 5.1.3.1-1 are executed with the following difference:

- the AMF removes the policy control request trigger(s) related to the AM policy association, but still keeps the provisioned AM policies and applies them to the UE.

\*\*\* 3rd Change \*\*\*

##### 5.2.2.2.1 Interactions between SMF, PCF and CHF

This procedure is performed when the PCF decides to modify policy decisions for a PDU session.



Figure 5.2.2.2-1: Interactions between SMF, PCF and CHF for PCF-initiated SM Policy Association Modification procedure

1. The PCF receives an internal or external trigger to re-evaluate PCC Rules and policy decision for a PDU Session. Possible external trigger events are described in subclause 5.2.2.2.2. In addition, this procedure is triggered by the following cases:

- The UDR notifies the PCF about a policy subscription change (e.g. change in MPS EPS Priority, MPS Priority Level, MCS Priority Level and/or IMS Signalling Priority, or change in user profile configuration indicating whether supporting application detection and control).

- The UDR notifies the PCF about application data change (e.g. change in AF influence data or IPTV configuration data).

- The CHF provides a Spending Limit Report to the PCF as described in subclause 5.3.5.

2. 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 subclause 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 subclause 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 subclause 5.3.4.

3. The PCF makes a policy decision. The PCF can determine that updated or new policy information need to be sent to the SMF.

4. The PCF invokes the Npcf\_SMPolicyControl\_UpdateNotify service operation by sending the HTTP POST request with "{notificationUri}/update" as the callback URI to the SMF that has previously subscribed. The request operation provides the PDU session ID and the updated policies, as described in subclause 4.2.3 of 3GPP TS 29.512 [9].

If the feature "TimeSensitiveNetworking" is supported and the PCF receives the TSCAI input information and QoS related data or a BMIC and/or one or more PMIC(s) from the AF, the PCF provisions them to the SMF.

5. The SMF sends an HTTP "200 OK" to the PCF.

\*\*\* 4th 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.



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" is supported and the "TSN\_BRIDGE\_INFO" policy control request trigger is provisioned in the SMF, the SMF may provide the new 5GS Bridge information, e.g. 5GS Bridge port information, a BMIC and/or one or more PMIC(s) to the PCF.

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.

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.

5. 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" is supported, the PCF may provide the new 5GS Bridge information received in step 2 to the AF.

5a. 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.

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

6a. 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.

7. 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.

7a. 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.

8. 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.

9. 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.

9a. The AF sends a Diameter STR message to the PCF to indicate that the AF session is terminated.

10. 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.

10a. The PCF responds by sending a Diameter STA message to the AF and the AF session is terminated.

11. 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 subclause 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 subclause 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 subclause 5.3.4.

12. 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 19.

If the BindingUpdate feature defined in 3GPP TS 29.521 [22] is supported, the steps 13 to 14 will be performed, otherwise the steps 15 to 18 will be performed.

13. If the UE address changes and the binding information has been previously registered in the BSF, 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 subclause 8.5.7.

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

15. 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 subclause 8.5.3.

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

17. 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, 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 subclause 8.5.2.

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

19. The PCF sends an HTTP "200 OK" response to the SMF with updated policy information about the PDU Session determined in step 12.

\*\*\* 5th Change \*\*\*

#### 5.2.3.1 SM Policy Association Termination initiated by the SMF

This procedure is performed when the UE requests to terminate a PDU session or based on some internal triggers in the SMF(e.g. operator policy).



Figure 5.2.3.1-1: SMF-initiated SM Policy Association Termination procedure

This procedure concerns both roaming and non-roaming scenarios.

In the LBO roaming case, the PCF acts as the V-PCF, and the step 8, steps 10 - step 13 shall be skipped. In the home routed roaming case, the PCF acts as the H-PCF, and the H-PCF interacts only with the H-SMF.

1. The SMF invokes the Npcf\_SMPolicyControl\_Delete service operation by sending the HTTP POST request to the "Individual SM Policy" resource to request the PCF to delete the context of the SM related policy as defined in subclause 4.2.5.2 of 3GPP TS 29.512 [9]. The request operation may include usage monitoring information (if applicable) and access network information.

2. Upon receipt of Npcf\_SMPolicyControl\_Delete service operation, the PCF identifies the PCC Rules that require an AF to be notified and removes PCC Rules for the PDU Session.

3. The SMF removes all the PCC Rules which are applied to the PDU session.

4. The PCF invokes the Npcf\_PolicyAuthorization\_Notify service operation by sending the HTTP POST request with "{notifUri}/terminate" as the callback URI to the AF to trigger the AF to request the application session context termination.

4a. The PCF indicates the session abort to the AF by sending a diameter ASR to the AF.

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

5a. The AF responds by sending a diameter ASA to the PCF.

6. The AF invokes the Npcf\_PolicyAuthorization\_Delete service operation by sending the HTTP POST request to the "Individual Application Session Context" resource. The request may include the events to subscribe to.

6a. The AF sends a diameter STR to the PCF to indicate that the session has been terminated. The request may include the events to subscribe to.

7. The PCF removes the AF application session context and sends an HTTP "204 No Content" response to the AF. If the PCF needs to report usage data or the access network information, it sends an HTTP "200 OK" response. If usage thresholds were provided by the AF earlier, and the PCF has usage data that has not yet been reported to the AF, the PCF informs the AF about the resources that have been consumed by the user since the last report. If the SMF in step 1 reports the access network information and if the AF requested the PCF to report access network information in step 6 and/or the RAN-NAS-Cause feature is supported, the PCF informs the AF about the access network information. The PCF also deletes the subscription to PCF detected events for that AF application Session.

7a. The PCF responds by sending a diameter STA to the AF. If usage thresholds were provided by the AF earlier, and the PCF has usage data that has not yet been reported to the AF, the PCF informs the AF about the resources that have been consumed by the user since the last report. If the SMF in step 1 reports the access network information and if the AF requested the PCF to report access network information in step 6a and/or the RAN-NAS-Cause feature is supported, the PCF informs the AF about the access network information.

8. If this is the last PDU session for this subscriber the Final Spending Limit Report Request as defined in subclause 5.3.4 is sent. If any existing PDU sessions for this subscriber require policy counter status reporting, the Intermediate Spending Limit Report Request as defined in subclause 5.3.3 can be sent to alter the list of subscribed policy counters.

9. The PCF removes PCC Rules for the terminated PDU Session and sends an HTTP "204 No Content" response to the SMF.

10. The PCF invokes the Nudr\_DataRepository\_Update service operation by sending the HTTP PATCH request to the "SessionManagementPolicyData" resource to store the remaining usage allowance in the UDR, if all PDU sessions of the user to the same DNN and S-NSSAI are terminated.

11. The UDR sends an HTTP "204 No Content" response to the PCF.

12-13. To unsubscribe the notification of the PDU session related data modification from the UDR, the PCF invokes the Nudr\_DataRepository\_Unsubscribe service operation by sending the HTTP DELETE request to the "IndividualPolicyDataSubscription" resource if it has subscribed such notification. The UDR sends an HTTP "204 No Content" response to the PCF.

Additionally, to unsubscribe the notification of the AF influence data from the UDR, the PCF invokes the Nudr\_DataRepository\_Unsubscribe service operation by sending the HTTP DELETE request to the "Individual Influence Data Subscription" resource if it has subscribed such notification. The UDR sends an HTTP "204 No Content" response to the PCF.

14. In the case that 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 subclause 8.5.3.

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

\*\*\* 6th Change \*\*\*

#### 5.2.3.2 SM Policy Association Termination initiated by the PCF

This procedure is performed when the PCF requests to terminate a SM Policy Association based on some external or internal triggers as described in step 1 below.



Figure 5.2.3.2-1: PCF-initiated SM Policy Association Termination procedure

This procedure concerns both roaming and non-roaming scenarios.

In the LBO roaming case, the PCF acts as the V-PCF. In the home routed roaming case, the PCF acts as the H-PCF, and the H-PCF interacts only with the H-SMF.

1. The PCF makes policy decisions to terminate a PDU session based on an external trigger, e.g. UE subscription data is deleted, or based on an internal trigger, e.g. operator policy is changed.

2. The PCF sends the Npcf\_SMPolicyControl\_UpdateNotify service operation by sending the HTTP POST request with "{notificationUri}/delete" as the callback URI to trigger the SMF to request the release of the PDU session as defined in subclause 4.2.3.3 of 3GPP TS 29.512 [9]. The request includes resource URI of the individual SM policy to be deleted and the cause why the PCF requests the termination.

3. The SMF sends an HTTP "200 OK" response to the PCF.

4. The PCF interacts with SMF/AF/UDR/CHF/BSF according to Figure 5.2.3.1-1.

\*\*\* 7th Change \*\*\*

#### 5.5.3.2 AF requests targeting an individual UE address



Figure 5.5.3.2-1: Processing AF requests to influence traffic routing for Sessions identified by an UE address

1A. The AF sends the AF request to PCF via the NEF.

1a-1b. These steps are the same as steps 1-2 in Figure 5.5.3.3-1.

1c-1d. If the PCF address is not available on the NEF based on local configuration, the NEF invokes the Nbsf\_Management\_Discovery service operation, specified in subclause 8.5.4, to obtain the selected PCF ID for the ongoing PDU session identified by the individual UE address in the AF request.

1e-1f. The NEF forwards the AF request to the PCF.

When receiving the Nnef\_TrafficInfluence\_Create request in step 1a, the NEF invokes the Npcf\_PolicyAuthorization\_Create service operation by sending the HTTP POST request to the "Application Sessions" resource as described in subclause 5.2.2.2.2.1. If the "URLLC" feature defined in 3GPP TS 29.514 [10] is supported, and the indication of AF acknowledgement was received from the AF request, the NEF forwards the indication to the PCF as described in 3GPP TS 29.514 [10].

When receiving the Nnef\_TrafficInfluence\_Update request in step 1a, the NEF invokes the Npcf\_PolicyAuthorization\_Update service operation by sending the HTTP PATCH request to the "Individual Application Session Context" resource as described in subclause 5.2.2.2.2.2. If the "URLLC" feature defined in 3GPP TS 29.514 [10] is supported, and the indication of AF acknowledgement was received from the AF request, the NEF forwards the indication to the PCF as described in 3GPP TS 29.514 [10].

When receiving the Nnef\_TrafficInfluence\_Delete request in step 1a The NEF invokes the Npcf\_PolicyAuthorization\_Delete service operation by sending the HTTP POST request to the "Individual Application Session Context" resource as described in subclause 5.2.2.2.2.3.

1g The NEF sends the HTTP response message to the AF correspondingly.

1B. The AF sends the AF request to PCF directly.

1a-1b. If the PCF address is not available on the AF based on local configuration, the AF invokes the Nbsf\_Management\_Discovery service operation, as specified in subclause 8.5.4, to obtain the selected PCF ID for the ongoing PDU session identified by the individual UE address in its request.

1c-1d. To create a new AF request, the AF invokes the Npcf\_PolicyAuthorization\_Create service operation by sending the HTTP POST request to the "Application Sessions" resource as described in subclause 5.2.2.2.2.1. If the "URLLC" feature defined in 3GPP TS 29.514 [10] is supported, the AF may provide an indication of AF acknowledgement to be expected as described in 3GPP TS 29.514 [10].

To update an existing AF request, the AF invokes the Npcf\_PolicyAuthorization\_Update service operation by sending the HTTP PATCH request to the "Individual Application Session Context" resource as described in subclause 5.2.2.2.2.2. If the "URLLC" feature defined in 3GPP TS 29.514 [10] is supported, the AF may provide an indication of AF acknowledgement to be expected as described in 3GPP TS 29.514 [10].

To remove an existing AF request, the AF invokes the Npcf\_PolicyAuthorization\_Delete service operation by sending the HTTP POST request to the "Individual Application Session Context" resource as described in subclause 5.2.2.2.2.3.

2-3. Upon receipt of the AF request, the PCF invokes the Npcf\_SMPolicyControl\_UpdateNotify service operation to update the SMF with corresponding PCC rule(s) by sending the HTTP POST request to the callback URI "{notificationUri}/update" as described in subclause 5.2.2.2.1. If the AF subscribes to UP Path change event, the PCF includes the related subscription information within the corresponding PCC rule(s) , in addition, if the "URLLC" feature defined in 3GPP TS 29.512 [9] is supported, and the indication of AF acknowledgement was received from the AF request, the PCF includes within the PCC rule(s) the indication of AF acknowledgement to be expected as specified in TS 29.512 [9].

- For the case of 4A, the PCF includes in the PCC rule(s) the Notification URI pointing to the NEF and the Notification Correlation ID assigned by NEF.

- For the case of 4B, the PCF includes in the PCC rule(s) the Notification URI pointing to the AF and the Notification Correlation ID assigned by AF.

If the AF unsubscribes from UP Path change event, the PCF removes the related subscription information from the corresponding PCC rule(s) as specified in 3GPP TS 29.512 [9].

3a. When the SMF installs PCC rule successfully, the SMF determines whether UP path change needs to be enforced. In this case, the SMF:

- when early notification is required, shall notify as described in step 4 before reconfiguring the User Plane of the PDU session;

- takes appropriate actions to reconfigure the User plane of the PDU Session such as:

i. adding, replacing or removing a UPF in the data path to e.g. act as an UL CL or a Branching Point;

ii. allocate a new Prefix to the UE (when IPv6 multi-Homing applies);

iii. updating the UPF in the target DNAI with new traffic steering rules; and

- when late notification is required, shall notify as described in step 4 after reconfiguring the User Plane of the PDU session.

4A. In case of 1A, if the SMF observes PDU Session related event(s) that AF has subscribed to, the SMF sends notification to the AF via the NEF.

4a-4d. The SMF invokes Nsmf\_EventExposure\_Notify service operation to the AF via the NEF by sending an HTTP POST request. When receiving the Nsmf\_EventExposure\_Notify service operation, the NEF performs information mapping (e.g. Notification Correlation ID to AF Transaction ID, etc.), and invokes the Nnef\_TrafficInfluence\_Notify service operation to forward the notification to the AF. If the indication of AF acknowledgement to be expected was included in the PCC rule(s), the SMF may notify with a notification URI for AF acknowledgement as described in 3GPP TS 29.508 [8], and then the NEF also notifies with a URI for the AF acknowledgement as described in 3GPP TS 29.522 [24].

4e-4h. When receiving the notification with the URI for AF acknowledgement, the AF acknowledges the notification to the SMF identified by the notification URI via the NEF.

The step is the same as steps 7-14 in Figure 5.5.3.3-1.

4B. In case of 1B, if the SMF observes PDU Session related event(s) that AF has subscribed to, the SMF sends notification to the AF directly.

4a-4b. The SMF invokes Nsmf\_EventExposure\_Notify service operation to the AF directly by sending an HTTP POST request to the callback URI "{notifUri}", and the AF sends a "204 No Content" response to the SMF. If the indication of AF acknowledgement to be expected was included in the PCC rule(s), the SMF may provide an URI for the AF acknowledgement as described in 3GPP TS 29.508 [8].

4c-4d. When receiving the notification with the URI for AF acknowledgement from the SMF, the AF invokes Nsmf\_EventExposure\_AppRelocationInfo service operation by sending an HTTP POST request to the callback URI "{ackUri}" to acknowledge the notification, and the SMF sends a "204 No Content" response to the AF.

\*\*\* 8th Change \*\*\*

#### 5.5.3.3 AF requests targeting PDU Sessions not identified by an UE address

If the AF traffic influence request affects future PDU session, the traffic influence procedure is performed as depicted in Figure 5.5.3.3-1.



Figure 5.5.3.3-1: Processing AF requests to influence traffic routing for Sessions not identified by an UE address, affecting future PDU session

1. To create a new AF request, the AF invokes the Nnef\_TrafficInfluence\_Create service operation to the NEF by sending the HTTP POST request to the "Traffic Influence Subscription" resource. If the "URLLC" feature defined in 3GPP TS 29.522 [24] is supported, the AF may provide an indication of AF acknowledgement to be expected.

To update an existing AF request, the AF invokes the Nnef\_TrafficInfluence\_Update service operation by sending the HTTP PUT or PATCH request to the "Individual Traffic Influence Subscription" resource. If the "URLLC" feature defined in 3GPP TS 29.522 [24] is supported, the AF may provide an indication of AF acknowledgement to be expected.

To remove an existing AF request, the AF invokes the Nnef\_TrafficInfluence\_Delete service operation by sending the HTTP DELETE request to the "Individual Traffic Influence Subscription" resource.

2. Upon receipt of the AF request, the NEF authorizes it and then performs the mapping from the information provided by the AF into information needed by the 5GC as described in 3GPP TS 23.501 [2] and 3GPP TS 23.502 [3].

3-4. When receiving the Nnef\_TrafficInfluence\_Create request, the NEF invokes the Nudr\_DataRepository\_Create service operation to store the AF request information in the UDR by sending the HTTP PUT request to the "Individual Influence Data" resource, and the UDR sends a "201 Created" response.

When receiving the Nnef\_TrafficInfluence\_Update request, the NEF invokes the Nudr\_DataRepository\_Update service operation to modify the AF request information in the UDR by sending the HTTP PATCH/PUT request to the resource "Individual Influence Data", and the UDR sends a "200 OK" or "204 No Content" response accordingly.

When receiving the Nnef\_TrafficInfluence\_Delete request, the NEF invokes the Nudr\_DataRepository\_Delete service operation to delete the AF requirements from the UDR by sending the HTTP DELETE request to the "Individual Influence Data" resource, and the UDR sends a "204 No Content" response.

5. The NEF sends the HTTP response message to the AF correspondingly.

6. The PCF retrieves the stored AF request in the UDR by invoking the Nudr\_DataRepository\_Query service operation during SM Policy Association Establishment procedure (see subclause 5.2.1).

The PCF generates the PCC rule(s) based on the AF request and provides it to the SMF. If the AF subscribes to UP Path change event, the PCF includes the Notification URI pointing to the NEF and the Notification Correlation ID assigned by NEF within the corresponding PCC rule(s) as specified in 3GPP TS 29.512 [9]. If the AF unsubscribes from UP Path change event, the PCF removes the related subscription information from the corresponding PCC rule(s) as specified in 3GPP TS 29.512 [9].

6a. This step is the same as the step 3a in Figure 5.5.3.2-1.

7. If the SMF observes PDU Session related event(s) that AF has subscribed to, the SMF invokes the Nsmf\_EventExposure\_Notify service operation to the NEF by sending an HTTP POST request to the callback URI "{notifUri}". If the indication of AF acknowledgement to be expected was included in the PCC rule(s), the SMF may notify with an URI for the AF acknowledgement as described in 3GPP TS 29.508 [8].

8. When receiving the Nsmf\_EventExposure\_Notify service operation, the NEF performs information mapping (e.g. Notification Correlation ID to AF Transaction ID), and invokes the Nnef\_TrafficInfluence\_Notify service operation to forward the notification to the AF by sending the HTTP request to the callback URI "notificationDestination" as specified in TS 29.522 [24]. If the notification from the SMF includes an URI for the AF acknowledgement, the NEF also notifies with a URI for the AF acknowledgement as described in 3GPP TS 29.522 [24].

9. The AF sends an HTTP "204 No Content" response to the NEF.

10. The NEF sends an HTTP "204 No Content" response to the SMF.

11-12. When receiving the notification with the URI for AF acknowledgement from the NEF, the AF invokes Nnef\_TrafficInfluence\_AppRelocationInfo service operation by sending an HTTP POST request to the callback URI "{afAckUri}" to acknowledge the notification, and the NEF sends a "204 No Content" response to the AF.

13-14. When receiving the AF acknowledgement from the AF, to forward it to the SMF, the NEF invokes Nsmf\_EventExposure\_AppRelocationInfo service operation by sending an HTTP POST request to the callback URI "{ackUri}", and the SMF sends a "204 No Content" response to the NEF.

If the AF traffic influence request affects ongoing PDU session, the traffic influence procedure is performed as depicted in Figure 5.5.3.3-2.



Figure 5.5.3.3-2: Processing AF requests to influence traffic routing for Sessions not identified by an UE address, affecting ongoing PDU session

0. The PCF subscribes to the changes of traffic influence data in the UDR during SM Policy Association procedure (see subclause 5.2.1).

1-5. These steps are the same as steps 1-5 in Figure 5.5.3.3-1.

6-7. The UDR invokes the Nudr\_DataRepository\_Notify service operation to PCF(s) that have subscribed to modifications of AF requests by sending the HTTP POST request to the callback URI "{notificationUri}", and the PCF sends a "204 No Content" response to the UDR.

8-9. Upon receipt of the AF request from the UDR, the PCF determines if existing PDU Sessions are potentially impacted by the AF request. For each of these PDU Sessions, the PCF invokes the Npcf\_SMPolicyControl\_UpdateNotify service operation to update the SMF with corresponding PCC rule(s) by sending the HTTP POST request to the callback URI "{notificationUri}/update" as described in subclause 5.2.2.2.1.

If the AF subscribes to UP Path change event, the PCF includes the information on AF subscription to UP path change event within the corresponding PCC rule(s) as specified in 3GPP TS 29.512 [9]. If the AF unsubscribes from UP Path change event, the PCF removes the related subscription information from the corresponding PCC rule(s) as specified in 3GPP TS 29.512 [9].

9a. This step is the same as step 6a in Figure 5.5.3.3-1.

10-17. These steps are the same as steps 7-14 in Figure 5.5.3.3-1.

\*\*\* 9th Change \*\*\*

### 5.5.5 BDT warning notification procedure



Figure 5.5.5-1: BDT warning notification procedure

0. The AF subscribes to BDT warning notification from the (H-)PCF via NEF during Negotiation for future background data transfer procedure (see subclause 5.5.4).

1. The (H-)PCF subscribes to network performance from the NWDAF, and is notified when the network performance in the area of interest goes below the criteria from the NWDAF (see subclause 5.4.2).

2-3. The (H-)PCF may invoke the Nudr\_DataRepository\_Query service operation by sending an HTTP GET request to the "BdtData" collection resource, to request from the UDR all stored transfer policies. The UDR sends an HTTP "200 OK" response to the (H-)PCF.

NOTE 1: If only one PCF is deployed in the network, transfer policies might be locally stored in the PCF and the interaction with the UDR is not required.

4. If the (H-)PCF determines that the background data traffic is impacted, the (H-)PCF decides, based on operator policies, for each of the affected transfer policies whether a list of candidate transfer policies has to be calculated. The (H-)PCF invokes the Npcf\_BDTPolicyControl\_Notify service operation by sending the HTTP POST request with the BDT warning notification to the Notification URI "{notifUri}".

The BDT warning notification includes the BDT Reference ID of the impacted transfer policy and optionally the time window when the network performance will go below the criteria set by the operator, the network area where the network performance will go below the criteria set by the operator and the list of candidate transfer policies.

5-6. If the (H-)PCF does not locally store the transfer policy, the (H-)PCF for each of the affected transfer policies shall invoke the Nudr\_DataRepository\_Delete service operation to remove the affected transfer policy from the UDR by sending the HTTP DELETE request to the "IndividualBdtData" resource. The UDR sends an HTTP "204 No Content" response to the (H-)PCF.

7-8. If the PCF subscribed to notification of "IndividualBDTdata" resource data changes in the UDR, the UDR invokes the Nudr\_DataRepository\_Notify service operation to the PCF by sending the HTTP POST request to the resource URI "{notificationUri}" as specified in 3GPP TS 29.519 [12].

NOTE 2: The PCF might be a different one than the PCF handling the BDT negotiation procedures, although in the figure it is represented as the same one for the simplification.

9. The (H-)PCF identifies if the URSP rules to UE need to be updated using the procedure "UE Policy Association Modification" defined in subclause 5.6.2.2.2.

10. The PCF identifies if the PCC rules and/or session rules delivered to the SMF need to be updated using the procedure "SM Policy Association Modification initiated by the PCF" defined in subclause 5.2.2.2.

11. To send the BDT warning notification from the (H-)PCF, the NEF invokes the Nnef\_BDTPNegotiation\_Notify service operation by sending the HTTP POST request with the BDT warning notification to the Notification URI "{notificationDestination}".

12. The AF sends an HTTP POST response to the NEF.

13. The NEF sends an HTTP POST response to the (H-)PCF.

14. When the AF receives the BDT warning notification, the AF may select one of the background transfer policies included in the candidate list.

15. If the AF selected one of the background transfer policies included in the candidate list, steps 8 - 13 from subclause 5.5.4 are executed.

16-17. If the PCF subscribed to notification of "IndividualBDTdata" resource data changes in the UDR, the UDR invokes the Nudr\_DataRepository\_Notify service operation to the PCF by sending the HTTP POST request to the callback URI "{notificationUri}" as specified in 3GPP TS 29.519 [12].

NOTE 3: The PCF might be a different one than the PCF handling the BDT negotiation procedures, although in the figure it is represented as the same one for the simplification.

18. The (H-)PCF identifies if the URSP rules to UE need to be updated using the procedure "UE Policy Association Modification" defined in subclause 5.6.2.2.2.

19. The PCF identifies if the PCC rules and/or session rules delivered to the SMF need to be updated using the procedure "SM Policy Association Modification initiated by the PCF" defined in subclause 5.2.2.2.

20. If the AF decides to remove subscription to the BDT warning notification, the AF invokes the Nnef\_BDTPNegotiation\_Update service operation by sending an HTTP PATCH request to the resource "Individual BDT Subscription".

21. The NEF invokes the Npcf\_BDTPolicyControl\_Update service operation by sending an HTTP PATCH request to the resource "Individual BDT policy" to remove subscription to the BDT warning notification from the (H-)PCF.

22. The (H-) PCF sends an HTTP PATCH response message to the NEF.

23. The NEF sends an HTTP PATCH response message to the AF.

NOTE 4: For details of Nnef\_BDTPNegotiation\_Notify service operation refer to 3GPP TS 29.522 [24].

NOTE 5: For details of Npcf\_BDTPolicyControl\_Notify service operation refer to 3GPP TS 29.554 [26].

NOTE 6: For details of Nudr\_DataRepository\_Query/Update/Notify/Delete service operations refer to 3GPP TS 29.519 [12] and 3GPP TS 29.504 [27].

\*\*\* 10th Change \*\*\*

### 5.5.6 Background data transfer policy applying procedure



Figure 5.5.6-1: Background data transfer policy applying procedure

0. The AF negotiates policy for background data transfer during Negotiation for future background data transfer procedure (see subclause 5.5.4).

1. To apply the negotiated Background Data Transfer Policy to UE or a group of UE, the AF invokes the Nnef\_ApplyPolicy\_Create service operation to the NEF by sending the HTTP POST request to the "Applying BDT Policy Subscription" resource .

To update the applied policy, the AF invokes the Nnef\_ApplyPolicy\_Update service operation by sending the HTTP PATCH request to the "Individual Applying BDT Policy Subscription" resource.

To remove the applied policy, the AF invokes the Nnef\_ApplyPolicy\_Delete service operation by sending the HTTP DELETE request to the "Individual Applying BDT Policy Subscription" resource.

NOTE 1: For details of Nnef\_ApplyPolicy\_Create/Update/Delete service operations refer to 3GPP TS 29.522 [24].

2. Upon receipt of the AF request, the NEF authorizes it and then performs the mapping from the information provided by the AF into information needed by the 5GC as described in 3GPP TS 23.502 [3].

3-4. When receiving the Nnef\_ApplyPolicy\_Create request, the NEF invokes the Nudr\_DataRepository\_Create service operation to store the AF request information in the UDR by sending the HTTP PUT request to the "Individual Applied BDT Policy Data" resource, and the UDR sends a "201 Created" response.

When receiving the Nnef\_ApplyPolicy\_Update request, the NEF invokes the Nudr\_DataRepository\_Update service operation to modify the AF request information in the UDR by sending the HTTP PATCH request to the resource "Individual Applied BDT Policy Data", and the UDR sends a "200 OK" or "204 No Content" response.

When receiving the Nnef\_ApplyPolicy\_Delete request, t he NEF invokes the Nudr\_DataRepository\_Delete service operation to delete the AF requirements from the UDR by sending the HTTP DELETE request to the "Individual Applied BDT Policy Data" resource, and the UDR sends a "204 No Content" response.

5. The NEF sends the HTTP response message to the AF correspondingly.

6A. The PCF previously subscribed to the changes of Applied BDT Policy Data during UE Policy Association Establishment procedure (see subclause 5.6.1.2).

6a. The UDR invokes the Nudr\_DataRepository\_Notify service operation to PCF(s) that have subscribed to the changes of Applied BDT Policy Data by sending the HTTP POST request to the callback URI "{notificationUri}".

6b. The PCF sends a "204 No Content" response to the UDR.

6c. The PCF initiates UE Policy Association Modification procedure (see subclause 5.6.2.2.2) to send the background data transfer policy to the UE.

6B. The PCF retrieves the Applied BDT Policy Data in the UDR by invoking the Nudr\_DataRepository\_Query service operation and sends the background data transfer policy to the UE during UE Policy Association Establishment procedure (see subclause 5.6.1.2).

7. The PCF invokes the Nudr\_DataRepository\_Update service operation to the UDR by sending the HTTP PATCH request to the "SessionManagementPolicyData" resource, to store the BDT reference ID(s) into the PDU session related policy data.

8. The UDR sends a "204 No Content" or "200 OK" response to the PCF.

NOTE 2: For details of the Nudr\_DataRepository\_Create/Update/Delete/Notify service operations refer to 3GPP TS 29.504 [27] and 3GPP TS 29.519 [12].

\*\*\* 11th Change \*\*\*

### 5.5.7 IPTV configuration provisioning



Figure 5.5.7-1: IPTV configuration provisioning procedure

1. To configure IPTV information to UE or a group of UE, the AF invokes the Nnef\_IPTVconfiguration\_Create service operation to the NEF by sending an HTTP POST request to the "IPTV Configurations" resource .

To update an existing IPTV configuration, the AF invokes the Nnef\_IPTVconfiguration\_Update service operation by sending an HTTP PUT or PATCH request to the "Individual IPTV Configuration" resource.

To remove an existing IPTV configuration, the AF invokes the Nnef\_IPTVconfiguration\_Delete service operation by sending an HTTP DELETE request to the "Individual IPTV Configuration" resource.

NOTE 1: For details of Nnef\_IPTVconfiguration\_Create/Update/Delete service operations refer to 3GPP TS 29.522 [24].

2. Upon receipt of the AF request, the NEF authorizes it and then performs the mapping from the information provided by the AF into information needed by the 5GC as described in 3GPP TS 23.502 [3].

3-4. When receiving the Nnef\_IPTVconfiguration\_Create request, the NEF invokes the Nudr\_DataRepository\_Create service operation to store the IPTV configuration in the UDR by sending the HTTP PUT request to the "Individual IPTV Configuration" resource, and the UDR sends a "201 Created" response.

When receiving the Nnef\_IPTVconfiguration\_Update request, the NEF invokes the Nudr\_DataRepository\_Update service operation to modify the IPTV configuration in the UDR by sending the HTTP PUT/PATCH request to the resource "Individual IPTV Configuration", and the UDR sends a "200 OK" or "204 No Content" response.

When receiving the Nnef\_IPTVconfiguration\_Delete request, the NEF invokes the Nudr\_DataRepository\_Delete service operation to delete the IPTV configuration from the UDR by sending the HTTP DELETE request to the "Individual IPTV Configuration" resource, and the UDR sends a "204 No Content" response.

5. The NEF sends the HTTP response message to the AF correspondingly.

6A. The PCF previously subscribed to the changes of IPTV configuration during SM Policy Association Establishment procedure (see subclause 5.2.1).

6a. The UDR invokes the Nudr\_DataRepository\_Notify service operation to PCF(s) that have subscribed to the changes of IPTV configuration by sending the HTTP POST request to the callback URI "{notificationUri}".

6b. The PCF sends a "204 No Content" response to the UDR.

6c. The PCF determines PCC rules based on the received IPTV configuration and initiates SM Policy Association Modification procedure (see subclause 5.2.2.2.1).

6B. The PCF retrieves the IPTV configuration in the UDR by invoking the Nudr\_DataRepository\_Query service operation, determines PCC rules based on the retrieved IPTV configuration and send the PCC rules to the SMF during SM Policy Association Establishment procedure (see subclause 5.2.1).

NOTE 2: For details of the Nudr\_DataRepository\_Create/Update/Delete/Notify service operations refer to 3GPP TS 29.504 [27] and 3GPP TS 29.519 [12].

\*\*\* 12th Change \*\*\*

### 5.5.8 AF-based service parameter provisioning for V2X communications



Figure 5.5.8-1: AF-based service parameter provisioning procedure

1. To provide the V2X service parameter to UE or a group of UE, the AF invokes the Nnef\_ServiceParameter\_Create service operation to the NEF by sending an HTTP POST request to the "Service Parameter Subscriptions" resource .

To update an existing V2X service parameter, the AF invokes the Nnef\_ServiceParameter\_Update service operation by sending an HTTP PUT or PATCH request to the "Individual Service Parameter Subscription" resource.

To remove an existing V2X service parameter, the AF invokes the Nnef\_ServiceParameter\_Delete service operation by sending an HTTP DELETE request to the "Individual Service Parameter Subscription" resource.

NOTE 1: For details of Nnef\_ServiceParameter\_Create/Update/Delete service operations refer to 3GPP TS 29.522 [24].

2. Upon receipt of the AF request, the NEF authorizes it and then performs the mapping from the information provided by the AF into information needed by the 5GC as described in 3GPP TS 23.502 [3].

3-4. When receiving the Nnef\_ServiceParameter\_Create request, the NEF invokes the Nudr\_DataRepository\_Create service operation to store the service parameter in the UDR by sending the HTTP PUT request to the "Individual Service Parameter Data" resource, and the UDR sends a "201 Created" response.

When receiving the Nnef\_ServiceParameter\_Update request, the NEF invokes the Nudr\_DataRepository\_Update service operation to modify the service parameter in the UDR by sending the HTTP PUT/PATCH request to the resource "Individual Service Parameter Data", and the UDR sends a "200 OK" or "204 No Content" response.

When receiving the Nnef\_ServiceParameter\_Delete request, the NEF invokes the Nudr\_DataRepository\_Delete service operation to delete the service parameter from the UDR by sending the HTTP DELETE request to the "Individual Service Parameter Data" resource, and the UDR sends a "204 No Content" response.

5. The NEF sends the HTTP response message to the AF correspondingly.

6A. The PCF previously subscribed to the changes of service parameter during UE Policy Association Establishment procedure (see subclause 5.6.1).

6a. The UDR invokes the Nudr\_DataRepository\_Notify service operation to PCF(s) that have subscribed to the changes of service parameter by sending the HTTP POST request to the callback URI "{notificationUri}".

6b. The PCF sends a "204 No Content" response to the UDR.

6c. The PCF determines V2X policy based on the received service parameter and initiates UE Policy Association Modification procedure (see subclause 5.6.2.2) to deliver the V2X policy to the UE.

6B. The PCF retrieves the service parameter in the UDR by invoking the Nudr\_DataRepository\_Query service operation, determines V2X policy based on the retrieved service parameter and delivers the V2X policy to the UE during UE Policy Association Establishment procedure (see subclause 5.6.1).

NOTE 2: For details of the Nudr\_DataRepository\_Create/Update/Delete/Notify service operations refer to 3GPP TS 29.504 [27] and 3GPP TS 29.519 [12].

\*\*\* 13th Change \*\*\*

##### 5.6.2.2.2 Non-roaming



Figure 5.6.2.2.2-1: PCF-initiated UE Policy Association Modification procedure – Non-roaming

1. The PCF receives an external trigger, e.g. the subscriber policy data of a UE is changed, the applied BDT Policy Data is changed, or subscription data for the 5G VN group data is changed, or application detection, or the PCF receives an internal trigger, e.g. operator policy is changed, to re-evaluate UE policy decision for a UE.

NOTE: When the external trigger affects more than one UE (e.g. when Network Performance is degraded in a network area info) the PCF will apply the next steps to all the affected active UE Policy Associations.

2-3. If the applied BDT policy Data is changed in step1, and if the corresponding transfer policy is not locally stored in the PCF, the PCF sends the HTTP GET request to the "IndividualBdtData" resource to retrieve the related Background Data Transfer policy information (i.e. Time window and Location criteria) stored in the UDR. The UDR sends an HTTP "200 OK" response to the PCF.

4. The PCF makes the policy decision including the applicable updated Policy Control Request Trigger(s) and/or updated UE Policy and/or updated N2 PC5 policy if the "V2X" feature is supported. The PCF checks if the size of determined UE policy exceeds a predefined limit the same as step 6 in subclause 5.6.1.2.

5. If the PCF decided to update the Policy Control Request Trigger(s) in step4, the V-PCF shall invoke the Npcf\_UEPolicyControl\_UpdateNotify service operation by sending an HTTP POST request to the callback URI "{notificationUri}/update".

6. The AMF sends an HTTP "204 No Content" response to the PCF.

7. If the PCF decided to update the UE policy and/or N2 PC5 policy in step 4, steps 10-13 as specified in Figure 5.6.1.2-1 are executed.

8-9. If the PCF decided to update the UE policy in step 4, steps 5-6 in subclause 5.6.2.1.2 are executed.

\*\*\* 14th Change \*\*\*

##### 5.6.2.2.3 Roaming



Figure 5.6.2.2.3-1: PCF-initiated UE Policy Association Modification procedure – Roaming

If the H-PCF receives a trigger, steps 1 to 4 and 10 to 11 are executed and steps 5 to 8 are omitted.

If the V-PCF receives a trigger, steps 1 to 4 and 10 to 11 are omitted and steps 5 to 8 are executed.

1. The H-PCF receives an external trigger, e.g. the subscriber policy data of a UE is changed, or the PCF receives an internal trigger, e.g. operator policy is changed, to re-evaluate UE policy decision for a UE.

2. The H-PCF makes the policy decision including the applicable updated Policy Control Request Trigger(s) and/or updated UE Policy and/or updated N2 PC5 policy if the "V2X" feature is supported.

In addition, the H-PCF checks if the size of determined UE policy exceeds a predefined limit.

NOTE 1: NAS messages from AMF to UE do not exceed the maximum size limit allowed in NG-RAN (PDCP layer), so the predefined size limit in H-PCF is related to that limitation.

- If the size is under the limit then the UE policy information is included in a single Npcf\_UEPolicyControl\_UpdateNotify service operation and messages 3 to 4 are thus executed one time.

- If the size exceeds the predefined limit, the PCF splits the UE policy information in smaller logical independent UE policy information fragments and ensures the size of each is under the predefined limit. Each UE policy information fragment will be then sent in separated Npcf\_UEPolicyControl\_UpdateNotify service operations and messages 3 to 4, and 9 are thus executed several times, one time for each UE policy information fragment.

3. The H-PCF invokes the Npcf\_UEPolicyControl\_UpdateNotify service operation by sending an HTTP POST request to the callback URI "{notificationUri}/update" with the updated UE policy and/or the updated N2 PC5 policy and/or Policy Control Request Trigger(s) if applicable.

4. The V-PCF sends an HTTP "204 No Content" response to the H-PCF.

5. The V-PCF receives an external trigger, e.g. operator policy in the V-UDR for the PLMN ID of this UE is changed, or the V-PCF receives an internal trigger, e.g. local policy is changed, to re-evaluate UE policy decision for a UE.

NOTE 2: When the V-PCF receives an internal or external trigger to re-evaluate the UE policy decision for the roaming UEs of a PLMN ID, the PCF applies control mechanisms to avoid signalling storms and potential network overload, as e.g. limiting the number of simultaneous updates distributing the base of visiting UEs in a time dispersion interval.

6. The V-PCF makes the policy decision including the applicable updated Policy Control Request Trigger(s) and/or updated UE Policy.

In addition, the V-PCF checks if the size of determined UE policy and received UE policy from H-PCF in step 3 exceeds a predefined limit.

NOTE 3: NAS messages from AMF to UE do not exceed the maximum size limit allowed in NG-RAN (PDCP layer), so the predefined size limit in V-PCF is related to that limitation.

- If the size is under the limit then the UE policy information is included in a single Namf\_Communication\_N1N2MessageTransfer service operation and message 9 is thus executed one time.

- If the size exceeds the predefined limit, the V-PCF splits the UE policy information in smaller logical independent UE policy information fragments and ensures the size of each is under the predefined limit. Each UE policy information fragment will be then sent in separated Namf\_Communication\_N1N2MessageTransfer service operations and message 9 is thus executed several times, one time for each UE policy information fragment.

7. If the V-PCF needs to update the Policy Control Request Trigger(s) or forward the Policy Control Request Trigger(s) received from the H-PCF in step 3, the V-PCF shall invoke the Npcf\_UEPolicyControl\_UpdateNotify service operation by sending an HTTP POST request to the callback URI "{notificationUri}/update".

8. The AMF sends an HTTP "204 No Content" response to the PCF.

9. If the V-PCF decided to update the UE policy in step 6 or the V-PCF received the UE Policy and/or N2 PC5 policy if the "V2X" feature is supported in step 3, steps 17-22 as specified in Figure 5.6.1.3-1 are executed.

10-11. If the H-PCF decided to update the UE policy in step 2, the steps 8-9 in subclause 5.6.2.1.3 are executed.

\*\*\* 15th Change \*\*\*

##### 5.6.3.2.2 Non-roaming



Figure 5.6.3.2.2-1: PCF-initiated UE Policy Association Termination procedure – Non-roaming

1. The subscriber policy control data is removed from the UDR.

2. The UDR invokes the Nudr\_DataRepository\_Notify service operation by sending the HTTP POST request to callback URI "{notificationUri}" to notify the PCF that the policy profile is removed if PCF has subscribed such notification.

3. The PCF sends HTTP "204 No Content" response to confirm reception and the result to UDR.

4. The PCF may, depending on operator policies, invoke the Npcf\_UEPolicyControl\_UpdateNotify service operation to the AMF of the removal of the UE policy control information by sending the HTTP POST request to the callback URI "{notificationUri}/terminate".

Alternatively, the PCF may decide to maintain the UE Policy Association if a default profile is applied, and then step 4 through 6 are not executed.

5. The AMF sends an HTTP "204 No Content" response to the PCF.

6. Steps 1 to 4 as specified in Figure 5.6.3.1.2-1 are executed.

\*\*\* 16th Change \*\*\*

##### 5.6.3.2.3 Roaming



Figure 5.6.3.2.3-1: PCF-initiated UE Policy Association Termination procedure – Roaming

1. The subscriber policy control data is removed from the H-UDR.

2. The H-UDR invokes the Nudr\_DataRepository\_Notify service operation by sending the HTTP POST request to callback URI "{notificationUri}" to notify the H-PCF that the policy profile is removed if H-PCF has subscribed such notification.

3. The H-PCF sends HTTP "204 No Content" response to confirm reception and the result to H-UDR.

4. The H-PCF may, depending on operator policies, invoke the Npcf\_UEPolicyControl\_UpdateNotify service operation to the AMF of the removal of the UE policy control information by sending the HTTP POST request to the callback URI "{notificationUri}/terminate".

Alternatively, the H-PCF may decide to maintain the UE Policy Association if a default profile is applied, and then step 4 through 10 are not executed.

5. The AMF sends an HTTP "204 No Content" response to the V-PCF.

6. The V-PCF invokes the Npcf\_UEPolicyControl\_UpdateNotify service operation to the AMF of the removal of the UE policy control information by sending the HTTP POST request to the callback URI "{notificationUri}/terminate".

7. The AMF sends an HTTP "204 No Content" response to the V-PCF.

8. The V-PCF invokes the Nudr\_DataRepository\_Unsubscribe service operation by sending the HTTP DELETE request to the "IndividualPolicyDataSubscription" resource to unsubscribe the notification from the V-UDR on changes in UE policy information if it has subscribed such notification.

9. The V-UDR sends an HTTP "204 No Content" response to the V-PCF.

10. Steps 1 to 6 as specified in Figure 5.6.3.1.3-1 are executed.

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