**3GPP TSG- Meeting #7e *1137***

**e-meeting, 3 – 3**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **513** | **CR** | **0450** | **rev** |  | **Current version:** |  |  |
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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:*** | Support for A2X service parameters and policy provisioning during UE Policy association establishment. | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | , Huawei | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | UAS\_Ph2 | | | | |  | ***Date:*** | | | 07 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | 8 |
|  | *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:*** | | As per SA2 agreed CR S2-230330, which updated stage 2 TS 23.256 with procedures for A2X service authorization and policy delivery for A2X are added:  For PCF based Service Authorization and Provisioning to UE, the Registration procedures as defined in clause 4.2.2.2 of TS 23.502 [3], UE Policy Association Establishment procedure as defined in clause 4.16.11 of TS 23.502 [3] and UE Policy Association Modification procedure as defined in clause 4.16.12 of TS 23.502 [3] apply with the following additions: | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Cl 5.6.1.2, 5.6.1.3, 5.6.2.1.2, 5.6.1.3, 5.6.2.2.2, 5.6.2.2.3, 8.2 are updated to support A2X service authorization and policy delivery provisioning during UE Policy association establishment and update procedures. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Non compliant with stage-2 requirements. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.6.1.2, 5.6.1.3, 5.6.2.1.2, 5.6.1.3, 5.6.2.2.2, 5.6.2.2.3, 8.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 \* \* \* \*

#### 5.6.1.2 Non-roaming



Figure 5.6.1.2-1: UE Policy Association Establishment procedure - Non-roaming

1. The AMF receives the registration request from the AN.

Based on local policy, and the authorized capabilities received from the UE (e.g. V2X/A2X capabilities and/or 5G ProSe capabilities), as defined in clause 4.2.2.1 of 3GPP TS 29.525 [31], the AMF decides to select and contact the PCF to create the UE policy association. The AMF invokes the Npcf\_UEPolicyControl\_Create service operation by sending an HTTP POST request to the "UE Policy Associations" resource as defined in clause 4.2.2.1 of 3GPP TS 29.525 [31].

2-3. If the PCF does not have the subscription data or the latest list of UPSIs for the UE, it invokes the Nudr\_DataRepository\_Query service operation to the UDR by sending an HTTP GET request to the "UEPolicySet" resource. The UDR sends an HTTP "200 OK" response to the PCF with the latest UPSIs and its content, and/or the subscription data.

Additionally, if the "EnhancedBackgroundDataTransfer" feature defined in 3GPP TS 29.504 [27] is supported, the PCF invokes the Nudr\_DataRepository\_Query service operation to the UDR by sending the HTTP GET request to the "Applied BDT Policy Data" resource to retrieve the applied BDT Policy Data. The UDR sends an HTTP "200 OK" response with the stored applied BDT Policy Data. And then, if the corresponding transfer policy is not locally stored in the PCF, the PCF invokes the Nudr\_DataRepository\_Query service operation by sending the HTTP GET request to the "IndividualBdtData" resource or the "BdtData" collection resource with the URI query parameter "bdt-ref-ids" as specified in 3GPP TS 29.519 [12], 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.

Additionally, if the "AfGuideURSP" feature is supported and URSPs are influenced by the AF, and/or V2XP or A2XP if the "A2X" feature is supported and/or the "ProSe" feature is supported and ProSeP policies may be delivered to the UE, the PCF invokes the Nudr\_DataRepository\_Query service operation to the UDR by sending the HTTP GET request to the "Service Parameter Data" resource to retrieve the service parameter data. The UDR sends an HTTP "200 OK" response with the stored service parameter data.

Additionally, the PCF invokes the Nudr\_DataRepository\_Query service operation to the UDR by sending the HTTP GET request to the "5GVnGroupsInternal" resource to retrieve the group configuration of the received 5G VN Group Id as specified in 3GPP TS 29.505 [47], if not internally available.

NOTE 1: The PCF can internally store the retrieved 5G VN group configuration data for later use for other SUPIs that belong to the same Internal-Group-Id.

4-5. The PCF may request notifications from the UDR on changes in the policy data subscription information (e.g, UE Policy Set resource), and in this case, the PCF shall invoke the Nudr\_DataRepository\_Subscribe service operation by sending an HTTP POST request to the "PolicyDataSubscriptions" resource. The UDR sends an HTTP "201 Created" response to acknowledge the subscription.

Additionally, if the "EnhancedBackgroundDataTransfer" feature defined in 3GPP TS 29.504 [27] is supported, to request notifications from the UDR on changes in the applied BDT Policy Data, the PCF invokes the Nudr\_DataRepository\_Subscribe service operation by sending an HTTP POST request to the "ApplicationDataSubscriptions" resource. The UDR sends an HTTP "201 Created" response to acknowledge the subscription.

Additionally, if the PCF requests notifications from the UDR on changes in the service parameter data, the PCF invokes the Nudr\_DataRepository\_Subscribe service operation by sending an HTTP POST request to the "ApplicationDataSubscriptions" resource. The UDR sends an HTTP "201 Created" response to acknowledge the subscription.

Additionally, to request notifications from the UDR on changes in the 5G VN group configuration data associated to each of the Internal-Group-Id provided to the PCF, the PCF invokes the Nudr\_DataRepository\_Subscribe service operation by sending an HTTP POST request to the "SubscriptionDataSubscriptions" resource as specified in 3GPP TS 29.505 [47], if not internally available. The UDR sends an HTTP "201 Created" response to acknowledge the subscription.

6. The PCF determines whether and which UE policy has to be provisioned or updated as defined in clause 4.2.2.2.1 of 3GPP TS 29.525 [31], and may determine applicable Policy Control Request Trigger(s).

The PCF determines whether and which ANDSP and/or URSP has to be provisioned or updated based on the NF service consumer inputs, the received list of UPSIs from the UE, if available, the UE Policy Sections stored in the UDR, if available, other received UE parameters, if available, the policy subscription and application data retrieved from UDR, if available, analytics information received from NWDAF (applicable to URSP), if available, and local policies as defined in clauses 4.2.2.2.1.1, 4.2.2.2.2 (for ANDSP) and/or 4.2.2.2.3 (for URSP) of 3GPP TS 29.525 [31].

If the "V2X" feature is supported, the PCF determines whether the V2XP and the V2X N2 PC5 policy have to be provisioned as defined in clauses 4.2.2.2.1.2 and 4.2.2.3 of 3GPP TS 29.525 [31].

If the "A2X" feature is supported, the PCF determines whether the A2XP and the A2X N2 PC5 policy have to be provisioned as defined in clauses 4.2.2.2.1.4 and 4.2.2.5 of 3GPP TS 29.525 [31].

If the "ProSe" feature is supported, the PCF determines whether the ProSeP and the 5G ProSe N2 PC5 policy have to be provisioned as defined in clauses 4.2.2.2.1.3 and 4.2.2.4 of 3GPP TS 29.525 [31].

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

NOTE 2: 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 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 messages 10 to 13 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 Namf\_Communication\_N1N2MessageTransfer service operations and messages 10 to 13 are thus executed several times, one time for each UE policy information fragment.

7. The PCF sends an HTTP "201 Created" response to the AMF with the Policy Control Request Trigger(s) if applicable.

8-9. If the "ProSe" feature is supported for the Npcf\_UEPolicyControl service, the PCF may register with the BSF as the PCF serving this UE, if not already registered at the AM Policy Association establishment. This is performed by using the Nbsf\_Management\_Register operation, providing as inputs the SUPI, the GPSI, if available, and the PCF end points related to the Npcf\_AMPolicyAuthorization service.

10. To subscribe to notifications of N1 message for UE Policy Delivery Result, or subsequent UE policy requests (e.g. for V2XP or A2XP and/or ProSeP), the PCF invokes Namf\_Communication\_N1N2MessageSubscribe service operation to the AMF by sending the HTTP POST method with the URI of the "N1N2 Subscriptions Collection for Individual UE Contexts" resource.

11. The AMF sends an HTTP "201 Created" response to the PCF.

12. If the PCF determines to provision or update the UE policy in step 6, the PCF sends the UE policy to the UE via the AMF by invoking the Namf\_Communication\_N1N2MessageTransfer service operation.

If the "V2X" feature is supported and the PCF determines to provision V2XP and V2X N2 PC5 policy in step 6, the PCF sends the V2XP to the UE and the V2X N2 PC5 policy to the NG-RAN via the AMF by invoking the Namf\_Communication\_N1N2MessageTransfer service operation.

If the "ProSe" feature is supported and the PCF determines to provision ProSeP and 5G ProSe N2 PC5 policy in step 6, the PCF sends the ProSeP to the UE and the5G ProSe N2 PC5 policy to the NG-RAN via the AMF by invoking the Namf\_Communication\_N1N2MessageTransfer service operation.

If the "A2X" feature is supported and the PCF determines to provision A2XP and A2X N2 PC5 policy in step 6, the PCF sends the A2XP to the UE and the A2X N2 PC5 policy to the NG-RAN via the AMF by invoking the Namf\_Communication\_N1N2MessageTransfer service operation.

The PCF can provision the UE policy (including V2XP or A2XP and/or ProSeP) and V2X N2 PC5 policy or A2X N2 PC5 policy and/or 5G ProSe N2 PC5 Policy in the same message.

13. The AMF sends a response to the Namf\_Communication\_N1N2MessageTransfer service operation.

14. When receiving the UE Policy container, the AMF forwards the response of the UE to the PCF using Namf\_Communication\_N1MessageNotify service operation.

15. The PCF sends a response to the Namf\_Communication\_N1MessageNotify service operation.

NOTE 3: Steps 7 and 10-15 are triggered by the Npcf\_UEPolicyControl\_Create request and can be received by the AMF in any order; e.g., all or some of the steps 10-15 can be received by the AMF prior to step 7. Note that, to ensure the UE Policy delivery response within the N1MessageNotify is received, the PCF should wait for the reception of a successful N1N2MessageSubscribe response (step 11) before sending the N1N2MessageTransfer request (step 12).

16-17. The PCF maintains the latest list of UE policy sections delivered to the UE (in step 12) and updates the UE policy information for the subscriber including the latest list of UPSIs and its content in the UDR by invoking the Nudr\_DataRepository\_Update service operation.

- If there is no UE policy information retrieved in step 3, the PCF sends an HTTP PUT request to the "UEPolicySet" resource, and the UDR sends an HTTP "201 Created" response.

- Otherwise, the PCF sends an HTTP PUT/PATCH request to the "UEPolicySet" resource, and the UDR sends an HTTP "200 OK" or "204 No Content" response accordingly.

\* \* \* \* Next changes \* \* \* \*

#### 5.6.1.3 Roaming



Figure 5.6.1.3-1: UE Policy Association Establishment procedure - Roaming

1. The AMF receives the registration request from the AN.

Based on local policy, and the capabilities received from the UE (e.g. V2X/A2X capabilities), as defined in clause 4.2.2.1 of 3GPP TS 29.525 [31], the AMF decides to establish UE Policy Association with the V-PCF. The AMF invokes the Npcf\_UEPolicyControl\_Create service operation by sending an HTTP POST request to the "UE Policy Associations" resource as defined in clause 4.2.2.1 of 3GPP TS 29.525 [31].

2. The V-PCF invokes the Npcf\_UEPolicyControl\_Create service operation by sending an HTTP POST request to the "UE Policy Associations" resource to forward the information received from AMF to the H-PCF. The request includes the parameters received in step 1. The V-PCF also provides the H-PCF the Notification URI where to send a notification when the policy is updated.

3-6. These steps are the same as steps 2-5 in clause 5.6.1.2, except the description of "EnhancedBackgroundDataTransfer" feature is not applicable.

7. The H-PCF determines whether and which ANDSP and/or URSP has to be provisioned or updated based on the NF service consumer inputs, the received list of UPSIs from the UE, if available, the UE Policy Sections stored in the UDR, if available, other received UE parameters, if available, the policy subscription and application data retrieved from UDR, if available, analytics information received from NWDAF (applicable to URSP), if available and local policies as defined in clauses 4.2.2.2.1.1, 4.2.2.2.2 (for ANDSP) and/or 4.2.2.2.3 (for URSP) of 3GPP TS 29.525 [31].

If the H-PCF does not receive information from the UE (the list of UPSIs and/or other UE parameters, as e.g. the ANDSP support indication) in step 2, and this information is available in the UDR and the H-PCF determines the information in UDR is reliable, the H-PCF uses the UE information retrieved from the UDR in the determination of whether and which ANDSP and/or URSP has to be provisioned. In this case, the UE parameters retrieved from UDR (e.g. the ANDSP support indication) are included in step 8 as described in 3GPP TS 29.525 [31].

If the "V2X" feature is supported, the H-PCF determines whether the V2XP and the V2X N2 PC5 policy have to be provisioned as defined in clause s 4.2.2.2.1.2 and 4.2.2.3 of 3GPP TS 29.525 [31].

If the "ProSe" feature is supported, the H-PCF determines whether the ProSeP and the 5G ProSe N2 PC5 policy have to be provisioned as defined in clauses 4.2.2.2.1.3 and 4.2.2.4 of 3GPP TS 29.525 [31].

If the "A2X" feature is supported, the H-PCF determines whether the A2XP and the A2X N2 PC5 policy have to be provisioned as defined in clause s 4.2.2.2.1.4 and 4.2.2.5 of 3GPP TS 29.525 [31].

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 Npcf\_UEPolicyControl\_Create response service operation.

- If the size exceeds the predefined limit, the H-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. One fragment will be sent in Npcf\_UEPolicyControl\_Create response service operation, and others will be sent by initiating the PCF-initiated UE Policy Association Modification procedure specified in clause 5.6.2.2.3.

8. The H-PCF sends an HTTP "201 Created" response to the V-PCF with the decided UE policy, Policy Control Request Trigger(s) N2 PC5 policy and UE parameters, if available.

9-10. If the "ProSe" feature is supported for the Npcf\_UEPolicyControl service, the H-PCF may register with the BSF as the PCF serving this UE. This is performed by using the Nbsf\_Management\_Register operation, providing as inputs the SUPI, the GPSI, if available, and the PCF end points related to the Npcf\_AMPolicyAuthorization service.

11. The V-PCF invokes Nudr\_DataRepository\_Query service operation to the UDR by sending an HTTP GET request to the "PlmnUePolicySet" resource to retrieve the list of UPSIs and its content stored in the V-UDR for the PLMN ID of this UE. Alternatively, the V-PCF can have this information configured locally.

12. The V-UDR sends an HTTP "200 OK" response to the V-PCF with the UE policy information.

13. The V-PCF may request notifications from the V-UDR on changes in UE policy information, and in this case, the PCF shall invoke the Nudr\_DataRepository\_Subscribe service operation by sending an HTTP POST request to the "PolicyDataSubscriptions" resource.

14. The V-UDR sends an HTTP "201 Created" response to acknowledge the subscription from the V-PCF.

15. The V-PCF determines whether and which UE policy has to be provisioned or updated as defined in clause 4.2.2.2.1 of 3GPP TS 29.525 [31], and may determine applicable Policy Control Request Trigger(s).

The V-PCF determines whether and which visited ANDSP has to be provisioned based on the NF service consumer inputs, the received list of UPSIs from the UE, if available, the UE Policy Sections locally configured or stored in the UDR for the UE PLMN, other received UE parameters, if available, and local polices as defined in clauses 4.2.2.2.1.1, and 4.2.2.2.2 of 3GPP TS 29.525 [31].

If the V-PCF does not receive information from the UE (the list of UPSIs and/or other UE parameters, as e.g. the ANDSP support indication) in step 1, the "UECapabilityIndication" feature is supported, and UE parameters are received from the H-PCF as defined in in step 8, the V-PCF uses the received UE parameters in the determination of whether and which ANDSP has to be provisioned.

If the "V2X" feature is supported and the V-PCF received the V2XP and the V2X N2 PC5 policy, the V-PCF sends the V2XP to the UE and the V2X N2 PC5 policy to the NG-RAN via the AMF by invoking the Namf\_Communication\_N1N2MessageTransfer service operation.

If the "ProSe" feature is supported and the V-PCF received the ProSeP and the 5G ProSe N2 PC5 policy, the V-PCF sends the ProSeP to the UE and the 5G ProSe N2 PC5 policy to the NG-RAN via the AMF by invoking the Namf\_Communication\_N1N2MessageTransfer service operation.

If the "A2X" feature is supported and the V-PCF received the A2XP and the A2X N2 PC5 policy, the V-PCF sends the A2XP to the UE and the A2X N2 PC5 policy to the NG-RAN via the AMF by invoking the Namf\_Communication\_N1N2MessageTransfer service operation.

The PCF can provision the UE policy (including V2XP or A2XP and/or ProSeP) and V2X N2 PC5 policy or A2X N2 PC5 policy and/or 5G ProSe N2 PC5 Policy in the same message.

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

NOTE 2: 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 messages 19 to 24 are 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 messages 19 to 24 are thus executed several times, one time for each UE policy information fragment.

16. The V-PCF sends an HTTP "201 Created" response to the AMF with the Policy Control Request Trigger(s) if available.

17. To subscribe to notifications of N1 message for UE Policy Delivery Result, or subsequent UE policy requests (e.g. for V2XP or A2XP and/or ProSeP), the V-PCF invokes Namf\_Communication\_N1N2MessageSubscribe service operation to the AMF by sending the HTTP POST method with the URI of the "N1N2 Subscriptions Collection for Individual UE Contexts" resource.

18. The AMF sends an HTTP "201 Created" response to the V-PCF.

19. The V-PCF invokes the Namf\_Communication\_N1N2MessageTransfer service operation to send the policy decided locally in step 13 and to forward the policy received from the H-PCF in step 8.

20. The AMF sends a response to the Namf\_Communication\_N1N2MessageTransfer service operation.

21. When receiving the UE Policy container for the result of the UE policy, the AMF forwards the response of the UE to the V-PCF using Namf\_Communication\_N1MessageNotify service operation.

22. The V-PCF sends a response to the Namf\_Communication\_N1MessageNotify service operation.

23. Upon receipt of the UE Policy container belonging to the H-PLMN in step 21, the V-PCF invokes the Npcf\_UEPolicyControl\_Update service operation by sending an HTTP POST request to the "Individual UE Policy Association" resource to forward the response of the UE to the H-PCF.

24. The H-PCF sends an HTTP "200 OK" response to the V-PCF.

NOTE 3: Steps 16-24 are triggered by the Npcf\_UEPolicyControl\_Create request and can be received by the AMF in any order, e.g., all or some of the steps 17-24 can be received by the AMF prior to step 16. Note that, to ensure the UE Policy delivery response within the N1MessageNotify is received, the PCF should wait for the reception of a successful N1N2MessageSubscribe response (step 18) before sending the N1N2MessageTransfer request (step 19).

25-26. The H-PCF maintains the latest list of UE policy information delivered to the UE and updates UE policy including the latest list of UPSIs and its content in the H-UDR by invoking the Nudr\_DataRepository\_Update service operation.

- If there is no UE policy information retrieved in step 4, the H-PCF sends an HTTP PUT request to the "UEPolicySet" resource, and the UDR sends an HTTP "201 Created" response.

- Otherwise, the H-PCF sends an HTTP PUT/PATCH request to the "UEPolicySet" resource, and the H-UDR sends an HTTP "200 OK" or "204 No Content" response accordingly.

\* \* \* \* Next change \* \* \* \*

##### 5.6.2.1.2 Non-roaming



Figure 5.6.2.1.2-1: AMF-initiated UE Policy Association Modification procedure – Non-roaming

1. When the AMF detects a Policy Control Request Trigger condition is met the old AMF transfers to the new AMF the UE Policy Association information, it invokes the Npcf\_UEPolicyControl\_Update service operation to the PCF by sending an HTTP POST request to the "Individual UE Policy Association" resource with information on the conditions that have changed.

NOTE 1: The old AMF transfers to the new AMF the UE Policy Association when the old AMF and the new AMF belong to the same PLMN or equivalent PLMN or belong to the same SNPN or equivalent SNPN.

During AMF relocation, when the new AMF decides to reuse the UE Policy Association established by the old AMF with the PCF:

a. If the feature "FeatureRenegotiation" is supported, the new AMF invokes the Npcf\_UEPolicyControl\_Update service operation to the PCF by sending an HTTP POST request to the "Individual UE Policy Association" resource, and includes the supported features, the feature(s) related information, if applicable and other information on the conditions that have changed.

b. If the feature "FeatureRenegotiation" is not supported, the new AMF invokes the Npcf\_UEPolicyControl\_Update service operation to the PCF by sending an HTTP POST request to the "Individual UE Policy Association" resource with information on the conditions that have changed.

2. The PCF makes the policy decision including the applicable updated Policy Control Request Trigger(s). When the feature "FeatureRenegotiation" is supported, and the PCF received the features supported by the AMF, the PCF re-evaluates the negotiated features and makes the policy decision considering the resulting negotiated features and the information provided by the new AMF.

The policy decision contains the applicable Policy Control Request Trigger(s) and/or updated UE Policy and/or updated V2X N2 PC5 policy, if the "V2X" feature is supported, or A2X N2 PC5 policy, if the "A2X" feature is supported, and/or updated ProSeP, if the "ProSe" feature is supported, within the updated UE Policy and/or 5G ProSe N2 PC5 policy. The PCF checks if the size of determined UE policy exceeds a predefined limit the same as step 6 in clause 5.6.1.2.

The PCF determines whether and which ANDSP and/or URSP has to be provisioned or updated based on the NF service consumer inputs, policy subscription and application data, if available, the UE Policy Sections previously delivered to the UE, if available, other UE parameters previously received from the UE, if available, the reported information by the AMF and local policies, as defined in clauses 4.2.2.2.1.1, 4.2.2.2.2 (for ANDSP) and/or 4.2.2.2.3 (for URSP) of 3GPP TS 29.525 [31].

3. The PCF sends an HTTP "200 OK" response to the AMF with:

a. When the feature "FeatureRenegotiation" is not supported, the applicable updated Policy Control Request Trigger(s).

b. When the feature "FeatureRenegotiation" is supported, the complete "Individual UE Policy Association" resource representation together with the negotiated supported features as described in clause 4.2.3.4 of 3GPP TS 29.525 [31].

4. If the PCF decided to update the UE policy, and/or N2 PC5 policy and/or 5G ProSe N2 PC5 policy in step 2, steps 12-15 as specified in Figure 5.6.1.2-1 are executed.

NOTE 2: The messages of step 4 are triggered by the Npcf\_UEPolicyControl\_Update request and some or all of them can be received by the AMF before step 3.

5-6. If the PCF decided to update the UE policy in step 2, the PCF maintains the latest list of UE policy information delivered to the UE and updates UE policy including the latest list of UPSIs and its content in the UDR by invoking the Nudr\_DataRepository\_Update service operation. The PCF sends an HTTP PUT/PATCH request to the "UEPolicySet" resource, and the UDR sends an HTTP "204 No Content" response.

\* \* \* \* Next changes \* \* \* \*

##### 5.6.2.1.3 Roaming



Figure 5.6.2.1.3-1: AMF-initiated UE Policy Association Modification procedure - Roaming

1. When the AMF detects a Policy Control Request Trigger condition is met the old AMF transfers to the new AMF the UE Policy Association information, it invokes the Npcf\_UEPolicyControl\_Update service operation to the V-PCF by sending an HTTP POST request to the "Individual UE Policy Association" resource with information on the conditions that have changed.

NOTE 1: The old AMF transfers to the new AMF the UE Policy Association when the old AMF and the new AMF belong to the same PLMN or equivalent PLMN or belong to the same SNPN or equivalent SNPN.

During AMF relocation, when the new AMF decides to reuse the UE Policy Association established by the old AMF with the V-PCF:

a. If the feature "FeatureRenegotiation" is supported, the AMF invokes the Npcf\_UEPolicyControl\_Update service operation to the PCF by sending an HTTP POST request to the "Individual UE Policy Association" resource, and includes the supported features, the feature(s) related information elements, if applicable and other information on the conditions that have changed.

b. If the feature "FeatureRenegotiation" is not supported, the new AMF invokes the Npcf\_UEPolicyControl\_Update service operation to the PCF by sending an HTTP POST request to the "Individual UE Policy Association" resource with information on the conditions that have changed.

2. The V-PCF forwards the information received from AMF in step 1 to the H-PCF by sending an HTTP POST request to the "Individual UE Policy Association" resource if the H-PCF has subscribed the notification.

If the V-PCF received a Namf\_Communication\_N1MessageNotify service request with a UE Policy container and/or the V-PCF is made aware of the delivery outcome of previously provided UE Policy, the V-PCF forwards the received informationto the H-PCF by sending an HTTP POST request to the "Individual UE Policy Association" resource.

NOTE 2: The V-PCF is aware of the delivery outcome either based on the response with the result of UE policy delivery from the UE or based on the AMF knowledge that the UE is temporarily unavailable.

3. The H-PCF makes the policy decision including the applicable updated Policy Control Request Trigger(s) and/or updated UE Policy, and/or updated V2XP within the updated UE Policy and/or V2X N2 PC5 policy if the "V2X" feature is supported, or updated A2XP within the updated UE Policy and/or A2X N2 PC5 policy if the "A2X" feature is supported, and/or updated ProSeP, if the "ProSe" feature is supported, within the updated UE Policy and/or 5G ProSe N2 PC5 policy.

If the H-PCF received the response of the UE Policy delivery outcome from the V-PCF and the AF subscribed to notifications about the outcome of UE Policies delivery, steps 7-10 of clause 5.5.8 are executed.

The H-PCF determines whether and which ANDSP and/or URSP has to be provisioned or updated based on NF service consumer inputs, policy subscription and application data, if available, the UE Policy Sections previously delivered to the UE, if available, other UE parameters previously received from the UE, if available, the reported information by the V-PCF and local policies, as defined in clauses 4.2.2.2.1.1, 4.2.2.2.2 (for ANDSP) and/or 4.2.2.2.3 (for URSP) of 3GPP TS 29.525 [31].

In addition, the H-PCF checks if the size of determined UE policy 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 H-PCF is related to that limitation.

- If the size is under the limit then the UE policy information is included in Npcf\_UEPolicyControl\_Update response service operation.

- If the size exceeds the predefined limit, the H-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. One fragment will be sent in Npcf\_UEPolicyControl\_Update response service operation, and others will be then sent by initiating the PCF-initiated UE Policy Association Modification procedure specified in clause 5.6.2.2.3.

4. The H-PCF sends an HTTP "200 OK" response to the V-PCF with the updated policy information decided in step 3.

5. The V-PCF makes the policy decision including the applicable updated Policy Control Request Trigger(s) and/or updated UE Policy, if applicable. The V-PCF checks if the size of determined UE policy exceeds a predefined limit the same as step 13 in clause 5.6.1.3.

The V-PCF determines whether VPLMN ANDSP has to be provisioned or updated based on NF service consumer inputs, policy subscription for the UE PLMN, other UE parameters previously received from the UE, if available, and local policies, as defined in clauses 4.2.2.2.1.1, 4.2.2.2.2 (for ANDSP) of 3GPP TS 29.525 [31].

6. The V-PCF sends an HTTP "200 OK" response to the AMF with the applicable updated Policy Control Request Trigger(s).

7. If the V-PCF decided to update the UE policy in step 5 or the V-PCF received the UE Policy, V2X N2 PC5 policy or A2X N2 PC5 policy and/or 5G ProSe N2 PC5 policy in step 4, steps 19-24 as specified in Figure 5.6.1.3-1 are executed.

NOTE 4: The messages of step 7 are triggered by the Npcf\_UEPolicyControl\_Update request and some or all of them can be received by the AMF before step 6.

8-9. If the H-PCF decided to update the UE policy in step 3, the H-PCF maintains the latest list of UE policy information delivered to the UE and updates UE policy including the latest list of UPSIs and its content in the H-UDR by invoking the Nudr\_DataRepository\_Update service operation. The PCF sends an HTTP PUT/PATCH request to the "UEPolicySet" resource, and the UDR sends an HTTP "204 No Content" response.

\* \* \* \* Next changes \* \* \* \*

##### 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 1: 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 V2X N2 PC5 policy, if the "V2X" feature is supported, or updated A2X N2 PC5 policy, if the "A2X" feature is supported and/or updated 5G ProSe N2 PC5 policy, if the "ProSe" feature is supported. The PCF checks if the size of determined UE policy exceeds a predefined limit the same as step 6 in clause 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, V2X N2 PC5 policy or A2X N2 PC5 policy and/or 5G ProSe N2 PC5 policy in step 4, steps 12-15 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 clause 5.6.2.1.2 are executed.

NOTE 2: When the trigger to update the UE policy is AF-based service parameter provisioning as described in clause 5.5.8, the AF requested to be notified of the outcome of the UE Policy delivery and the PCF initiated step 7 based on the AF request, then steps 7 - 10 specified in clause 5.5.8 are executed.

\* \* \* \* Next changes \* \* \* \*

##### 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 V2X N2 PC5 policy, if the "V2X" feature is supported, or updated A2X N2 PC5 policy, if the "A2X" feature is supported and/or updated 5G ProSe N2 PC5 policy, if the "ProSe" feature is supported.

The H-PCF determines whether and which ANDSP and/or URSP has to be provisioned or updated based on policy subscription and application data, if available, the UE Policy Sections previously delivered to the UE, if available, other UE parameters previously received from the UE, if available, and local policies, as defined in clauses 4.2.2.2.1.1, 4.2.2.2.2 (for ANDSP) and/or 4.2.2.2.3 (for URSP) of 3GPP TS 29.525 [31].

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 V2X N2 PC5 policy, or the updated A2X N2 PC5 policy, and/or the updated 5G ProSe 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 V2X N2 PC5 policy, if the "V2X" feature is supported, or A2X N2 PC5 policy, if the "A2X" feature is supported, and/or 5G ProSe N2 PC5 policy, if the "ProSe" feature is supported, in step 3, steps 19-24 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 clause 5.6.2.1.3 are executed.

\* \* \* \* Next changes \* \* \* \*

## 8.2 PCF discovery and selection by the AMF

PCF discovery and selection functionality is implemented in the AMF and the SCP, and follows the principles described in 3GPP TS 23.501 [2], clause 6.3.1. The AMF uses the PCF services for a UE.

When the AMF performs discovery and selection for a UE, the AMF may utilize the Nnrf\_NFDiscovery service of the NRF to discover the candidate PCF instance(s). In addition, PCF information may also be locally configured in the AMF. The AMF selects a PCF instance, or two when roaming, based on the available PCF instances (obtained from the NRF or locally configured in the AMF) and depending on operator's policies.

In the non-roaming case, the AMF selects a PCF instance for AM policy association and selects the same PCF instance for UE policy association. In the roaming case, the AMF selects a V-PCF instance for AM policy association and selects the same V-PCF instance for UE policy association. The following factors may be considered for PCF discovery and selection for Access and Mobility policies and UE policies:

- SUPI; the AMF selects a PCF instance based on the SUPI range the UE's SUPI belongs to or based on the results of a discovery procedure with the NRF using the UE's SUPI as an input for PCF discovery.

- GPSI; the AMF selects a PCF instance based on the GPSI range the UE's GPSI belongs to or based on the results of a discovery procedure with the NRF using the UE's GPSI as an input for PCF discovery.

- S-NSSAI(s). In the roaming case, the AMF selects the V-PCF instance based on the S-NSSAI(s) of the VPLMN and selects the H-PCF instance based on the S-NSSAI(s) of the HPLMN.

- PCF Set ID.

- PCF Group ID of the UE's SUPI.

NOTE 1: The AMF can infer the PCF Group ID the UE's SUPI belongs to or UE's GPSI belongs to based on the results of PCF discovery procedures with the NRF. The AMF can provide the PCF Group ID to other PCF NF consumers as described in 3GPP TS 23.502 [3].

- The features supported by the PCF (e.g. the PCF supporting the "DNNReplacementControl" feature is selected by the AMF supporting DNN replacement).

- The V2X support stored in the NRF.

- The A2X support stored in the NRF.

- The ProSe support stored in the NRF.

- PCF Selection Assistance Info and PCF Instance Id(s) serving the established PDU Sessions/PDN Connections received from UDM. In case PCF Selection Assistance Info and PCF Instance Id(s) are received from the UDM, the AMF selects a PCF instance that matches one of the received PCF instance Id(s) serving a combination of DNN and S-NSSAI that is included in the the PCF Selection Assistance Info. If multiple DNN and S-NSSAI combinations are provided, the AMF selects the DNN, S-NSSAI using local configuration. In case PCF instance Id(s) are not received, e.g. EPS interworking is not supported, the AMF selects the PCF instance by considering other above factors.

In the case of delegated discovery and selection in the SCP, the AMF shall include in the first request to the PCF the above factors, if available, within the "3gpp-Sbi-Discovery-\*" request headers, as specified in 3GPP TS 29.500 [5], clause 6.10.3.2.

In the following scenarios, information about the PCF instance that has been selected by the AMF (e.g. the selected PCF instance Id, the PCF set ID, and if the PCF set ID is not available, the PCF Group ID, if available) can be forwarded to another NF consumer of the PCF:

- During AMF relocation, the target AMF may receive from the source AMF a resource URI of AM Policy association and/or a resource URI of UE Policy association, a PCF instance ID, a PCF set ID, and if the PCF set ID is not available, a PCF Group ID (if available) to enable the target AMF to reuse the same PCF instance (i.e. reuse the AM Policy association resource and/or UE Policy association resource), and the target AMF may decide based on operator policy either to re-use the AM/UE Policy Association in the same PCF instance or select a new PCF instance.

- In the roaming case, the AMF may, based on operator policies (e.g. roaming agreement), select the H-PCF in addition to the V-PCF for a UE by performing a PCF discovery and selection as described above. The AMF sends the selected H-PCF instance Id to the V-PCF during the UE Policy association establishment procedure.

In these scenarios, if the target AMF performs discovery and selection, the target AMF may use the received PCF information instead of performing PCF selection interacting with the NRF as described above (discovery may still be needed depending on what level of information is sent by the AMF, e.g. the address of the PCF instance may not be present)

In addition, in the case of delegated discovery and selection in the SCP, the following applies:

a) The selected PCF instance may include the PCF instance ID, the PCF set ID, and if the PCF set ID is not available, the PCF Group ID (if available) in the response to the AMF.

NOTE 2: The selected (V-)PCF instance can include a binding indication, including the (V-)PCF ID and possibly the PCF Set ID in the response to the AMF.

b) The AMF first establishes an AM policy association; when forwarding the related request message, the SCP discovers and selects a (V-)PCF instance for AM policy association. Unless binding information is provided in the response of the PCF to that request, the SCP adds the PCF instance ID it selected into the response to the AMF, as per clause 6.10.3.4 of 3GPP TS 29.500 [5]. The AMF uses the received (V-)PCF instance Id for the AM policy association and/or the available binding information within the "3gpp-Sbi-Discovery-\*" request headers for the request to establish the UE policy association. The SCP selects the corresponding (V-)PCF instance for UE policy association based on the received discovery and selection parameters.

c) During AMF relocation, the target AMF may receive a resource URI of AM Policy association and/or a resource URI of UE Policy association, a PCF instance ID, a PCF set ID, and if the PCF set ID is not available, a PCF Group ID (if available) from the source AMF to enable it to reuse the same PCF instance. The AMF may decide based on operator policy either to use the old PCF instance or select another PCF instance (i.e. reuse the AM Policy association resource and/or UE Policy association resource). If the target AMF decides to reuse the old PCF instance, the AMF includes the {apiRoot} of the resource URI within the "3gpp-Sbi-Target-apiRoot" request header, the PCF instance ID, the PCF set ID, and if the PCF set ID is not available, the PCF Group ID (if available) within the "3gpp-Sbi-Discovery-\*" request header as received from the source AMF in the AM policy update request and/or the UE policy update request to the PCF via the SCP.

d) In the roaming case, the AMF performs discovery and selection of the H-PCF from NRF as described in this clause. The AMF may indicate the maximum number of H-PCF instances to be returned from NRF, i.e. H-PCF selection at NRF. The AMF uses the received V-PCF instance Id for AM Policy association and/or the available binding information received during the AM policy association procedure as described in bullet b) above to send the UE policy association establishment request, which also includes the selected H-PCF instance Id, to the V-PCF via the SCP. The SCP discovers and selects the V-PCF instance. The V-PCF sends an UE policy association establishment request towards the HPLMN, which includes the selected H-PCF instance Id within the "3gpp-Sbi-Discovery-\*" request header as a discovery and selection parameter to the H-PCF via the SCP.

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