**3GPP TSG-CT3 Meeting #118e C3-215xxx**

**E-Meeting, 11th – 15th October 2021**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  |  | **CR** | **0294** | **rev** | **1** | **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:***  | Handling of Session Management Policy Data per PLMN |
|  |  |
| ***Source to WG:*** |  |
| ***Source to TSG:*** | CT3 |
|  |  |
| ***Work item code:*** | en5GPccSer17 |  | ***Date:*** | 2021-09-09 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***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 canbe 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:*** | According to SA2 LS Reply on Session Management Policy Data per PLMN, *For local breakout roaming, PDU Session policy control subscription information and Remaining allowed usage subscription information for monitoring control are not available in V-UDR. V-PCF uses locally configured information according to the roaming agreement with the HPLMN operator as described in clause 5.2.2 and 6.2.1.4 of TS 23.503.**In the LBO scenario, the PDU Session policy control subscription information is not supported in the UDR of VPLMN. The V-PCF makes PCC decision according to the roaming agreement.*TS 23.502 has been updated with clarifications in this regard. |
|  |  |
| ***Summary of change:*** | SM Policy Association procedures in TS 29.513 are updated to clarify that for local breakout roaming, session management policy data for the UE is not available in VPLMN and V-PCF uses locally configured information according to the roaming agreement with the HPLMN operator.  |
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| ***Consequences if not approved:*** | Misalignment with stage 2. Incorrect assumptions that can bring interoperability problems when obtaining policy control subscription information. |
|  |  |
| ***Clauses affected:*** | 4; 5.2.1; 5.2.2.1; 5.2.3.1 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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

# 4 Reference architecture

The policy framework functionality in 5G is comprised of the functions of the Policy Control Function (PCF), the policy and charging enforcement functionality supported by the SMF and UPF, the access and mobility policy enforcement functionality supported by the AMF, the Network Data Analytics Function (NWDAF), the Network Exposure Function (NEF), the Charing Function (CHF), the Unified Data Repository (UDR) , the Application Function (AF) and the 5G Direct Discovery Name Management Function (5G DDNMF). For the roaming scenario, the Security Edge Protection Proxy (SEPP) is deployed between the V-PCF and H-PCF. 3GPP TS 23.503 [4] specifies the 5G policy framework stage 2 functionality.



Figure 4.1-1a: Overall non-roaming 5G Policy framework architecture (service based representation)



Figure 4.1-1b: Overall non-roaming 5G Policy framework architecture (reference point representation)

NOTE 1: The N4 interface is not part of the Policy Framework architecture but shown in the figures for completeness.

NOTE 2: If an SCP is deployed it can be used for indirect communication between NFs and NF services as described in Annex E of 3GPP TS 23.501 [2].

The Nchf service for online and offline charging consumed by the SMF is defined in 3GPP TS 32.240 [28].

The Nchf service for Spending Limit Control consumed by the PCF is defined in 3GPP TS 29.594 [23].

The PCF providing session management policy control for a UE (i.e. PCF for the PDU Session) and the PCF providing non-session management policy control for that UE (i.e. PCF for the UE) may be different PCF instances and the communication between the PCF for the UE and the PCF for the PDU Session is performed over the N43 reference point.

NOTE 3: The roaming scenarios for SNPNs are not supported in this Release.



Figure 4.1-2a: Overall roaming policy framework architecture - LBO (service based representation)



Figure 4.1-2b: Overall roaming policy framework architecture - LBO (reference point representation)

NOTE 4: In the LBO scenario, the PCF in the VPLMN may interact with the AF in order to generate PCC rules for services delivered via the VPLMN. The PCF in the VPLMN uses locally configured policies according to the roaming agreement with the HPLMN operator as input for PCC rule generation. The PCF in VPLMN has no access to subscriber policy information from the HPLMN nor to session management policy data for the UE in the VPLMN to retrieve input for PCC Rule generation. The interactions between the PCF in the VPLMN and the PCF in the HPLMN through the Npcf service based interface enables the PCF in the HPLMN to provision UE policies to the PCF in the VPLMN, as described in 3GPP TS 23.503 [4] subclause 5.2.5.

NOTE 5: In the LBO scenario, AF requests targeting a DNN (and slice) and / or a group of UEs are stored in the UDR by the NEF. The PCF in the VPLMN subscribes to and get notification from the UDR in the VPLMN for those AF requests. Details are defined in subclause 5.6.7 of 3GPP TS 23.501 [2].

NOTE 6: For the sake of clarity, SEPPs are not depicted in the roaming reference point architecture figures.

NOTE 7: N4 and N32 are not service based interfaces.



Figure 4.1-3a: Overall roaming policy framework architecture - home routed scenario (service based representation)



Figure 4.1-3b: Overall roaming policy framework architecture - home routed scenario (reference point representation)

NOTE 8: For the sake of clarity, SEPPs are not depicted in the roaming reference point architecture figures.

NOTE 9: N4 and N32 are not service based interfaces.

NOTE 10: An SCP can be used for indirect communication between NFs and NF services within the VPLMN, within the HPLMN, or in within both VPLMN and HPLMN. For simplicity, the SCP is not shown in the roaming architecture.

To allow the 5G system to interwork with AFs related to existing services, e.g. IMS based services, Mission Critical Push To Talk services, the PCF shall support the corresponding Rx procedures and requirements defined in 3GPP TS 29.214 [18]. This facilitates the migration from EPC to 5GC without requiring these AFs to upgrade to support the N5 interface.



Figure 4.1-4: Interworking between 5G Policy framework and AFs supporting Rx interface

\* \* \* Second Change \* \* \*

### 5.2.1 SM Policy Association Establishment

This clause is applicable if a new SM Policy Association is being established.

The following procedure concerns both roaming and non-roaming scenarios.

In the LBO roaming case, the PCF acts as the V-PCF, and the V-PCF shall not contact the UDR/CHF. In the home routed roaming case, the PCF acts as the H-PCF and the H-PCF interacts with the H-SMF.



Figure 5.2.1-1: SM Policy Association Establishment procedure

This procedure concerns both roaming and non-roaming scenarios.

In the home routed roaming case, the PCF acts as the H-PCF. In the LBO roaming case, the PCF acts as the V-PCF, and the step 2 to 5 shall be skipped.

NOTE x: For LBO roaming case, session management policy data for the UE is not available in the VPLMN and V-PCF uses locally configured information according to the roaming agreement with the HPLMN operator. Therefore, interactions between PCF and UDR in the following procedures do not apply to this scenario.

1. The SMF receives a PDU session establishment request from the UE. The SMF selects the PCF as described in subclause 8.3 and invokes the Npcf\_SMPolicyControl\_Create service operation by sending the HTTP POST request to the "SM Policies" resource as defined in subclause 4.2.2.2 of 3GPP TS 29.512 [9]. The request operation provides the SUPI, the PDU session ID, PDU Session Type, DNN, and S-NSSAI, and may provide the GPSI, the Internal Group Identifier, the Access Type (and additional access type, in case of MA PDU session), the IPv4 address or the IPv6 network prefix (if available), the MA PDU session indication and the ATSSS capability, if available, the PEI if received in the SMF, the User Location Information, the UE Time Zone, Serving Network, RAT type, charging information, the Session-AMBR, the DN-AAA authorization profile index if available, one or more framed routes if available, the subscribed default QoS, if available, etc., as defined in subclause 4.2.2 of 3GPP TS 29.512 [9]. The request operation also includes a Notification URI to indicate to the PCF where to send a notification when the SM related policies are updated.

2-3. If PCF does not have the subscription data for the SUPI, DNN and S-NSSAI, the PCF invokes the Nudr\_DataRepository\_Query service operation to the UDR by sending the HTTP GET request to the "SessionManagementPolicyData" resource as specified in 3GPP TS 29.519 [12].The UDR sends an HTTP "200 OK" response to the PCF with the policy control subscription data.

4. If the "ExtendedSamePcf" feature is supported, and based on operator’s policies and retrieved data the PCF determines that the same PCF needs to be used for all the SM Policy associations that match a combination of SUPI, DNN and S-NSSAI, and no SM Policy association for the given combination exists, the PCF invokes the Nbsf\_Management\_Register service operation to check if another PCF exists for the given parameter combination as specified in 3GPP TS 29.512 [9], subclause 4.2.2.2.

If the "ExtendedSamePcf" feature is not supported and the "SamePcf" is supported, and based on operator’s policies and retrieved data the PCF determines that the same PCF needs to be used for all the SM Policy associations that match a combination of SUPI, DNN and S-NSSAI, and no SM Policy association for the given combination exists, the PCF invokes the Nbsf\_Management\_Register service operation to check if another PCF exists for the given parameter combination as specified in 3GPP TS 29.512 [9] subclause 4.2.2.2 if the BSF is to be used for PDU session binding and the IP address/prefix or MAC address is received in step 1.

The PCF includes together with the PCF address information for the Npcf\_SMPolicyControl, in case the BSF is to be used for PDU session binding, the PCF address information for the Npcf\_PolicyAuthorization and/or Rx, and the UE address, if available.

5. If the PCF receives an HTTP "201 Created" response from the BSF with the created binding information as detailed in subclause 8.5.2 and the flow continues in step 6.

If the PCF receives an HTTP "403 Forbidden" response from the BSF, the PCF replies the SMF as described in 3GPP TS 29.512 [9], subclause 4.2.2.2and the flow terminates here.

6-7. If BDT Reference ID(s) is included in the response from the UDR, the PCF shall invoke the Nudr\_DataRepository\_Query service operation to the UDR to retrieve the Background Data Transfer policy corresponding to the BDT Reference ID(s) 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], and the UDR sends an HTTP "200 OK" response to the PCF with the Background Data Transfer policy.

 Additionally, if the TSC feature defined in 3GPP TS 29.512 [9] is supported, the PCF invokes the Nudr\_DataRepository\_Query service operation to retrieve the stored AF influence data in the UDR by sending the HTTP GET request to the "Influence Data" resource as specified in 3GPP TS 29.519 [12]. The UDR sends an HTTP "200 OK" response with the stored AF request.

 Additionally, if the ATSSS feature defined in 3GPP TS 29.512 [9] is supported, and the SDF template of the PCC rule includes an application identifier, the PCF invokes the Nudr\_DataRepository\_Query service operation to retrieve the stored OS Id(s) supported by the UE from the UDR by sending the HTTP GET request to the "UePolicySet" resource as specified in 3GPP TS 29.519 [12]. The UDR sends an HTTP "200 OK" response with the stored UE Policy data. The PCF determines the application descriptors based on the retrieved OS Id(s), if available, and local configuration, as specified in 3GPP TS 29.512 [9].

 Additionally, if the WWC feature defined in 3GPP TS 29.512 [9] is supported, the PCF invokes the Nudr\_DataRepository\_Query service operation to retrieve the stored IPTV configuration from the UDR by sending the HTTP GET request to the "IPTV Configurations" resource as specified in 3GPP TS 29.519 [12]. The UDR sends an HTTP "200 OK" response with the stored IPTV configuration. The PCF determines Multicast Access Control information (i.e., whether the multicast channel represented by the SDF of the PCC rule is allowed or not) based on the retrieved IPTV configuration as specified in 3GPP TS 29.512 [9].

8-9. To request notifications from the UDR on changes in the subscription information, the PCF invokes 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 TSC feature defined in 3GPP TS 29.512 [9] is supported, to request notifications from the UDR on changes in the AF influence data, the PCF invokes the Nudr\_DataRepository\_Subscribe service operation by sending an HTTP POST request to the "Influence Data Subscription" resource. The UDR sends an HTTP "201 Created" response to acknowledge the subscription.

 Additionally, if the WWC feature defined in 3GPP TS 29.512 [9] is supported, to request notifications from the UDR on changes in the IPTV configuration, 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.

10. 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 Retrieval as defined in subclause 5.3.2. If policy counter status reporting is already established for the subscriber, and the PCF determines that the status of additional policy counters are required, the PCF initiates an Intermediate Spending Limit Report Retrieval as defined in subclause 5.3.3.

11. The PCF makes the policy decision to determine the information provided in step 10.

 When the feature "TimeSensitiveNetworking" is supported and the PCF detects that the request relates to TSC traffic based on the received DNN and S-NSSAI, the PCF determines to provide the "TSN\_BRIDGE\_INFO" policy control request trigger in step 14.

12. When the "SamePcf" feature is not supported, in the case that the BSF is to be used and that either the IP address/prefix or MAC address is available, the PCF invokes the Nbsf\_Management\_Register service operation by sending HTTP POST request to create the PDU session binding information for a UE in the BSF as detailed in subclause 8.5.2.

When the "SamePcf" feature or the "ExtendedSamePcf" feature is supported, the PCF determines that the same PCF needs to be used for the SM Policy associations of the same DNN, S-NSSAI and SUPI parameter combination, and a SM Policy association already exists for the given parameter combination (i.e., step 4, 5 did not apply) the PCF invokes the Nbsf\_Management\_Register service operation by sending HTTP POST request to create the PDU session binding information for a UE in the BSF as detailed in subclause 8.5.2, and includes:

- the PCF address for the Npcf\_SMPolicyControl service; and

- in the case that the BSF is to be used for PDU session binding, the PCF address for the Npcf\_PolicyAuthorization and/or Rx interface, and either the IP address/prefix or MAC address if available.

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

14. The PCF sends an HTTP "201 Created" response to the SMF with the determined policies as described in subclause 4.2.2 of 3GPP TS 29.512 [9].

\* \* \* Third Change \* \* \*

#### 5.2.2.1 General

The following procedures concern both roaming and non-roaming scenarios.

In the LBO roaming case, the PCF acts as the V-PCF, and the V-PCF shall not contact the UDR/CHF. In the home routed roaming case, the PCF acts as the H-PCF and the H-PCF interacts with the H-SMF.

NOTE x: For LBO roaming case, session management policy data for the UE is not available in the VPLMN and V-PCF uses locally configured information according to the roaming agreement with the HPLMN operator. Therefore, interactions between PCF and UDR in the following procedures do not apply to this scenario.

The SM Policy Association Modification procedure may be initiated either by the SMF or by the PCF.

NOTE y: The following procedures cover both Npcf\_PolicyAuthorization service operations over the N5 reference point and Rx interactions between AF and PCF. It is assumed that for the interactions between one AF and one PCF, only one of those possibilities is used. For details of Rx interface refer to 3GPP TS 29.214 [18] and for details on the Npcf\_PolicyAuthorization service refer to 3GPP TS 29.514 [10].

\* \* \* Fourth 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.

NOTE x: For LBO roaming case, session management policy data is not stored in the VPLMN. Therefore, interactions between PCF and UDR in the SM Policy Association Termination procedures do not apply to this scenario.

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.

NOTE: The PCF invokes the Nbsf\_Management\_Deregister for every binding information previously registered in the BSF for the PDU session.

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

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