**3GPP TSG- Meeting #**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **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:*** | Access and mobility policy control functionality to enable dynamic change of AM Polcies | | | | | | | | | |
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| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
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| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *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:*** | | This contribution addresses Tasks 1, 2 and 3 in the TEI17\_DCAMP work plan, those are impacts on 23.503 to introduce dynamic change of AM policies. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * Update AM related policy control requirements to cover dynamic change of frequency and dynamic change of coverage both temporary. * Clarify that there may be deployment options with a PCF for a UE and a PCF for a PDU session. An a reference point N37 is defined. * Add a new clause on Application function influence on AM Policies. * Extend inputs for policy decisions. * Extend events reported by the PCF to add start/stop of application reported to the PCF serving the UE. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Dynamically changing AM policies are not supported by the 5GC. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.2.1, 5.2.1, 5.3.1, 5.3.x (new), 6.1.2.1, 6.1.2.1.x (new), 6.2.1.2, 6.3.18 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 \* \* \* \*

### 4.2.1 Access and mobility related policy control requirements

The policy framework shall provide following functionality for the access and mobility enforcement:

- Policy Control Function (PCF) shall support interactions with the access and mobility policy enforcement in the AMF, through service-based interfaces.

- The PCF shall be able to provide Access and Mobility Management related policies to the AMF.

- The PCF shall be able to evaluate operator policies that are triggered by events received from the AMF, from the AF or from the UDR.

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

### 5.2.1 Non-roaming architecture

The reference architecture of policy and charging control framework for the 5G System is comprised by the functions of the Policy Control Function (PCF), the Session Management Function (SMF), the User Plane Function (UPF), the Access and Mobility Management Function (AMF), the Network Exposure Functionality (NEF), the Network Data Analytics Function (NWDAF), the Charging Function (CHF), the Application Function (AF) and UDR (Unified Data Repository).

Figure 5.2.1-1 shows the service based representation and Figure 5.2.1-1a shows the reference point representation of the reference architecture of policy and charging control framework for the 5G System.



Figure 5.2.1-1: Overall non-roaming reference architecture of policy and charging control framework for the 5G System (service based representation)



Figure 5.2.1-1a: Overall non-roaming reference architecture of policy and charging control framework for the 5G System (reference point representation)

NOTE 1: The N4 reference point is not part of the 5G Policy Framework architecture but shown in the figures for completeness. See TS 23.501 [2] for N4 reference point definition.

NOTE 2: How the PCF/NEF stores/retrieves information related with policy subscription data or with application data is defined in TS 23.501 [2].

The Nchf service for online and offline charging consumed by the SMF is defined in TS 32.240 [8].

The Nchf service for Spending Limit Control consumed by the PCF is defined in TS 23.502 [3].There may be deployment topologies with separate session management policy control, i.e. PCFs for PDU sessions and non-session management policy control, i.e. PCFs for a UE, functionality. The PCF for PDU session(s) does not support N15 reference point while the PCF for a UE does not support N7 reference point. N37 reference point enables communication between the PCF for a UE and the PCF for UE PDU session(s).

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

### 5.3.1 Interactions between PCF and AF

Npcf and Naf enable transport of application level session information and Ethernet port management information from AF to PCF. Such information includes, but is not limited to:

- IP filter information or Ethernet packet filter information to identify the service data flow for policy control and/or differentiated charging;

- media/application bandwidth requirements for QoS control;

- In addition, for sponsored data connectivity:

- the sponsor's identification;

- optionally, a usage threshold and whether the PCF reports these events to the AF;

- information identifying the application service provider and application (e.g. SDFs, application identifier, etc.);

- information required to enable Application Function influence on traffic routing as defined in clause 5.6.7 of TS 23.501 [2];

- information required to enable setting up an AF session with required QoS as defined in clause 6.1.3.22;

- information required to enable setting up an AF session with support for Time Sensitive Networking (TSN) as defined in clause 6.1.3.23.

Npcf and Naf also enable application function request to influence Access and Mobility policies for a UE.

Npcf and Naf enable the AF subscription to notifications on PDU Session events, i.e. the events requested by the AF as described in clause 6.1.3.18 and the change of DNAI as defined in clause 5.6.7 of TS 23.501 [2].

### The N5 reference point is defined for the interactions between PCF and AF in the reference point representation.5.3.x Interactions between PCF for a UE and PCF for a PDU session

Npcf services enables reporting of PDU session related events detected by the PCF for a PDU session to the PCF for a UE. Such events are reporting start and stop of application traffic detection.

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

#### 6.1.2.1 Access and mobility related policy control

The access and mobility policy control encompasses the management of service area restrictions, the management of the RFSP functionalities and UE-AMBR, and the management of the SMF selection. This clause defines the management of service area restrictions and RFSP Index for a UE registered over 3GPP access. The management of service area restrictions for a 5G-RG or a FN-CRG using W-5GAN are specified in TS 23.316 [27].

The management of service area restrictions enables the PCF of the serving PLMN (e.g. V-PCF in roaming case) to modify the service area restrictions used by AMF as described in TS 23.501 [2] clause 5.3.4.

A UE's subscription may contain service area restrictions, which may be further modified by PCF based on operator defined policies at any time, either by expanding a list of allowed TAIs or by reducing a non-allowed TAIs or by increasing the maximum number of allowed TAIs. Operator defined policies in the PCF may depend on input data such as UE location, time of day, information provided by other NFs such as an AF to request temporary change of coverage, etc.

The AMF may report the subscribed service area restrictions received from UDM during Registration procedure or when the AMF changed, the conditions for reporting are that local policies in the AMF indicate that Access and Mobility Control is enable. The AMF reports the subscribed service area restrictions to the PCF also when the policy control request trigger for service area restrictions change, as described in clause 6.1.2.5, is met. The AMF receives the modified service area restrictions from the PCF. The AMF stores them then use it to determine mobility restriction for a UE. The PCF may indicate the AMF that there is an unlimited service area.

The service area restrictions consist of a list of allowed TAI(s) or a list of non-allowed TAI(s) and optionally the maximum number of allowed TAIs.

NOTE 1: The enforcement of the service area restrictions is performed by the UE, when the UE is in CM-IDLE state or in CM-CONNECTED state when in RRC Inactive, and in the RAN/AMF when the UE is in CM-CONNECTED state.

The management of the RFSP Index enables the PCF to modify the RFSP Index used by the AMF to perform radio resource management functionality as described in TS 23.501 [2] clause 5.3.4. PCF modifies the RFSP Index based on operator policies that take into consideration e.g. accumulated usage, load level information per network slice instance, the request to provide a desired throughput for a specific application traffic or independent of the application in use etc. The subscribed RFSP Index may be further adjusted by the PCF based on operator policies at any time.

Operator policies in the PCF may determine that the RFSP index changes at the start and stop of an application/service data flow, the PCF subscribes to the SMF for application detection as described in clause 6.2.2.5.

For radio resource management, the AMF may report the subscribed RFSP Index received from UDM during the Registration procedure or when the AMF changed. The conditions for reporting are that local policies in the AMF indicate that Access and Mobility Control is enable. The AMF reports the subscribed RFSP Index to the PCF when the subscription to RFSP Index change to the PCF is met. The AMF receives the modified RFSP Index from the PCF.

NOTE 2: The enforcement of the RFSP Index is performed in the RAN.

Upon change of AMF, the source AMF informs the PCF that the UE context was removed in the AMF in the case of inter-PLMN mobility.

The management of UE-AMBR enables the PCF to provide the UE-AMBR information to AMF based on serving network policy. The AMF may report the subscribed UE-AMBR received from UDM. The conditions for reporting are that the PCF provided Policy Control Request Triggers to the AMF to report subscriber UE-AMBR change. The AMF receives the modified UE-AMBR from the PCF. The AMF provides a UE-AMBR value of the serving network to RAN as specified in TS 23.501 [2], clause 5.7.2.6.

The management of the SMF selection enables the PCF to instruct the AMF to contact the PCF during the PDU Session Establishment procedure to perform a DNN replacement, as specified in TS 23.501 [2], clause 5.6.1. To indicate the conditions to check whether to contact the PCF at PDU Session establishment (as specified in clause 6.1.2.5), the PCF provides the Policy Control Request Triggers SMF selection management and, if necessary Change of the Allowed NSSAI, together with SMF selection management related policy control information (see clause 6.5) during UE Registration procedure and at establishment of the AM Policy Association.

The PCF may update SMF selection management information based on PCF local decision or upon being informed about a new Allowed NSSAI. The AMF applies the updated SMF selection management information to new PDU Sessions only, i.e. already established PDU Sessions are not affected.

##### 6.1.2.1.x Support for Access and Mobility policies when the PCF serving the UE and PCF serving the UE PDU sessions are different

The Access and Mobility policies are provided by the PCF serving the UE.

For the management of the RFSP index value the PCF for a UE may determine that the RFSP index value is changed at the start/stop of application traffic, then subscribes to notifications when a PCF for a PDU sesson is registered in the BSF, including the SUPI and DNN,S-NSSAI. The DNN,S-NSSAI is either provided by the AF or locally configured in the PCF for an Appliaction Id(s) or Flow description(s).

When the PCF for a UE is notified that PCF for a UE PDU session is registered, the BSF provides the UE IP address/prefix, DNN and the PCF address, PCF instance Id and PCF SET id if available. The PCF for a UE subscribes to reporting event “start/stop of application traffic detection” defined in clause 6.1.3.18.

The reporting of “start/stop of application traffic detection” to the PCF serving the UE is used as input for a policy decision to change the RFSP index value.

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

#### 6.1.2.x Application function influence Access and Mobility policies

The Application function influence Access and Mobility policies refers to the AF capability to request a service coverage area or a desired throughput for a UE.

Two methods enable the AF to influence Access and Mobility policies:

* Method 1 - The AF learns that a UE is registered, and then request a service area coverage for the UE or provide a desired throughput as defined in 6.1.2.y.1.
* Method 2 - The AF provides the service area coverage for the UE or a desired throughput for UE that may or may not be registered, and that is considered when the AM Policy control association is established, as defined in 6.1.2.y.2.

The content of this clause applies to non-roaming i.e. to cases where the PCF, AF, AMF and SMF belong to the Serving PLMN or AF belongs to a third party with which the Serving PLMN has an agreement. AF influence on Access and Mobility policies does not apply in the case of Home Routed or Local breakout roaming cases.

##### 6.1.2.x.1 Method 1 to enable the AF to influence Access and Mobility policies

The AF may subscribe to notifications when a PCF for a UE is serving an AM Policy association, the AF provides the SUPI or the GPSI, as described in clause 6.1.1.2.1.1.

The AF may contact, either directly or via NEF, the PCF to request allocation of a coverage service area, represented by a geographical area (e.g. a civic address), for a SUPI or a GPSI.

When the AF contacts NEF then following mapping are done:

1. Maps the geographic zone identifier(s) into a list of TAs determined by local configuration.
2. Maps GPSI to SUPI according to the subscription information received from UDM.

When the AF contacts the PCF, then the AF in the PLMN may provide a list of TAs and a SUPI or GPSI to the PCF.

The AF may subscribe to notifications on changes on the coverage service area to the PCF. The PCF takes list of TAs as input for policy decisions, the PCF considers the list of TAs as allowed TAIs for the UE as provided by the AF, when calculating the service area restrictions, then check operator policies to determine whether the service area restrictions needs to be updated, as described in clause 6.1.2.1. The PCF reports the result of allocation of a coverage service area, including the list of allowed TAIs, to the AF, that is mapped to a geographical area if the requests goes via NEF.

If the service area restrictions change, the PCF checks if the AF needs to be informed, based on the subscription to events defined in clause 6.x.x.

The AF may contact, either directly or via NEF, the PCF to indicate the desired throughput (e.g. high) for UE traffic and may include the related application id or a service data flow.

When the AF contacts NEF that performs mapping 1) above, and then maps the External Application id into an Application Id that is provided to the PCF.

When the AF contacts the PCF, then the AF in the PLMN provides a SUPI or GPSI, the desired throughput and may include the Application Id(s) or flow description (s) to the PCF. If no Application Id or flow description, the AF requests applies immediately. If the Application Id or flow description is included, then the request applies when the application traffic starts or stops.

The PCF checks if the RFSP value index for a UE needs to be changed, as described in clause 6.1.2.1 taking whether the application is in use (if the request is related to an application) and the desired thoughput as input information. The PCF reports to the AF that the request was executed, the outcome to the AF, note that the outcome do not report any throughput to the AF since this is unknown to the PCF.

##### 6.1.2.x.2 Method 2 to enable the AF to influence Access and Mobility policies

The AF may request allocation of a coverage service area, represented by a geographical area (e.g. a civic address), for a Target UE, the AF transaction identifier, an expiration time and the Notification Correlation Id, then the NEF performs the following mappings where needed:

1) When the Target UE includes a GPSI, map the GPSI into SUPI, according to information received from UDM.

2) When the Target UE includes an External Group Identifier, map the External Group Identifier into Internal Group Identifier, according to information received from UDM.

3) Map the geographic zone identifier(s) into a list of TAs determined by local configuration.

The NEF stores the AF request in the UDR as Data Set "Application Data" and Data Subset "Access and Mobility”.

For an AM Policy association, the PCF subscribes to notifications on change to UDR on “Application Data” and “Access and Mobility” to be informed on the request from the AF. The PCF calculates the service area restrictions as defined in clause 6.1.2.x.1, then the PCF sends a notification with the result of allocation of a coverage service area, including the list of allowed TAIs, to the AF using the Notification Correlation Id, that is mapped to a geographical area by NEF.

When the expiration time is reached, the PCF re-evaluates the policies as defined in clause 6.1.2.x.1.

The AF may indicate the desired throughput (e.g. high) for a Target UE and may include the related Application id(s) or flow description(s), the AF transaction identifier, an expiration time and the Notification Correlation Id then NEF performs mapping 1) and 2) as described above and maps the External Application id into an Application Id that is provided to the PCF. If no Application Id or flow description, the AF requests applies at the time the AM Policy association is established. If the Application Id or flow description is included, then the request applies when the application traffic starts or stops.

The NEF stores the AF request in the UDR as Data Set "Application Data" and Data Subset "Access and Mobility”.

The AF Transaction identifier is generated by the AF and allows the AF to update or remove the AF request.

For an AM Policy association, the PCF subscribes to notifications on change to UDR on “Application Data” and “Access and Mobility” to be informed on the request from the AF. The PCF calculates the RFSP index value as defined in clause 6.1.2.x.1, then the PCF notifies that the request was executed to the AF using the Notification Correlation Id, via NEF.

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

#### 6.2.1.2 Input for PCC decisions

The PCF shall accept input for PCC decision-making from the SMF, the AMF, the CHF, the NWDAF if present, the UDR and if the AF is involved, from the AF, as well as the PCF may use its own predefined information. These different nodes should provide as much information as possible to the PCF. At the same time, the information below describes examples of the information provided. Depending on the particular scenario all the information may not be available or is already provided to the PCF.

The AMF may provide the following information:

- SUPI;

- PEI of the UE;

- Location of the subscriber;

- Service Area Restrictions;

- RFSP Index;

- RAT Type;

- GPSI;

- Access Type;

- Serving Network identifier (PLMN ID or PLMN ID and NID, see clause 5.34 of TS 23.501 [2]);

- Allowed NSSAI;

- UE time zone;

- Subscribed UE-AMBR;

- Mapping Of Allowed NSSAI;

- S-NSSAI for the PDU Session;

- Requested DNN.

NOTE 1: The Access Type and RAT Type parameters should allow extension to include new types of accesses.

The UE may provide the following information:

- OSId;

- List of PSIs;

- Indication of UE support for ANDSP.

The SMF may provide the following information:

- SUPI;

- PEI of the UE;

- IPv4 address of the UE;

- IPv6 network prefix assigned to the UE;

- Default 5QI and default ARP;

- Request type (initial, modification, etc.);

- Type of PDU Session (IPv4, IPv6, IPv4v6, Ethernet, Unstructured);

- Access Type;

- RAT Type;

- GPSI;

- Internal-Group Identifier;

- Location of the subscriber;

- S-NSSAI;

- NSI-ID (if available);

- DNN;

- Serving Network identifier (PLMN ID or PLMN ID and NID, see clause 5.34 of TS 23.501 [2]);

- Application identifier;

- Allocated application instance identifier;

- Detected service data flow descriptions;

- UE support of reflective QoS (as defined in clause 5.7.5.1 of TS 23.501 [2]);

- Number of supported packet filters for signalled QoS rules for the PDU Session (indicated by the UE as defined in clause 5.7.1.4 of TS 23.501 [2]);

- 3GPP PS Data Off status;

- DN Authorization Profile Index (see clause 5.6.6 of TS 23.501 [2]);

- DN authorized Session AMBR (see clause 5.6.6 of TS 23.501 [2]).

The UDR may provide the information for a subscriber connecting to a specific DNN and S-NSSAI, as described in the sub clause 6.2.1.3.

The UDR may provide the following policy information related to an ASP:

- The ASP identifier;

- A transfer policy together with a Background Data Transfer Reference ID, the volume of data to be transferred per UE, the expected amount of UEs.

NOTE 2: The information related with AF influence on traffic routing may be provided by UDR when the UDR serving the NEF is deployed and stores the application request.

The UDR may provide the service specific information as defined in clause 4.15.6.7 of TS 23.502 [3].

The AF, if involved, may provide the following application session related information directly or via NEF, e.g. based on SIP and SDP:

- Subscriber Identifier;

- IP address of the UE;

- Media Type;

- Media Format, e.g. media format sub-field of the media announcement and all other parameter information (a= lines) associated with the media format;

- Bandwidth;

- Sponsored data connectivity information;

- Flow description, e.g. source and destination IP address and port numbers and the protocol;

- AF application identifier;

- AF-Service-Identifier, or alternatively, DNN and possibly S-NSSAI;

- AF Communication Service Identifier (e.g. IMS Communication Service Identifier), UE provided via AF;

- AF Application Event Identifier;

- AF Record Information;

- Flow status (for gating decision);

- Priority indicator, which may be used by the PCF to guarantee service for an application session of a higher relative priority;

NOTE 3: The AF Priority information represents session/application priority and is separate from the MPS 5GS Priority indicator.

- Emergency indicator;

- Application service provider;

- DNAI;

- Information about the N6 traffic routing requirements;

- GPSI;

- Internal-Group Identifier;

- Temporal validity condition;

- Spatial validity condition;

- AF subscription for early and/or late notifications about UP management events;

- AF transaction identifier;

- TSN QoS information as described in clause 6.1.3.23;

- QoS information to be monitored;

- Service coverage area;

- Desired throughput:

- Reporting frequency.The AF may provide the following BDT related information via NEF:

- Background Data Transfer Reference ID;

- BDT Policy;

- Volume per UE;

- Number of UEs;

- Desired time window;

- Network Area Information.

The CHF, if involved, may provide the following information for a subscriber:

- Policy counter status for each relevant policy counter.

The NWDAF, if involved, may provide analytics information as described in clause 6.1.1.3.

In addition, the predefined information in the PCF may contain additional rules based on charging policies in the network, whether the subscriber is in its home network or roaming, depending on the QoS Flow attributes.

The 5QIs (see clause 5.7.4 of TS 23.501 [2]) in the PCC rule is derived by the PCF from AF or UDR interaction if available. The input can be SDP information or other available application information, in line with operator policy.

The Allocation and Retention Priority in the PCC Rule is derived by the PCF from AF or UDR interaction if available, in line with operator policy.

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

#### 6.1.3.18 Event reporting from the PCF

The AF may subscribe/unsubscribe to notifications of events from the PCF for the PDU Session to which the AF session is bound. Alternatevly, a PCF for the UE may subscribe/unsubscribe to notifications from the PCF for the PDU session.

The events that can be subscribed by the AF and by the PCF for the UE are listed in Table 6.1.3.18-1.

Table 6.1.3.18-1: Events relevant for reporting from the PCF

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Event | Description | Conditions for reporting | Availability for Rx PDU Session (NOTE 2) | Availability for N5 per PDU Session | Availability for Bulk Subscription  (NOTE 1) | Availability for N5 per UE |
| PLMN Identifier Notification | The PLMN identifier where the UE is currently located. | AF | Yes | Yes | Yes | No |
| Change of Access Type | The Access Type and, if applicable, the RAT Type of the PDU Session has changed. | AF | Yes | Yes | Yes | No |
| EPS fallback | EPS fallback is initiated | AF | Yes | Yes | No | No |
| Signalling path status | The status of the resources related to the signalling traffic of the AF session. | AF | Yes | Yes | No | No |
| Access Network Charging Correlation Information | The Access Network Charging Correlation Information of the resources allocated for the AF session. | AF | Yes | Yes | No | No |
| Access Network Information Notification | The user location and/or timezone when the PDU Session has changed in relation to the AF session. | AF | Yes | Yes | No | No |
| Reporting Usage for Sponsored Data Connectivity | The usage threshold provided by the AF has been reached; or the AF session is terminated. | AF | Yes | Yes | No | No |
| Service Data Flow deactivation | The resources related to the AF session are released. | AF | Yes | Yes | No | No |
| Resource allocation outcome | The outcome of the resource allocation related to the AF session. | AF | Yes | Yes | No | No |
| QoS targets can no longer (or can again) be fulfilled | The QoS targets can no longer (or can again) be fulfilled by the network for (a part of) the AF session. | AF | No | Yes | No | No |
| QoS Monitoring parameters | The QoS Monitoring parameter(s) (e.g. UL packet delay, DL packet delay or round trip packet delay) are reported to the AF according to the QoS Monitoring reports received from the SMF. | AF | No | Yes | No | No |
| Out of credit | Credit is no longer available. | AF | Yes | Yes | No | No |
| Reallocation of credit | Credit has been reallocated after the former Out of credit indication. | AF | Yes | Yes | No | No |
| 5GS Bridge information Notification  (NOTE 3) | 5GS Bridge information that has been received by PCF from SMF. | AF | No | Yes | No | No |
| Reporting change of coverage | A change in service coverage | AF | No | No | No | Yes |
| Start of application traffic detection and  Stop of application traffic detection | The start or the stop of application traffic has been detected. | AF | Yes | Yes | No | Yes |
| NOTE 1: Additional parameters for the subscription as well as reporting related to these events are described in TS 23.502 [3].  NOTE 2: Applicability of Rx is described in Annex C.  NOTE 3: 5GS Bridge information is described in clause 6.1.3 UE-DS-TT Residence Time is only provided if a DS-TT port is detected. | | | | | | |

If an AF requests the PCF to report the PLMN identifier where the UE is currently located, then the PCF shall provide the PLMN identifier to the AF if available. Otherwise, the PCF shall provision the corresponding PCC rules, and the Policy Control Request Trigger to report PLMN change to the SMF. The PCF shall, upon receiving the PLMN identifier from the SMF forward this information to the AF.

If an AF requests the PCF to report on the change of Access Type, the PCF shall provide the corresponding Policy Control Request Trigger to the SMF to enable the report of the Change in Access Type to the PCF. The PCF shall, upon reception of information about the Access Type the user is currently using and upon indication of change of Access Type, notify the AF on changes of the Access Type and forward the information received from the SMF to the AF. The change of the RAT Type shall also be reported to the AF, even if the Access Type is unchanged. For MA PDU Session the Access Type information may include two Access Type information that the user is currently using.

If an AF requests the PCF to report on the signalling path status, for the AF session, the PCF shall, upon indication of removal of PCC Rules identifying signalling traffic from the SMF report it to the AF.

If an AF requests the PCF to report Access Network Charging Correlation Information, the PCF shall provide to the AF the Access Network Charging Correlation Information, which allows to identify the usage reports that include measurements for the Service Data Flow(s), once the Access Network Charging Correlation Information is known at the PCF.

If an AF requests the PCF to report Access Network Information (i.e. the User Location Report and/or the UE Timezone Report) at AF session establishment, modification or termination, the PCF shall set the Access Network Information report parameters in the corresponding PCC rule(s) and provision them together with the corresponding Policy Control Request Trigger to the SMF. For those PCC rule(s) based on preliminary service information the PCF may assign the 5QI and ARP of the QoS Flow associated with the default QoS rule to avoid signalling to the UE. The PCF shall, upon receiving an Access Network Information report corresponding to the AF session from the SMF, forward the Access Network Information as requested by the AF (if the SMF only reported the serving PLMN identifier to the PCF, as described in clause 6.1.3.5, the PCF shall forward it to the AF). For AF session termination the communication between the AF and the PCF shall be kept alive until the PCF report is received.

If an AF requests the PCF to report the Usage for Sponsored Data Connectivity, the PCF shall provision the corresponding PCC rules, and the Policy Control Request Trigger to the SMF. If the usage threshold provided by the AF has been reached or the AF session is terminated, the PCF forwards such information to the AF.

If an AF requests the PCF to report the Service Data Flow deactivation, the PCF shall report the release of resources corresponding to the AF session. The PCF shall, upon being notified of the removal of PCC Rules corresponding to the AF session from the SMF, forward this information to the AF. The PCF shall also forward, if available, the reason why the resources are released, the user location information and the UE Timezone.

If an AF requests the PCF to report the Resource allocation outcome, the PCF shall report the outcome of the resource allocation of the Service Data Flow(s) related to the AF session. The AF may request to be notified about successful or failed resource allocation. In this case, the PCF shall instruct the SMF to report the successful resource allocation trigger (see clause 6.1.3.5). If the SMF has notified the PCF that the resource allocation of a Service Data Flow is successful and the currently fulfilled QoS matches an Alternative QoS parameter set (as described in clause 6.2.2.1), the PCF shall also provide to the AF the QoS reference parameter corresponding to the Alternative QoS parameter set referenced by the SMF.

If an AF requests the PCF to report when the QoS targets can no longer (or can again) be fulfilled for a particular media flow, the PCF shall set the QNC indication in the corresponding PCC rule(s) that includes a GBR or delay critical GBR 5QI value and provision them together with the corresponding Policy Control Request Trigger to the SMF. At the time, the SMF notifies that GFBR can no longer (or can again) be guaranteed for a QoS Flow to which those PCC Rule(s) are bound, the PCF shall report to the AF the affected media flow and provides the indication that QoS targets can no longer (or can again) be fulfilled. If additional information is received with the notification from SMF (see clause 5.7.2.4 of TS 23.501 [2]), the PCF shall also provide to the AF the QoS reference parameter corresponding to the Alternative QoS parameter set referenced by the SMF. If the SMF has indicated that the lowest priority Alternative QoS parameter set cannot be fulfilled, the PCF shall indicate to the AF that the lowest priority QoS reference of the Alternative Service Requirements cannot be fulfilled.

If the AF has subscribed to be notified of the QoS Monitoring information, the PCF further sends the QoS Monitoring report to the AF.

If an AF requests the PCF to report on the Out of credit event for the associated service data flow(s), the PCF shall inform the AF (when it gets informed by the SMF) that credit is no longer available for the services data flow(s) related to the AF session together with the applied termination action.

If an AF requests the PCF to report on the Reallocation of credit event for the associated service data flow(s), the PCF shall inform the AF (when it gets informed by the SMF) that credit has been reallocated after credit was no longer available and the termination action was applied for the service data flow(s) related to the AF session.

If an AF requests the PCF to report on the event of the 5GS Bridge information Notification, for the AF session, the PCF shall, request the SMF to report on the trigger of 5GS Bridge information available as described in the clause 6.1.3.5. Upon reception of the 5GS Bridge information, the PCF forwards this information to the TSN AF.

If the AF requests the PCF to report on the event of change of coverage at the time that a service area coverage is provided, the PCF reports a change of the service area coverage to the AF. When the AF request includes an expiration time, the PCF stops reporting when the expiration time is reached.

A request to report Start of application traffic detection and Stop of application traffic detection triggers the reporting when the PCF receives both start of application traffic detection event and stop of application traffic detection event from SMF. The reception of this event triggers the corresponding Policy Control Request Trigger to SMF if not already subscribed.

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