**3GPP TSG-WG SA2 Meeting #156 e-meeting *S2-230xxxx***

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**Title: Discussion on issues for PIN**

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*Abstract: this paper discusses some important issues for PIN, including PEGC requested traffic routing, enablement of PIN management by PEMC, PIN ID usage, 5GC PIN operations, etc.*

# 1. Discussion

## 1.1 PEGC requested traffic routing and QoS for a PIN

### 1.1.1 Traffic routing request for PIN

Before talking about PEGC requested traffic routing, first we study the AF requested traffic routing.

Following is the normative text for AF influence traffic (without QoS request) in TS 23.502, which indicates that the PCF needs to determine the impacted PDU Sessions according to the AF request and notifies SMF per the impacted PDU Session, then SMF takes appropriate actions on UP configuration accordingly:

|  |
| --- |
| 4.3.6.2 Processing AF requests to influence traffic routing for Sessions not identified by an UE address   ……  4. The PCF(s) that have subscribed to modifications of AF requests (Data Set = Application Data; Data Subset = **AF traffic influence request information**, Data Key = S-NSSAI and DNN and/or Internal Group Identifier or SUPI) receive(s) a Nudr\_DM\_Notify notification of data change from the UDR.  5. **The PCF determines if existing PDU Sessions are potentially impacted by the AF request. For each of these PDU Sessions, the PCF updates the SMF** with corresponding new policy information about the PDU Session by invoking Npcf\_SMPolicyControl\_UpdateNotify service operation as described in steps 5 and 6 in clause 4.16.5.  6. When the updated policy information about the PDU Session is received from the PCF, the SMF may take appropriate actions to reconfigure the User plane of the PDU Session. The SMF may consider service experience analytics and/or DN Performance analytics per UP path (i.e. including UPF and/or DNAI and/or AS instance) as defined in clauses 6.4.3 and 6.14.3, respectively, of TS 23.288 [50] before taking such actions. Examples of actions are:  - Determining a target DNAI and adding, replacing or removing a UPF in the data path to e.g. act as an UL CL or a Branching Point e.g. as described in clause 4.3.5.  - Allocate a new Prefix to the UE (when IPv6 multi-Homing applies).  - Updating the UPF in the target DNAI/Common DNAI with new traffic steering rules.  - Subscribe to notifications from the AMF for an Area of Interest via Namf\_EventExposure\_Subscribe service operation.  - Determining whether to relocate PSA UPF considering the user plane latency requirements provided by the AF (see clause 6.3.6 of TS 23.548 [74]).  When the updated policy information about the PDU Session is received from the PCF, the SMF may take appropriate actions to assist the EAS discovery and re-discovery for PDU Session with Session Breakout connectivity model such as:  - Retrieve the EAS deployment information as defined in clause 6.2.3.4.1 of TS 23.548 [74].  - Providing DNS message handling rule to forward DNS messages of the UE and/or report when detecting DNS messages as defined in clause 6.2.3.2.2 of TS 23.548 [74].  …… |

Following figure shows **how the AF influence traffic routing** is used for a PIN (for simplicity, PEGCs do not perform NAT):



Following table shows how “appropriate actions to reconfigure the User plane of the PDU Session” is done with the PDRs/FARs for the above example (no extension):

|  |  |  |  |
| --- | --- | --- | --- |
| **PDRs and FARs for PDU Session#1** | | **PDRs and FARs for PDU Session#2** | |
| **PDR#1 for UL** | | **PDR#3 for UL** | |
| Source interface | "access side" | Source interface | "access side" |
| CN tunnel info | N3 TEID for PDU Session#1 | CN tunnel info | N3 TEID for PDU Session#2 |
| Packet Filter Set | **src: IP#1, dst: IP#2** | Packet Filter Set | **src: IP#2, dst: IP#1** |
| FAR ID | FAR#1 | FAR ID | FAR#3 |
| **FAR#1 for UL** | | **FAR#3 for UL** | |
| Destination interface | "5G VN internal" | Destination interface | "5G VN internal" |
| **PDR#2 for DL** | | **PDR#4 for DL** | |
| Source interface | "5G VN internal" | Source interface | "5G VN internal" |
| Packet Filter Set | **src: IP#2, dst: IP#1** | Packet Filter Set | **src: IP#1, dst: IP#2** |
| FAR ID | FAR#2 | FAR ID | FAR#4 |
| **FAR#2 for DL** | | **FAR#4 for DL** | |
| Destination interface | "access side" | Destination interface | "access side" |
| Outer header creation | N3 TEID for PDU Session#1 | Outer header creation | N3 TEID for PDU Session#2 |

PEGC requested traffic routing for a PIN is mostly used in the scenario that PIN AF is not deployed (and may also be used in the case of PIN AF deployed if user has privacy concern), and has the same purpose as AF requested traffic routing for a PIN.

Considering that **PCF already supports determination of impacted PDU Sessions**, it can be reused, the only difference is that the input is PEGC request instead of AF request.

Following figure shows the **proposed PEGC requested traffic routing** within a PIN via 5GS (for simplicity, PEGCs do not perform NAT):



**Proposal 1: In case of PEGC requested traffic routing for PIN, the determination of impacted PDU Sessions performed by PCF shall be reused for PEGC request same as for AF request.**

### 1.1.2 QoS request for PIN

For **PEGC request QoS for a PIN**, the PDU Session Modification Request sent by the PEGC also includes QoS, if the packet filters include IP address belongs to other PEGC, (example is described in clause 1.1.1), it **may result in PDU Session Modification procedure for the PDU Session of the other PEGC to ensure e2e QoS**.

**Proposal 2: In case of PEGC requested QoS for PIN, if other PDU Sessions are impacted, PDU Session Modification Procedure may be performed for the other PDU Sessions to ensure e2e QoS.**

## 1.2 Enable PIN management by PEMC UE when PEMC UE has no direct connection with PEGC

When AF for PIN is deployed, the PEMC can interact with the AF for managing the PIN, or when the PEMC has direct connection with PEGC, the PEMC can interact with the PEGC for managing the PIN.

There’s a case that **AF for PIN is not deployed while the PEMC UE has no direct connection with PEGC**. This case is very often because user may be out of home with the PEMC UE and PEGC is in home (e.g., you are on public transportation or in office). In this case, the 5GS needs to enable the network local switch for traffic among the PEMC UE and PEGCs to make the PIN management by PEMC UE feasible.

There’s an EN as following related to the above scenario.

Editor's note: The handling of PEMC in 5GC in relation with PIN is FFS.

Following figure depicts the example:



Lots of **existing methods** can be used for this purpose that **does not require the PEMC UE has PIN subscription data**, following lists the candidates:

(1). PEMC UE and PEGCs use the same DNN+S-NSSAI to establish the PDU Sessions associated with the PIN (e.g., 4.15.6.10 of TS 23.502).

(2). 5G VN group data and membership provisioning are used that the group membership includes the PEGCs and PEMC UEs (4.15.6.3b and 4.15.6.3c of TS 23.502).

For (1), following **existing methods** can be used:

(A). The PEMC UE can be pre-configured with the URSP rules;

(B). Operator can pre-configure PCF of the PEMC UE with the URSP rules according to the PIN service subscription made by user;

(C). An AF guides the 5GC to provision the URSP rules to the PEMC UE as described in clause 4.15.6.10 of TS 23.502, how the AF knows the DNN+S-NSSAI can be out of scope in R18 (e.g., based on agreement between the AF and the operator according to the PIN service subscription made by user).

Following figure depicts the example of URSP rules configured on PEMC UE and PEGCs:



For (2), PEMC UEs and PEGCs are included in the membership of 5G VN group described in clause 4.15.6.3c of TS 23.502, and procedure in 4.15.6.3b of TS 23.502 will result the corresponding associated URSP rule without PIN ID provisioning to PEMC UE that uses same DNN+S-NSSAI associated with the PDU Sessions established by PEGCs for the PIN.

**Proposal 3: Using existing method for associated URSP rules configuration on PEMC UE to enable PEMC UE managing PIN via 5GC local switch.**

## 1.3 Difference between PIN and 5G VN

There’re some obvious similarities between PIN and 5G VN, e.g.,

(1). Enable network local switch between UEs.

(2). URSP rule is provisioned to UEs with same <DNN, S-NSSAI> combination.

But there’re also some major differences as following because **PIN is designed that any traffic shall be in a controlled way by PEMC/AF**:

(1). All traffics between 5G VN group member UEs are allowed as described in 5.8.2.13 of TS 23.501 when PDU Session is established, while **for PIN, any traffic is not allowed between PEGCs, unless PEMC/AF requests**, e.g., do not install PDR/FAR described in 5.8.2.13 of TS 23.501 to UPF for PDU Sessions of PEGC-capable UEs with PIN subscription for a PIN.

(2). **5G VN group data provisioned** by AF as described in 4.15.6.3b of TS 23.502 **results in legacy URSP rule provisioning to all member UEs**, while for PIN, URSP rule with PIN ID is provisioned to PEGC-capable UEs with PIN subscription.

(3). For 5G VN, UE is not able to configure communication between UEs via 5GC, including traffic routing and QoS.

(4). When PDU Session is established, for 5G VN, the UE-DN communication **may** be allowed (e.g., a default PDR rule with match-all packet filter as described in clause 5.8.2.13.0 of TS 23.501 is used for UE-DN communication), but **for PIN, PEGC-DN communication shall not be allowed until PEMC/AF requests**.

Following is part of the PDRs and FARs installed by SMF for 5G VN **local switch**, which shall not be configured, or shall be modified, for PIN.

|  |
| --- |
| 5.8.2.13.1 Support for unicast traffic forwarding of a 5G VN (23.501) To enable unicast traffic forwarding in a UPF, the following applies:  - The SMF provides for each 5G VN group member's N4 Session (i.e. N4 Session corresponding to PDU Session) the following N4 rules that enable the processing of packets received from this UE.  - in order to detect the traffic, a PDR containing Source Interface set to "access side", and CN Tunnel Information set to PDU Session tunnel header (i.e. N3 or N9 GTP-U F-TEID); and  - in order to forward the traffic, a FAR containing Destination Interface set to "5G VN internal".  - The SMF provides for each 5G VN group member's N4 Session (i.e. N4 session corresponding to PDU Session) the following N4 rules that enable the processing of packets towards this UE.  - in order to detect the traffic, a PDR containing Source Interface set to "5G VN internal", and Destination Address set to the IP/MAC address (es) of this 5G VN group member; and  - in order to forward the traffic, a FAR containing Outer Header Creation indicating the N3/N9 tunnel information, and Destination Interface set "access side".  …… |

**Proposal 4: For PDU Sessions associated with a PIN established by PEGC-capable UE with PIN subscription, the SMF shall disallow any traffic routing between the PDU Sessions and disallow any traffic routing from/to DN via the PDU Sessions unless PEMC/AF requests.**

There’s lots of existing ways to provision URSP rule with same <DNN, S-NSSAI> combination to PEMC UE and PEGC as described in clause 1.2.

When the PDU Session established by UE associated with the <DNN, S-NSSAI> combination is established, the SMF shall be able to distinguish whether the PDU Session is for 5G VN or for PIN considering the difference of (1).

**Proposal 5: The SMF shall be able to know that the PDU Session associated with PIN is established by a PEGC-capable UE with PIN subscription.**

Following solution candidates may be used:

(A). PEGC sends PIN related information to SMF along with the PDU Session Establishment Request.

(B). For a PIN, the UE with PIN subscription is provided with <DNN, S-NSSAI> combination that will not be provided to UEs without PIN subscription.

For (B), e.g., slice1 and slice2 are configured for a PIN, the **NRF is configured that both slice1 and slice2 return same SMF**, only the UEs with PIN subscription will be provisioned with slice1 and PIN ID (e.g., network is configured to only allow a PIN AF to be able to use 4.15.6.3b/4.15.6.10 with slice2 for a PIN, and uses slice1 for PEGCs by pre-configuration or when PIN parameters for the PIN are received from the PIN AF), so if PDU Session associated with slice1 is established, it is established only possible by a PEGC. **(B) has less impact on UE but is a tricky way that incorrectly uses slice**.

**Proposal 6: PEGC indicates “Traffic management for PIN” in “UE 5GSM Core Network Capability” sent to SMF.**

## 1.4 PIN ID usage

In SA2#155 meeting, PIN ID is proposed to be used by 5GC in a similar way as External Group ID, i.e., NEF mapping PIN ID to Internal Group ID. But **it is not clear how to use the Internal Group ID**.

**It is concluded that the 5GC does not support PINE management, which includes the membership management for a PIN, except reusing existing mechanism (i.e., 5G VN group membership).**

### 1.4.1 5G VN mechanism is used for a PIN

Following is the specification on how to use the Internal-Group-ID(s) in subscription data:

|  |
| --- |
| 5.9.7 Internal-Group Identifier (23.501) ……  The Internal-Group Identifier(s) corresponding to an UE are provided by the UDM to the SMF as part Session Management Subscription data and (when PCC applies to a PDU Session) by the SMF to the PCF. The SMF may use this information to apply local policies and to store this information in CDR. The PCF may use this information to enforce AF requests as described in clause 5.6.7.  The Internal-Group Identifier(s) corresponding to an UE are provided by the UDM to the AMF as part of Access and Mobility Subscription data. The AMF may use this information to apply local policies (such as Group specific NAS level congestion control defined in clause 5.19.7.5). |

|  |
| --- |
| 4.16.11 UE Policy Association Establishment (23.502) ……    Figure 4.16.11-1: UE Policy Association Establishment  ……  2. The AMF sends a Npcf\_UEPolicyControl Create Request with the following information: SUPI, may include Access Type and RAT, PEI, ULI, UE time zone, Serving Network (PLMN ID, or PLMN ID and NID, see clause 5.34 of TS 23.501 [2]), the Internal-Group-ID-list and UE Policy Container (the list of stored PSIs, operating system identifier, Indication of UE support for ANDSP). In roaming scenario, based on operator policies, the AMF may provide to the V-PCF the PCF ID of the selected H-PCF. The V-PCF contacts the H-PCF. In roaming case, steps 3 and 4 are executed, otherwise step 5 follows.  ……  6. The (H-)PCF gets policy subscription related information and the latest list of PSIs from the UDR using Nudr\_DM\_Query service operation (SUPI, Policy Data, UE context policy control data, Policy Set Entry) if either or both are not available and makes a policy decision. The (H-)PCF may get the PEI, the OSId or the indication of UE support for ANDSP in the UDR using Nudr\_DM\_Query including DataSet "Policy Data" and Data Subset "UE context policy control data" if the AMF relocates and the PCF changes. In the roaming scenario, the H-PCF may provide the indication of UE support for ANDSP to the V-PCF, if the indication was not present in the Npcf\_UEPolicyControl Create request from V-PCF and the H-PCF gets this information from the H-UDR. The (H-)PCF may get the 5G VN group data and 5G VN group membership for each Internal-Group-ID received from the AMF using Nudr\_DM\_Query (Internal-Group-Id, Subscription Data, 5G VN Group Configuration). The (H-)PCF may store the 5G VN group data and 5G VN group membership for later use for other SUPIs that belong to the same Internal-Group-ID.…… |

The 5G VN mechanism uses the Internal Group ID(s) in the AM subscription data to enable the PCF of the member UEs to obtain policy and policy update from UDR for 5G VN.

If 5G VN mechanism is used for PIN, **the membership of the PIN is the membership of a 5G VN group**, and is pre-configured in 5GC or provisioned by AF to 5GC using procedure in clause 4.15.6.3c of TS 23.502. **In this case, the PIN ID is same as the External Group ID of the 5G VN group**, and corresponding Internal Group ID is used within 5GS domain (e.g., PCF uses the Internal Group ID to subscribe event from UDR) while PIN ID=External Group ID is used for URSP rules.

**Some Internal-Group-IDs in Internal-Group-ID-list in AM and SM subscription data can identify groups other than PINs** (e.g., 5G VN), there should be a way to record the PIN that the PEGC belongs to, so that the (AM/SM-)PCF can obtain policy and policy update from UDR for PIN, for this purpose, **the PIN subscription data of the PEGC includes the Internal-Group-ID(s) for PIN that the PEGC belongs to**.

**Proposal 7: In case an Internal-Group-ID in AM and SM subscription data of a PEGC identifies a PIN, PIN subscription data of the PEGC also includes the Internal-Group-ID that the PEGC belongs to, and the corresponding External Group ID is the PIN ID.**

The 5G VN group membership can be dynamically managed by AF, **for authorization, the Max PIN number that a PEGC is allowed to be included may be pre-configured according to PIN service subscription made between user and operator**, which also is aligned with the conclusions in TR 23.700-88 as following:

|  |
| --- |
| 17) If AF for PIN is used, the 5GC authorizes the number of PIN that the AF requests to create, which results in the number of PDU Sessions per PEGC/PEMC for PIN, according to user's PIN service subscription, which reflect the agreement between user and operator for using PIN service. |

**Proposal 8: In case 5G VN mechanism used, PIN subscription data of a PEGC may include max PIN number that the PEGC is allowed to be included.**

Following example shows the case that **5G VN mechanism is used for a PIN**:



In the above example, followings can be known:

(A). PEGC 1, PEGC 2, and PEMC UE are preconfigured or dynamically included in PIN#1 identified by Internal Group ID#1. PEGC 3, PEGC 4, and PEMC UE are preconfigured or dynamically included in PIN#2 identified by Internal Group ID#2;

(B). PEGC 2 and PEGC 3 are also included in a group **not for PIN** (e.g., 5G VN group) identified by Internal Group ID#3;

(C). PEGC 1 and PEGC 3 is not able to be included in any additional PIN (due to PEGC 1 and PEGC 3 already belong to one PIN while Max PIN number = 1), while PEGC 2 and PEGC 4 are allowed to be **dynamically included in one additional PIN** (Max PIN number = 2), e.g., when PIN parameters provisioning by AF includes PIN ID#4, which is same as External Group ID#4 that the corresponding group members including PEGC 2 and PEGC 4 have already been configured to UDR, then the PEGC 2 and PEGC 4 are dynamically included in PIN#4.

### 1.4.2 5G VN is not used for a PIN

If 5G VN is not used, **the membership of the PIN is not stored in UDR, the PINs that a PEGC belongs to are pre-configured in PIN subscription**. In this case, there’re two different ways:

(A). PIN ID has corresponding Internal Group ID that UDR does not have the membership of the Internal Group ID, and **Internal Group ID is preconfigured in PIN subscription**;

(B). PIN ID does not have corresponding Internal Group ID.

For (A), mechanism in clause 1.4.1 can be reused, **except that PCF is not able to retrieve membership of the PIN**.

For (B), the AM and SM subscription data shall include preconfigured PIN IDs in addition of Internal-Group-ID-list, which has more impacts on 5GC. In order to simplify the handling of PIN ID, it is proposed that (A) is used in this case.

**Proposal 9: PIN ID has corresponding Internal Group ID, and the corresponding Internal-Group-ID may not have membership information.**

## 1.5 5GC PIN operations exposed to AF

In SA2#155 meeting, some companies do not agree to use PIN create/update/delete concept. This paper proposes another way to describe the 5GC PIN operations:

PIN includes a group of UEs (PEGCs and PEMCs), and **AF for PIN may not know all the PEMCs and PEGCs of the PIN** (there’s a possible case that PEMC does not allow PEGCs to interact with AF for privacy concern, but PEMC can request AF to provision PIN parameters), so the **5GC** **PIN operation shall consider both cases that AF knows the PEGC and AF does not know the PEGC**.

**Proposal 10: 5GC** **PIN operation shall consider both cases that AF knows the PEGC and AF does not know the PEGC.**

### 1.5.1 PIN parameters provisioning by AF

The general procedure for PIN parameters provisioning is that:

(A). AF provides PIN information to NEF;

(B). NEF interacts with UDR/UDM and UDR stores PIN information;

(C). UDR/UDM notifies AM-PCF of the PIN information;

(D). AM-PCF generate URSP rules and provisions to PEGC;

The above procedure is very similar as procedure described in 4.15.6.2 of TS 23.502 (UDM used) for **Subscription Data**, which is used by, e.g., 5G VN (4.15.6.3b/3c), Network Configuration parameters (4.15.6.3a), etc., or procedure described in 4.15.6.7 of TS 23.502 (UDR used) for **Application Data**, which is used by, e.g., Set a policy for a future AF session (4.15.6.8), Application guidance for URSP determination (4.15.6.10), etc.

The procedure may be target to a group of UEs or a specific UE, if AF knows the PEGC and determines to provision URSP rules with PIN ID to the specific PEGC, procedure described in clause 4.15.6.10 can be reused with extension of PIN ID.

**Proposal 11: Considering that PIN is a subscribed service, PIN parameters provisioning procedure targeting to a PIN is based on 4.15.6.2 of TS 23.502, and application guidance for URSP rule with PIN ID to specific PEGC is based on 4.15.6.10 of TS 23.502.**

### 1.5.2 QoS management for PIN by AF

The procedure described in 4.15.6.6/6a of TS 23.502 is used by AF to **request QoS for a specific UE** **without UDR storage**. **In case AF for PIN does not know the PEGC** (i.e., targeting to a PIN/group UEs), AF input in 4.3.6.2 of TS 23.502 (targeting to a group UEs) needs to be extended to include QoS information, and **UDR also stores the QoS information** for notifying the PCF of the QoS information.

After receiving the QoS request for a traffic within a PIN, the PCF notifies the request to SMF per the impacted PDU Session, **which may result in PDU Session Modification procedure for updating the QoS information**.

**Proposal 12: For QoS management for PIN, 4.3.6.2 of TS 23.502 needs to be extended to include QoS information in AF input and UDR storage, and will cause PDU Session Modification procedure to ensure e2e QoS. In case AF knows the PEGC, 4.15.6.6/6a of TS 23.502 also can be reused.**

### 1.5.3 Traffic routing management for PIN by AF

The procedure described in 4.3.6.2 of TS 23.502 is used by AF to **request traffic influence targeting to a group UEs with UDR storage**, while 4.3.6.4 of TS 23.502 is used by AF to **request traffic influence targeting to a specific UE without UDR storage**.

**Proposal 13: For traffic routing management for PIN, 4.3.6.2 of TS 23.502 is reused, and in case AF knows the PEGC, 4.6.3.4 of TS 23.502 also can be reused.**

### 1.5.4 Whether to support PIN activation and deactivation by 5GC exposed to AF

The PIN activation and deactivation does not remove the resources for the PIN (i.e., PDU Sessions) and the URSP rule configurations on UEs. According to above 5GC PIN operations, the PIN parameters provisioning in 1.5.1 will result in URSP rules provisioning and PDU Session establishment, hence the meaning of PIN activation and deactivation is proposed as following:

**Proposal 14: PIN deactivation deletes all traffic routing and QoS configurations for a PIN and a specific PEGC of the PIN, and PIN activation re-enforces the previously configured traffic routing and QoS configurations.**

**In case AF is not deployed**, the PEMC interacts with PEGCs (directly or via 5GC local switch) to manage the PIN. The PEMC holds all the traffic routing and QoS configurations. For PIN deactivation, the PEMC interacts with PEGCs to undo all the traffic routing and QoS configurations for a PIN. For PIN activation, the PEMC interacts with PEGCs to redo all the traffic routing and QoS configurations for a PIN.

**In case AF is deployed**, the PEMC is able to interact with AF as well as interacts with PEGCs (directly or via 5GC local switch in case for privacy concern by user) to manage the PIN. The PEMC and AF holds all the traffic routing and QoS configurations.

There’re two ways to perform PIN deactivation:

(A). The AF and PEMC can undo all the traffic routing and QoS configurations for a PIN;

(B). The AF can request 5GC to undo all the traffic routing and QoS configurations for a PIN.

Same for PIN activation.

**Proposal 15: In order to have minimal impact on 5GC, PIN activation and deactivation status is managed by PEMC and AF.**

## 1.6 Whether and how to support multiple PIN in one PDU Session

In SA2#155 meeting, it is agreed that URSP with PIN ID is used for UE policy. URSP already supports multiple TDs use same PDU Session, e.g., if URSP rule#1 with TD of PIN ID#1 and URSP rule#2 with TD of PIN ID#2 use same RSD, then one PDU Session is used by two PINs. How to mapping different PINE into different PIN is in SA6 scope. Seems SA2 scope already support multiple PIN in one PDU Session.

Considering the difference between PIN and 5G VN that no PDR/FAR described in 5.8.2.13.1 is installed in UPF for PDU Sessions of PEGCs associated with a PIN, the **local switch rule will always include “Packet Filter Set”** according to PEGC/AF input (example in clause 1.1.1) (authorization by SMF/PCF may be needed), the isolation between PINs will be ensured by the “Packet Filter Set” along with the “CN Tunnel Info”, seems no local switch issue exists.

**Proposal 16: Multiple PIN in one PDU Session is already supported when using URSP with PIN ID.**

# 2. Proposals

**Proposal 1: In case of PEGC requested traffic routing for PIN, the determination of impacted PDU Sessions performed by PCF shall be reused for PEGC request same as for AF request.**

**Proposal 2: In case of PEGC requested QoS for PIN, if other PDU Sessions are impacted, PDU Session Modification Procedure may be performed for the other PDU Sessions to ensure e2e QoS.**

**Proposal 3: Using existing method for associated URSP rules configuration on PEMC UE to enable PEMC UE managing PIN via 5GC local switch.**

**Proposal 4: For PDU Sessions associated with a PIN established by PEGC-capable UE with PIN subscription, the SMF shall disallow any traffic routing between the PDU Sessions and disallow any traffic routing from/to DN via the PDU Sessions unless PEMC/AF requests.**

**Proposal 5: The SMF shall be able to know that the PDU Session associated with PIN is established by a PEGC-capable UE with PIN subscription.**

**Proposal 6: PEGC indicates “Traffic management for PIN” in “UE 5GSM Core Network Capability” sent to SMF.**

**Proposal 7: In case an Internal-Group-ID in AM and SM subscription data of a PEGC identifies a PIN, PIN subscription data of the PEGC also includes the Internal-Group-ID that the PEGC belongs to, and the corresponding External Group ID is the PIN ID.**

**Proposal 8: In case 5G VN mechanism used, PIN subscription data of a PEGC may include max PIN number that the PEGC is allowed to be included.**

**Proposal 9: PIN ID has corresponding Internal Group ID, and the corresponding Internal-Group-ID may not have membership information.**

**Proposal 10: 5GC** **PIN operation shall consider both cases that AF knows the PEGC and AF does not know the PEGC.**

**Proposal 11: Considering that PIN is a subscribed service, PIN parameters provisioning procedure targeting to a PIN is based on 4.15.6.2 of TS 23.502, and application guidance for URSP rule with PIN ID to specific PEGC is based on 4.15.6.10 of TS 23.502.**

**Proposal 12: For QoS management for PIN, 4.3.6.2 of TS 23.502 needs to be extended to include QoS information in AF input and UDR storage, and will cause PDU Session Modification procedure to ensure e2e QoS. In case AF knows the PEGC, 4.15.6.6/6a of TS 23.502 also can be reused.**

**Proposal 13: For traffic routing management for PIN, 4.3.6.2 of TS 23.502 is reused, and in case AF knows the PEGC, 4.6.3.4 of TS 23.502 also can be reused.**

**Proposal 14: PIN deactivation deletes all traffic routing and QoS configurations for a PIN and a specific PEGC of the PIN, and PIN activation re-enforces the previously configured traffic routing and QoS configurations.**

**Proposal 15: In order to have minimal impact on 5GC, PIN activation and deactivation status is managed by PEMC and AF.**

**Proposal 16: Multiple PIN in one PDU Session is already supported when using URSP with PIN ID.**