**3GPP TSG-SA2 Meeting #156E *S2-230xxxx***

**Elbonia, 17th – 21th April, 2023**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **23.501** | **CR** | **-** | **rev** | **-** | **Current version:** | **18.1.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

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| ***Title:***  | UP management for PIN |
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| ***Source to WG:*** | vivo |
| ***Source to TSG:*** | SA2 |
|  |  |
| ***Work item code:*** | PIN |  | ***Date:*** | 2023-04-07 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-18 |
|  | *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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | In SA1 specification (clause 6.38.2.9 of TS 22.261), it has following requirements:*- Authorize/deauthorise for a PIN Element(s):**-* ***which other PIN Element it can communicate with****,* *-* ***which applications/service or service in that PIN it can access****,**- which PIN Element it can use as a relay.**- Authorize/deauthorise a UE to perform service discovery of PIN Elements over the 5G network;**-* ***Configure a PIN Element for external connectivity e.g.via 5G system****;*In FS\_PIN study, we have studied the solution and has following conclusions related to the above requirements:*1) When the* ***communication between a PEMC and a PINE*** *behind a PEGC takes place via 5GC, or when the* ***communication between PINEs*** *requires multiple PEGCs and 5GC, the existing traffic forwarding functionalities in 5GS* ***via UPF(s) or N6*** *can be applied if available.**4) If AF for PIN is used, the AF can request the 5GC to exposes capabilities in order for the AF to provision parameters for resources configuration/deconfiguration for a PIN, QoS authorization for a PIN, QoS control for the PIN traffic, and* ***routing control for the PIN traffic****. The mechanism and criteria used by the AF to determine the need for a QoS modification for the PIN traffic are out of 3GPP scope.**8)* ***PIN indirect communication via PEGC is managed within the PIN, which may be supported by 5GS****.*If the communication is routed not via 5GS, the traffic is able to be controlled by UE OS/APP, but when the communication is routed via 5GS, the traffic mapping/routing is fully controlled by URSP rules, UE OS/APP has no way to influent the traffic, i.e., the traffic will not go to OS from low layer then back, or OS/APP is not able to install any filters for the traffic routing via 5GS, it is because the communication module and other part of UE are similar as different NFs in CN, they use standard interface to interact with each other, and the communication module does not have corresponding APIs for that purpose.In order to support the requirements when traffic is via 5GS, the filters can only be installed in 5GC to enforce the traffic routing management requirements.Clause 5.8.2 is for UP management handling, and to forward traffic, corresponding PDRs and FARs need to be installed in UPF. There’re three kinds of routing/forwarding: local switch (i.e., via UPF internal interface - "5G VN internal" interface), N6-based forwarding, and N19-based forwarding.Local switch uses two-step detection and forwarding process with UPF internal interface (“5G VN internal”) as described in clause 5.8.2.13.0, N6-based and N19-based forwarding can use both two-step and one-step detection and forwarding processes.Considering we need PDRs and FARs for routing traffic among all PEGCs and PEMCs for a PIN to enable PIN manangement, we use **m** as the number of <PDR, FAR> sets. Then we consider the traffic between PINEs as following.For N6-based forwarding, no matter whehter one-step or two-step process is used, when traffic of PINE A<->PINE B for a PIN is allowed, a UL PDR for A shall include destination B and DL PDR for A shall include source B, as well as UL PDR for B shall include destination A and DL PDR for B shall include source A, which means a traffic needs 4 sets of <PDR, FAR>, n traffic needs total **m+4\*n** sets of <PDR, FAR>. There’s no difference for N19-based forwarding.In order to reduce the PDRs and FARs, it is proposed that all PDU Sessions for a PIN are anchored at same PSA UPF, and local switch is used, which is described in the CR text that shows for PINE A<->PINE B traffic, only **two** sets of <PDR, FAR> are needed because part of m sets <PDR, FAR> can be reused. |
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| ***Summary of change:*** | Add UP management for supporting PIN |
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| ***Consequences if not approved:*** | Imcomplete PIN specification |
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| ***Clauses affected:*** | 5.8.2.X (New), 5.8.2.X.1 (new), 5.8.2.X.2 (new), 5.8.2.X.3 (new) 5.44.3.1 |
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|  | **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 ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

\* \* \* \* 1st change \* \* \* \*

5.8.2.X Support for PIN communication

5.8.2.X.1 General

In order to support communication of a PIN, a common SMF is controlling a PSA UPF that the PDU Sessions for the PIN established by PEGC-capable UEs with PIN subscription are anchored at the PSA UPF.

The UPF local switching with UPF internal interface ("5G VN internal") and a two-step detection and forwarding process described in clause 5.8.2.13.0 are used. The packets received from any PEGC-capable UE (via it's PDU Session) are forwarded to the UPF internal interface, and the packets received from the UPF internal interface are forwarded to the respective PEGC-capable UE and PINEs behind the PEGC-capable UE. These configurations do not allow any PINE-to-PINE communication and communication with DN via 5GC.

The SMF provides following N4 rules as described in clause 5.8.2.13.1 for each PEGC-capable UE’s N4 Session (i.e., N4 Session corresponding to PDU Session for the PIN) with following additions:

- The PDR with Source Interface set to "access side" shall also contain the Source Address set to the IP address (es) of the PEGC-capable UE;

- The FAR with Destination Interface set to "5G VN internal" shall also contain the Network Instance set to the value representing the PIN;

- The PDR with Source Interface set to "5G VN internal" shall also contain the Network Instance set to the value representing the PIN as well as the Destination Address set to the IP ranges of the PEGC-capable UE and the PINEs behind the PEGC-capable UE;

5.8.2.X.2 Support communication between PEGC and PEMC

To enable management of a PIN, a common SMF is controlling a PSA UPF that the PDU Sessions for the PIN established by PEGC-capable UEs with PIN subscription and the PDU Sessions for manageing the PIN established by PEMCs are anchored at the PSA UPF.

The SMF provides N4 rules as described in clause 5.8.2.13.1 for each PEMC's N4 Session (i.e., N4 Session corresponding to PDU Session for managing the PIN) with following additions:

- The PDR with Source Interface set to "access side" may also contain the Destionation Address set to the IP ranges of the PIN;

- The FAR with Destination Interface set to "5G VN internal" shall also contain the Network Instance set to the value representing the PIN;

- The PDR with Source Interface set to "5G VN internal" shall also contain the Network Instance set to the value representing the PIN;

5.8.2.X.2 Support PINE-to-PINE communication

For a PDU Session established by a PEGC-capable UE with PIN subscription, if the PDU Session is associated with a PIN and when traffic description (i.e., represented by packet filters) for the PDU Session is received, the SMF checks whether the traffic needs to be routed between the PDU Session and other PDU Sessions for the PIN.

If check succeeds, the following applies:

- The SMF provides for the N4 Session (i.e. N4 Session corresponding to the PDU Session) the following N4 rules that enable the processing of packets received from this PEGC-capable UE.

- in order to detect the traffic, a PDR containing Source Interface set to "access side", CN Tunnel Information set to PDU Session tunnel header (i.e. N3 GTP-U F-TEID), and Packet Filter Set includes UL part of the traffic routing information; and

- in order to forward the traffic, a FAR containing Destination Interface set to "5G VN internal", and Network Instance set to the value representing the PIN.

5.8.2.X.3 Support communication with DN

For a PDU Session established by a PEGC-capable UE with PIN subscription, if the PDU Session is associated with a PIN and when traffic routing information (i.e., represented by packet filters) for the PDU Session is received, the SMF checks whether the traffic needs to be routed between the PDU Session and DN.

If check succeeds, the following applies:

- The SMF provides for the N4 Session (i.e. N4 Session corresponding to the PDU Session) the following N4 rules that enable the processing of packets towards DN.

- in order to detect the traffic, a PDR containing Source Interface set to "access side", CN Tunnel Information set to PDU Session tunnel header (i.e. N3 GTP-U F-TEID), and Packet Filter Set includes UL part of the traffic routing information; and

- in order to forward the traffic, a FAR containing Destination Interface set to "core side".

- The SMF provides for the N4 Session (i.e. N4 Session corresponding to the PDU Session) the following N4 rules that enable the processing of packets received from DN.

- in order to detect the traffic, a PDR containing Source Interface set to "core side", and Packet Filter Set includes DL part of the traffic routing information; and

- in order to forward the traffic, a FAR containing Destination Interface set to "5G VN internal", and Network Instance set to the value representing the PIN.

\* \* \* \* 2nd change \* \* \* \*

5.44.3.1 PDU Session Establishment for PIN

When a PDU Session associated with a PIN is established by PEGC-capable UE with PIN subscription, an SMF is selected according to clause 4.3.2.2.3 of TS 23.502 [3]. The PEGC-capable UE uses methods as specified in clause 5.8.2.2 (i.e. IPv6 Prefix Delegation feature) for allocating IPv6 addresses to PINEs or mapping addresses of PINEs to IPv6 addresses.

One PEGC may serve more than one PINs and in this case the PEGC shall have at least one PDU Session for each PIN if the PIN traffic is via PEGC/5GC. One PIN may be served by more than one PDU sessions in the PEGC.

Editor's note: How and whether to handle the case where PINs share a PDU session and local switching is FFS.

Editor's note: One PIN served by more than one PDU sessions in PEGC is FFS.

\* \* \* \* End of change \* \* \* \*