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**Title: KI#3: Update to conclusion solving EN**

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*Abstract of the contribution: This contribution updates conclusions for KI#3.*

# 1. Discussion

In this document we solve one EN, add some conclusions aligned with architectural assumptions and principles and clarify some unclear issues in the evaluation of KI#3.

Regarding EN below:

Editor's note: It is FFS whether an explicit URSP Provisioning Support Indication in EPS in UE Policy Container needs to be included when UE does Initial Attach in EPS.

It is clarified that when the UE makes initial attach in EPS and provides UE Policy Container including the stored UE Policies in the UE, there is no need to add any explicit URSP support indication in EPS. The sending of such UE Policy container in EPS initial attach is an implicit indication to the network about the support of URSP in EPS.

Aligned with architectural assumptions and principles in section 4, it is added that for the ePCO based URSP delivery solution to work, the network needs to ensure that those UEs requiring URSP delivery in EPS are registered in an MME supporting 5GS interworking, and as such transferring of ePCO in the PDN Connection signalling is supported by the MME and SGW. It is also added that the network needs also to ensure that the SMF+PGW-C selected for a PDN Connection used for URSP delivery in EPS supports UE policy delivery service (i.e. SMF+PGW-C supports sending and receiving of a UE Policy Container to/from the UE). The proposal to ensure both things require:

- The network defines a list of APNs whose associated SMF+PGW-C support UE Policy delivery service (URSP rules EPS delivery APN list).

NOTE: The network needs to ensure that all the MMEs in the network supports ePCO to allow a UE to send the ePCO UE Policy Container. In other case, if a UE sends ePCO UE Policy Container this implies all legacy PCO parameters will be also included as ePCO and the MME not supporting ePCO may discard or reject those messages impacting to the legacy functionality.

- For 5GS to EPS mobility the SM-PCF is also configured with the “URSP rules EPS delivery APN List”. That way, upon 5GS to EPS mobility the SM-PCF will trigger the establishment of UE Policy Association only in case there is an ongoing PDU session towards those APNs.

The solution is limited to the non-roaming scenario.

Evaluation section is also updated removing some unclear aspects of the solution #16 and #33 in regards with:

* “*Whether the PGW know that a PDN connection is due to an initial attach or has been added by the UE as a second connection*”: There is no need for the PGW to know it. The PGW just has to include the UE Policy Container in the corresponding PDU Session establishment if received from the MME/SGW, no matter if it is from initial attach or due to a second connection.
* “*It is also not clear how to ensure that different SM PCF, different PGW, will select the same UE PCF*”: For UE initial attach, the UE includes a UE Policy Container either in the PDN Connectivity Request encapsulated in Attach Request or in the PDN Connectivity Request during the first request for PDN connectivity, so there is a single SMF+PGW-C contacted and a single SM-PCF. For 5GS to EPS handover there might be multiple SM-PCF triggering the establishment of UE Policy association but all of them query BSF to find the same registered UE-PCF for that UE (the one that registered in 5GS) and use it.

# 2. Proposal

It is proposed to accept the following changes to TR 23.700-85

**FIRST CHANGE**

## 7.3 Evaluation on Solutions for KI#3

The Key Issue #3 includes three aspects:

- #1: Identify the use cases and scenarios where the UE may need URSP that is consistent across 5GC and EPC.

- #2: Study whether there are any issues and gaps in the existing URSP mapping mechanism described in clause 5.17.1.2 of TS 23.501 [2], if so, identify them and propose solutions.

- #3: Whether, when and how to provision the URSP to UE when served by the EPC and ANDSF is not deployed in the network. For the Rel-15 UEs not supporting the URSP mapping in EPS, whether the URSP updating/provisioning to such UEs in EPS should be supported.

For bullet #2, there is only one solution (Solution#17) on the table. For this solution, there is very restricted applicability for the dynamic mapping. EPS only supports SSC mode 1; APN is always equivalent to DNN; The mapping to PDN connection need to follow what 5GS has; and S-NSSAI is not applicable in EPS. For Multi-Access preference, Time window, Location criteria, they are already setting as "not applicable in EPS". The only two parameters that may have different mapping settings are Access Type preference and Non-seamless Offload indication. However, there was no identified scenario that requiring setting a value dynamically and differently from the 5G URSP RSD.

The advantages in adopting Sol#17 are that there are certain aspects in the URSP that are currently only applicable to 5GS due to the static mapping make the URSPs (RSDs) invalid in EPS. For example: a rule that has an S-NSSAI in its RSD will simply be considered invalid in EPS by the UE as S-NSSAI is not applicable in EPS. With Sol#17 S-NSSAI parameter of the RDS can be simply set as "to be ignored in EPS" and hence the rule will be applied identically to EPS. This will ensure URSP rule consistency.

The additional advantage of adopting Sol #17 is that we can enable support of certain parameters that currently are not supported in EPS. For example, in FS\_eIMS5G2 it is discussed that S-NSSAI may be used in EPS to indicate the IMS slice to be used.

For bullet #1 and #3, there are 6 solutions (Solution#16, #18, #19, #20, #33, #34) in total, but solution #18, #19 and #20 have been covered in the consolidated solution #33 (for PCRT handling, #20 is covered by #16), so only three solutions (Sol#16, #33, #34) should be evaluated.

Solution #34 proposes to provision the URSP to UE in EPS by registering the UE to 5GC via E-UTRAN with N3IWF, which relies on the deployment of N3IWF in 5GC and UE triggering the registration. There are some aspects unclear for this solution:

- If the URSP update happens before the UE triggers the URSP provisioning request, how does UE-PCF update the URSP rule to UE?

- Accessing to 5GC via N3IWF was defined to use non-3GPP access, while this proposal uses the 3GPP access (E-UTRAN), which was never studied in early releases and may have significant architecture change.

- The design requires the UE to do dual registration to both EPS and 5GS, it's very questionable in real deployment.

However, Sol #34 has many advantages over Sol#16, #33 and the rest of the solutions that are proposing similar mechanisms. Sol #34 has minimum impact on the network as network operators need to only deploy N3IWF (if not already deployed). There is also minimal impact on the UE to support registering to 5GC via N3IWF using a PDN connection in the EPC as underlay.

Based on above analysis, it's proposed not to proceed with Solution#34.

For Solution#16 and #33, the major parts of the two solutions are same (i.e. using ePCO for URSP Delivery in EPS, relying on UE-PCF to terminate the UE Policy Association during 5GS to EPS mobility, UE indicating the URSP Delivery Support indication in UE Policy Container in Registration Request in 5GS) but with following difference:

- Sol#33 requires UE to indicate URSP Support Indication in EPS in the ePCO carried in PDN Connectivity Request message. During mobility from 5GS to EPS with N26,

- Sol#33 doesn't require AMF to initiate to terminate the UE Policy Association with UE-PCF, the UE Policy Association can be terminated by UE-PCF after the UE Policy Association is updated by SM-PCF in EPS for the UE, while this solution would require the AMF to be able to differentiate the UE supporting URSP delivery in EPS or not, which means the UE needs to report its capability of URSP Delivery Support Indication in EPS in the MM Capability in Registration Request. Sol#16 doesn't require AMF to initiate to terminate the UE Policy Association with UE-PCF either, but it further proposes the AMF to indicate to UE-PCF to delay the UE Policy Association termination for a configured period, the UE-PCF will remove the UE Policy Association either after the configured period or after receiving the UE Policy Association establishment request from SM-PCF for this UE.

- In Sol#16, AMF doesn't provide any new information to MME and let SM-PCF determine whether the UE supports URSP delivery in EPC by checking UE context policy control subscription information in UDR. In solution#33, by providing the UE Policy Association information (i.e. URSP Provisioning Support Indication in EPS, UE-PCF ID in 5GS, PCRTs) to MME by AMF, the MME can determine to create a UE Policy Container only including the indication of MME Created UE Policy Container for 5GS to EPS Mobility, based on this indication, the UE-PCF knows it's an MME initiated UE Policy Association update procedure and updates the UE Policy Association with SM-PCF and terminates the UE Policy Association with AMF for this UE. Based on the UE-PCF ID, the SM-PCF knows to select the same UE-PCF serving the UE in 5GS. In order to avoid impact to MME, Sol #16 proposed mechanism can be used as a way forward.

For Solution#16 and #33, however there are many drawbacks and technically unclear. For example:

- It is also not clear what happens if the UE is Dual registered e.g. with a N3IWF and thus already having an UE PCF.

Based on above analysis on Sol #16 and Sol #33, both solutions work from technical viewpoint to address bullet #1 and #3 for KI #3.

**Conclusion Proposal #1:** The ePCO based URSP delivery to UE in EPS is selected as baseline mechanism for normative work.

**Conclusion Proposal #2:** In order to avoid unnecessary signalling overload for the purpose of delivery URSP to pre-Rel-18 UEs in EPS, the UE needs to indicate the URSP Delivery Support Indication in EPS in the UE Policy **Container to UE-PCF in EPS and 5GS.**

**Conclusion Proposal #3:** During 5GS to EPS mobility with N26, the AMF doesn't initiate the UE Policy Association termination procedure, instead the AMF will request the UE-PCF to delay the termination of UE Policy Association for a configured period. The UE-PCF can initiate the UE Policy Association Termination procedure either after it receives the UE Policy Association Establishment from SM-PCF or after the configured period.

**Conclusion Proposal #4:** AMF doesn't provide any new information to MME during 5GS to EPS mobility with N26, the SM-PCF determines whether the UE supports URSP delivery in EPS by checking UE context policy control subscription information in UDR. The SM-PCF discovers the address of UE-PCF serving the UE by querying BSF. The UE-PCF recovers the information about the PSI list in the UE and the subscribed PCRTs in 5GS from former UE Policy Association for the UE after receiving the UE Policy Association Establishment request including a UE Policy Container only including an indication about the trigger for the UE Policy Association Establishment ("5GS to EPS handover").

**Conclusion Proposal #5:** When the UE is attached to EPS, the SM-PCF can retrieve the PCRTs for UE Policy from UE-PCF and subscribe to the applicable PCRTs in EPC to SMF+PGW-C.

**NEXT CHANGE**

## 8.3 Conclusion on KI#3:

- The ePCO based URSP delivery to UE in EPS is selected as baseline mechanism for normative work.

- In order to avoid unnecessary signalling overload for the purpose of delivery URSP to pre-Rel-18 UEs in EPS, the UE needs to indicate the URSP Provisioning Support Indication in EPS in the UE Policy Container to UE-PCF in 5GS.

- During 5GS to EPS mobility with N26, the AMF doesn't initiate the UE Policy Association termination procedure, instead the AMF will request the UE-PCF to delay the termination of UE Policy Association for a configured period. The UE-PCF can initiate the UE Policy Association Termination procedure either after it receives the UE Policy Association Establishment from SM-PCF or after the configured period. The mobility procedure from 5GS to EPC described in clause 6.16.2.3.3 is selected as the baseline procedure for 5GS to EPS mobility with N26.

- AMF doesn't provide any new information to MME during 5GS to EPS mobility with N26, the SM-PCF determines whether the UE supports URSP delivery in EPS by checking UE context policy control subscription information in UDR. The SM-PCF discovers the address of UE-PCF serving the UE by querying BSF. The UE-PCF recovers the information about the PSI list in the UE and the subscribed PCRTs in 5GS from former UE Policy Association for the UE after receiving the UE Policy Association Establishment request including a UE Policy Container only including an indication about the trigger for the UE Policy Association Establishment ("5GS to EPS handover").

- When the UE is attached to EPS, the SM-PCF can retrieve the PCRTs for UE Policy from UE-PCF and subscribe to the applicable PCRTs in EPC to SMF+PGW-C.

- When the UE returns from EPS to 5GS, the old UE policy association in EPS should be terminated after the new UE policy association established in 5GS.

- When the UE does Initial Attach to EPC, in the default PDN connection is requested to established, the UE includes the UE Policy Container ePCO in PDN Connectivity Request encapsulated in Attach Request; otherwise, the UE will include the UE Policy Container ePCO in the PDN Connectivity Request during the first request for PDN connectivity as described (i.e. as described in Sol#16). The PDN Connection used by UE and SMF/PGW-C to convey UE Policy Container ePCO shall be kept when the UE is in the CONNECTED mode.

- The PCF triggers the re-evaluation of applicable URSPs for the UE and determines an update of URSP is needed for the UE when an event as described in clause 6.16.11 happens in PCF. The PCF selects one of the PDN connection/PDU sessions associated to EPC for the delivery of the URSP update. Then the PCF generates the corresponding UPDP message MANAGE UE POLICY COMMAND in a similar way than it is done in 5GC and then includes the message into a new IE for sending it to the SMF over N7, then further to UE as described in clause 6.16.2.2.

Editor's note: It is FFS how to handle the EPS mobility for a UE that is dual registered (i.e. with a registration in 5GS via N3IWF and attached to EPC/E-UTRAN) and thus whether UE policy association can be maintained in both EPS and 5GS or only in 5GS or EPS.

Editor's note: It is FFS whether URSP mapping in EPS requires any dynamic configuration mechanism (e.g. as proposed in Sol #17) to address the aspects identified in the 2nd bullet of the KI#3 description.

NOTE: Whether a PDN Connection established with dedicated APN is used to convey UE Policy Container in EPS will be further investigated in normative phase.**END OF CHANGES**