**3GPP TSG-WG SA2 Meeting #152E e-meeting *S2-2206537***

**Elbonia, August 17 – 26, 2022 (revision of S2-220xxxx)**

**Source: Huawei, HiSilicon**

**Title: KI#2, Evaluation and Conclusion of KI#2**

**Document for: Approval**

**Agenda Item: 9.25**

**Work Item / Release: FS\_UPEAS / Rel-18**

*Abstract: This paper proposes an evaluation of solution 19 associated with KI#2.*

# 1. Introduction/Discussion

There are 18 candidate solutions proposed to address key issue#2, i.e. except solution#1. This document provides the evaluation and conclusion for KI#2.

# 2. Text Proposal

It is proposed to capture the following changes vs. TR 23.700-62.

\* \* \* \* First change \* \* \* \*

# 7 Overall Evaluation

Editor's note: This clause provides evaluations of different solutions.

## 7.2 Evaluation for KI#2

There are 18 candidate solutions proposed to address key issue#2, i.e. except solution#1, from solution#2 to #19. These 18 solutions can be group as follows:

* Group 1: How the UPF expose the data to the TSN AF/TSCTSF. The related solution is sol#2.
* Group 2: How the UPF expose the data to NWDAF. The related solution is sol#7, 8, 9,10,11,12.
* Group 3: How the UPF expose the data to NEF/AF. The related solution is sol#15, 18, 19.
* Group 4: Generic issue related to UPF data collection. The related solution is sol#3,4,5,6,13,14,16,17

**UPF Data collection to TSNAF/TSCTSF**

Solution#2 describe how to collect the PIMC/UMIC information via the UPF event exposure service. Currently this bridge information and its related operation code is encapsulated as a container to be forwarded to UPF. And only the NW-TT is requested to understand that container not the UPF. With this proposal, it means all the operation code defined in the container need be redefined in the UPF event exposure service. Also it is unnecessary to introduce a new interaction mode between the SMF and UPF, i.e. activate the event exposure not via the N4 interface.

**UPF Data collection to NWDAF**

For Group 2 solution, the data collection can be categorized into two types:

- Direct subscription from UPF (sol#7, 11, 12), i.e. NWDAF directly subscribes the UPF data from the UPF.

- Indirect subscription via SMF (sol#8, 9, 10, 12), i.e. NWDAF firstly subscribes the UPF data from the SMF, then SMF transfer the subscription information to the UPF. There one different on which message should be used between the SMF and UPF, N4 procedure? Or Nupf\_EventExposure\_Subscribe service operation?

Solution 9 propose SMF use Nupf\_EventExposure\_Subscribe for event subscription. Solution 8/10/12 propose SMF use the N4 procedure for event subscription. As the N4 interface support the data collection per existing specification, it is unnecessary to introduce a new type of interaction mode between SMF and UPF.

For the data collection for single UE case, as it always need search the related SMF first. If we want to terminate the subscription at the UPF, a new UPF discovery mechanism is to be defined, e.g. enhance the SMF event exposure service. However if the subscription is terminated at the SMF, no enhancement is expected. Hence in this case the UPF data collection subscription is more suitable to be terminated at the SMF.

**Proposal 1:** For the data collection related to single UE case, the UPF data collection subscription is preferred to be terminated at the SMF.

**Proposal 2:** For the subscription via the SMF, the SMF activate the data collection at the UPF via the N4 interface.

**UPF Data collection to the NEF/AF**

For Group 3 solution, all solution is related to the data collection related to one flow within one PDU session. The solution can be summarized as below:

* Solution#15 describes how the direct subscription can be done via the BSF. It is unclear how the related flow information which need measurement is triggered?
* Solution#18 describes how the QoS parameter information at the UPF can be exposed to the AF. It is unclear if this information is the provision information or measurement information. If the QoS information is the provision information, why not directly get it from the SMF? If the information is the measurement information, how to trigger the measurement?
* Solution#19 describes how NEF do the subsequent subscription to the same QoS flow and how to use the direct UPF subscription to do the data collection from QoS Monitoring.

For the AF do the subscription to the same QoS flow it is unclear how the NEF can determine that subsequent subscription request from AF is for the same service data flow, then it can send the subscription to the UPF not the SMF directly? Even if the subscription is for the same QoS flow, if there are some update on the QoS Monitoring, e.g. change the monitoring reporting frequency, how to handle it?

For the direct subscription to the UPF and UPF trigger the SMF action, it is unsuitable to trigger the UPF subscription directly. Normally this monitoring subscription is combined with the PCC rule and notified to the SMF. By doing that, the SMF can trigger the related action, e.g. PDU session modification. The input for the activate measurement also need consider the policy control from the PCF. So why not do the subscription via the SMF considering the UPF discovery may also need go via the SMF?

**Proposal 3:** for the data collection which need some action besides UPF, e.g. QoS flow characteristics measurement, the subscription should be terminated at the SMF.

**Generic issue related to UPF data collection**

For Group 4 solution, the solution is not bound to one specific type NF consumer. It can be considered in all UPF data collection case. The solution can be summarized as follows:

* Solution#3 give some generic guidance on whether the UPD data collection should be the direct subscription or indirect subscription. It can be considered when the NF consumer do the UPF event subscription and not need be concluded individually.
* Solution#4 describe that N4 interface need be enhanced to pass the related event filtering information to the UPF. It can be part of the data collection procedure.
* Solution#5/#6 describe how to find the related UPF via the SUPI or IP address. It is more related to KI#1.
* Solution#13 describe how the UPF event subscription can be updated if the UPF is changed. It may be more suitable to consider this procedure in the related context. For example if the UL-CL is released, no target UPF, how to consider this UPF subscription change case?
* Solution#14 describe how to avoid performance impact due to the UPF data collection. Similar consideration is also considered at the Solution#11. There are at least two mechanisms can be considered, i.e. the NF consumer indicates the Reporting suggestion information in the Event subscription procedure and per Reporting suggestion information UPF can concatenate several notification message to the same notification endpoint in one notification message.

By doing so it can greatly reduce number of the event reporting message and avoid the impact at the peak time especially avoiding event exposure impact to the normal UPF data packet transfer handling. This also give some flexibility to the UPF on when to report the collected data to NF consumer.

* Solution#16 describe that when the UPF receives the event subscription it may notify to the SMF to verify whether the subscription is allowed or not. If the intention of this procedure is for service operation authorization, it can be done as part of the service operation discovery, which is defined by SA3 WG. Also it is unclear how the SMF/PCF based on what information do the subscription authorization?
* Solution 17 describe two case, i.e. the update/release directly to UPF or update/release indirectly via the SMF. For the update/release directly, similar issue about the authorization process via SMF/PCF. For the update/release indirectly, it can be part for the subscription handling, i.e. not need be listed individually.

**Proposal 4:** to reduce the event exposure impact to the UPF, it is suggested to introduce the Reporting suggestion information in the Event subscription procedure and per Reporting suggestion information UPF can concatenate several notification message to the same notification endpoint in one notification message

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

# 8 Conclusions

## 8.2 Conclusions for KI#2

The following conclusion is proposed for KI#6:

1. Subscription to UPF events via SMF is the rule except for the cases listed in bullet 2; Subscription via SMF means the final consumer of UPF notifications sends the subscription request to the SMF and then the SMF is doing a third-party subscription onto UPF on behalf of this final consumer. Conversely the notifications are directly sent by the UPF to the final consumer of UPF notifications

NOTE 1: Optimizing notifications is more important than optimizing subscriptions. UPEAS allows reducing the signaling path for the UPF reporting (most frequent operations) for all the cases while keeping the subscription via the SMF in cases not listed in bullet 2; this allows UPF event consumers not to have to determine and select the appropriate UPF (for example determining the dedicated PSA UPF that handles a specific application flow…), and allows UPF event consumers not to have to deal with changes of PSA UPF.

NOTE 2: Subscriptions related with AoI are handled by SMF that subscribe/unsubscribe to the relevant UPF(s) on behalf of the final consumer based on whether the UE is in the target AoI. This allows the UPF not having to determine the AMF where to subscribe for UE presence in the AoI

NOTE 3: For event subscriptions requiring interactions with 5G AN, a solution where the UPF event consumer would directly subscribe to UPF and then UPF would ask SMF to send N2 SM signaling to 5G AN would be more complex and not bring advantage

2. Direct subscription to UPF (i.e. not requiring third party subscription to UPF via SMF) shall be possible for following cases:

A TS 23.288 [5] Table 6.5.2-2: Data collected by NWDAF for UPF load analytics recalled in item 2 of Annex A of the TR

B For analytics targeting "any UE" (possibly for specific DNN and or slices) and not related with an AoI or with a specific data flow:

NOTE 4: This can relate to use cases such as Data collected by NWDAF for UPF load analytics, User Data Congestion Analytics, Data Volume dispersion analytics, WLAN performance analytics

1. When a SMF is doing a third-party subscription on behalf of the final consumers of UPF notifications, the SMF uses SBA based UPF exposure service to subscribe onto UPF. A SBA interface is defined for subscribing to any UPF event regardless of whether this subscription is direct from the consumer of UPF notifications or whether this subscription is done by SMF on behalf of the final consumer of UPF notifications

NOTE 5: Using a subscription SBA based API (and not PFCP evolutions) allows to benefit from SBA advantages / features (defined now and in the future) and avoids un-necessary protocol translations.

1. In Rel18,

A. the only defined consumers of UPF event SUSCRIBE are SMF and NWDAF.

B. the only defined consumers of UPF event notifications are SMF, AF/NEF and NWDAF

6. UPF event exposure **Service description:** This service provides events related to PDU Sessions towards consumer NF. The service operations exposed by this service allow other NFs to subscribe and get notified of events happening on UPFs. The following are the key functionalities of this NF service.

The following events may be subscribed by a NF consumer:

- QoS flow Bit Rate.

- QoS flow Packet Delay.

- Packet transmission.

- Traffic usage report.

- Communication start and stop (3GPP access or WLAN access).

- UL/DL data rate (3GPP access or WLAN access).

- Traffic volume (3GPP access or WLAN access).

- Throughput UL/DL.

- Throughput UL/DL (peak).

- UL/DL packet delay GTP.

1. For some of the information that a consumer may subscribe to (see bullet 6), the consumer may provide a sampling ratio. In the corresponding notifications, the UPF may provide an indication of Achieved sampling ratio
2. To determine which SMF to contact the final consumer of UPF events proceeds as follows
* If the event targets any UE, the final consumer of UPF events looks up the NRF to discover all suitable SMF(s) (e.g. SMF(s) that serve the target combination of DNN and S-NSSAI)
* If the event targets a unique UE identified by its SUPI, the final consumer of UPF events sends Nudm\_UECM\_Get\_Request(SUPI, type of requested information set to SMF Registration Info and the S-NSSAI and DNN) to UDM to get the SMF ID serving the target UE.
* If the event targets a unique UE identified by its (IP) address (associated with a target DNN and S-NSSAI), the final consumer of UPF events uses and evolved Nbsf\_Management\_Discovery to get the SMF ID serving the target UE.

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