**SA WG2 Meeting #153eS2-2208221r11**

**October 10th – 14th, 2022; Elbonia (revision of S2-220+8523+8885+8271 (non-PFCPvSBI parts))**

**Source: Nokia, Nokia Shanghai Bell, LG Electronics, China Mobile, Deutsche Telekom, Ericsson**

**Title: Update to conclusions on KI2 except for** **usage of SBA versus usage PFCP for SMF 3rd party subscription onto UPF**

**Document for: Approval**

**Agenda Item: 9.25**

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

*Abstract of the contribution:* **Update to conclusions on KI2 except for usage of SBA versus usage PFCP for SMF 3rd party subscription onto UPF**

# 1 Discussion

This Tdoc addresses all points still FFS in the KI2 conclusion except for usage of SBA versus usage PFCP for SMF 3rd party subscription onto UPF that is addressed by another tdoc

Following EN can be removed

1. Editor's note: Whether other direct subscriptions are possible is FFS.

This is removed, adding following direct subscription case

C. The case described in solution 20 (UE IP address mapping information exposure by UPF)  where the BSF can directly discover the UPF that performs NAT (based on the NAted IP address) and then invoke directly the NAT related API at the UPF

Following EN can be removed as in this release there is no use case defined for AF/NEF to directly subscribe to UPF

1. Editor's note: Whether AF/NEF can directly subscribe to UPF is FFS.

Following EN can be removed

1. Editor's note: The following part is FFS "Both UserDataUsageMeasures and serDataUsageTrends events provide measurement context (for example, time stamps for the packets and the measures) and information of the PDU Session. When the information refers to an application, the Application Id or Packet Filter Set is included".

Due to the addition of following principle

When the UPF provides notifications related with UserDataUsageMeasures or UserDataUsageTrends events the notifications may indicate the time stamps for the measures and also refer to the Application Id or Packet Filter Set indicated in the consumer subscription.

Following EN can be removed

1. Editor's note: If the consumer of NWDAF service doesn't provide the necessary parameters to NWDAF, for example, the DNN, S-NSSAI (these parameters are optional for NWDAF service defined in TS 23.288 [5]), how to discover the SMF in any UE situation without these parameters is FFS.

By adding following principle

If the consumer of NWDAF service doesn't provide the target DNN, S-NSSAI (these parameters are optional for NWDAF service defined in TS 23.288 [5]), and the event targets a unique UE identified by its SUPI it is up to NWDAF implementation to reject the request or to get the list of all PDU Session for that SUPI via Nudm\_UECM\_Get\_Request and then determine which (DNN, S-NSSAI) it will consider

# 2 Proposal

**It is proposed to update TR 23700-62** **as follows**

\* \* \* Start of changes \* \* \*

## 8.2 Conclusions for KI#2

The following interim conclusions are proposed for KI#2:

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 event 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.

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 (for example, the SMF can first get the UE list within the AoI and keep being updated about the UE list by subscribing to AMF, and then subscribe/unsubscribe to the relevant UPF(s) on behalf of the final consumer).. 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 signalling 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 data collection where UPF is the source as defined in TS 23.288 [5], i.e. the 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 BSSID/SSID or with a specific data flow

Editor’s Note: the following exception case is FFSThe case described in solution 20 (UE IP address mapping information exposure by UPF)  where the BSF can directly discover the UPF that performs NAT (based on the NAted IP address) and then invoke directly the NAT related API at the UPFNOTE 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.

Editor's note: Whether other direct subscriptions are possible is FFS.

3.

Editor's note: When a SMF is doing a third-party subscription on behalf of the final consumers of UPF notifications, it is FFS whether SBI and/or PFCP (TS 29.244 [8]) is used for interaction with UPF.

4. In Rel18:

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

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

5. 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 events may be subscribed by a NF consumer:

- Event: QoS monitoring. This event provides QoS Flow level performance information (information listed in Solution #8, clause 6.8.2).

- Event: UserDataUsageMeasures. This event provides information of user data usage of the User PDU Session (information listed in Solution #7, clause 6.7.2).

- Event: UserDataUsageTrends. This event provides statistical measurements (information listed in Solution #7, clause 6.7.2).

When the UPF provides notifications related to UserDataUsageMeasures or UserDataUsageTrends events the notifications may indicate the time stamps for the measures and also refer to the Application Id or Packet Filter Set indicated in the consumer subscription.

6. 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 target are UEs identified by a Group Identifier, the final consumer of UPF events sends Nudm\_SDM\_Get\_Request to UDM and requests the list of SUPIs that correspond to the Group ID. Final consumer then proceeds with these SUPIs as described above to get SMF ID serving each UE identified by one of received SUPIs.

If the consumer of NWDAF service doesn't provide the target DNN, S-NSSAI (these parameters are optional for NWDAF service defined in TS 23.288 [5]), and the event targets a unique UE identified by its SUPI, the NWDAF gets the list of all PDU Session for that SUPI via Nudm\_UECM\_Get\_Request and then determine which (DNN, S-NSSAI) it will consider

If the consumer of NWDAF service doesn't provide the target DNN, S-NSSAI (these parameters are optional for NWDAF service defined in TS 23.288 [5]), but provides the application server IP address/FQDN, and the event targets a unique UE identified by its SUPI or any UE, the NWDAF obtain the target DNAI from 5GC by the mapping table between Application IP range/address and DNAI as described in clause 8.7 conclusion of TR 23.700-48 [x]. After obtaining DNAI from the NEF by providing AS IP/IP range and/or FQDN, the NWDAF uses the DNAI to trigger the SMFs discovery in NRF for single UE or any UE.

7. For the UPF data collection, the event subscription includes Reporting suggestion information as described in Sol#14, which is used to assist the UPF event notification. Per Reporting suggestion information UPF can concatenate several notification messages to the same notification endpoint in one notification message.

NOTE x: The trade-off between operator’s flexibility on the network deployments/management and uncertain reporting from the dynamic on/off, as described in Solution#21, will be determined during normative phase.

*Second change*

## 7.2 Evaluation for KI#2

There are 21 candidate solutions proposed to address key issue#2, i.e. except solution#1, from solution#2 to #22. These 21 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, 20.

- Group 4: Generic issue related to UPF data collection. The related solution is sol#3,4,5,6,13,14,16,17, 21, 22.

**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. Using the SBA based API for subscription allows to benefit from SBA advantages / features (defined now and in the future) and avoids un-necessary protocol translations. Using PFCP for some events allows reusing N4 IEs defined for the purpose..

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:** void.

**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 to find a way with lower latency and higher flexibility. The QoS parameters requested to be exposed by UPF are provision information that are configured in the UPF by 5GC for packet processing and can be identified by AF. This information is provisioned by the UPF without other operations by the SMF or AN.

- 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, AF is allocated Transaction Reference ID during the QoS monitoring initial request to identify service data flow. Subsequent request is used for updating current subscription with the same Transaction Reference ID. Local NEF can identify the request is for the same service data and invoke Nupf\_EventExposure\_Subscribe service operation directly.

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?

* Solution #20 describes how the UE IP address mapping information can be exposed by UPF so that the AF can know the UE private IP address which is internally used in 5GC. This is for the case that the UPF supports the NAT.

**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 UPF 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 and Solution#21. 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.

- 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.

- Solution#21 describes whether the UPF event exposure is used or not at any time by taking a consideration on the UPF performance. By muting and resuming the UPF reporting based on the threshold of UPF performance configured from operator policy, it may be helpful to manage efficiently the UPF event exposure, and give the operator the flexibility of network deployments and managements. However due to the reporting is uncertain, it is unclear on its benefit of this type of reporting.

- Solution #22 describes how to support the updating of target UPF for UPF event exposure service subscription in case of UPF change during the life time of the PDU Session.

**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.

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