**3GPP TSG-WG SA2 Meeting #141E e-meeting *S2-2006914***

**Elbonia, October 12 – 23, 2020 (revision of S2-200xxxx)**

**Source: Huawei, HiSilicon**

**Title: KI #13, Sol #75: Update to clarify concepts**

**Document for: Approval**

**Agenda Item: 8.1**

**Work Item / Release:** **FS\_eNA\_Ph2 / Rel-17**

*Abstract: This contribution clarify concepts on AF influencing NF consumers subscription to analytics ID for specific UEs and or group of UEs and remove ENs.*

# 1. Introduction/Discussion

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| --- | --- | --- |
|  Topic | Reason | Proposal of Changes |
| Removal of Editor’s Notes | Editor's note: Whether Option1 and Option 2 are in the scope of the KI, the reason why the NF triggers for analytics are AF driven are FFS. | 1. Add additional text in Section 6.75.1 to motivate the solution association with KI#13 and remove the EN
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| Editor's note: How the AMF or any NF considers the ASI vs their own internal triggers is FFS. | 1. Add of text in Section 6.75.1 to extend the principles of the solution and remove the EN
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| Editor's note: How the AF knows the ASI that is related to each NF is FFS. |
| Editor's note: Which procedures defined in 23.501 needs this ASI is FFS. | 1. Update of text in section 6.75.1 to clarify the procedures related to the use of ASI and removal of EN.
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| Clarification of the scenarios when solution is applicable | During SA2#140E email discussion it was raised the issue about the scenarios applicable to this solution.  | 1. Add scenario description in Section 6.75.1.
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Our solution indeed describes that AF has a better understanding of the UEs at application level, but it is also true that MNO can also know the UEs/group of UE behavior, and this is why we included such possibility in step 1a in the procedure. The text in TR 23.700-91 Clause 6.75.1 does not reflect this and we will correct this in our planned update for Sol #75.

We envision the usage of our solution in at least two possible scenarios:

* Our solution is target as a complement to the scenario that rises when AFs or OAM use existing mechanism already defined in R16 TS 23.288, where AF or OAM, or even UDM can receive NWDAF the expected UE behavior analytics ID (TS 23.288 Clause 6.7.4). In TS 23.288 it is not document what happens with 5GS when such information is obtained by an NF/OAM. For instance, if an AF (or OAM as indicated in TS 23.288 Clause 6.7.4.1) receives in the Expected UE behavior the indications that UEs or group of UEs have erratic UE communication behavior, the AF (or OAM) therefore can know the UEs/group of UEs behavior and with the support of our solution can indicate to the further NFs of 5GS that such UEs or group of UEs are restricted/or allowed from being used as target of analytics ID in the calculation of analytics IDs such as service experience, or data congestion.
* Our solution target the scenario in which 5GS knows the behavior of the UE/group of UEs while the AF knows why the UEs are behaving like that due to its unique knowledge of the application level. Therefore, AF can support 5GS to better use its resources when performing analytics processes. For instance, the scenario considering 5G in a factory service where robots (i.e., UEs) take certain (fixed) routes and some robots may not be active for a long time or be backups in standby. From a network perspective, all these UEs will be connected to the network (eventually with minimal communication), but from an application perspective AF knows about the UEs inactivity for the next few hours/days and can therefore remove them from the generation of analytics IDs, which it means that AF is supporting 5GS to reduce data collection for UEs that have a will not influence (are inactive from application perspective) the network behavior.

The advantage of our solution is twofold:

1) Avoid that all NFs need to subscribe to NWDAF to obtain the UE expected behavior in order to be able to determine which UEs such NF should use as target of analytics IDs. This reduces the load on analytics generation: computational load at NWDAF (potential to save energy); reduce load of data collection because if NFs subscribe to UE expected behavior with different parameters (e.g. TA) NWDAF needs to collect data from multiple areas.

2) Avoid delays on the generation of analytics IDs when such UEs or group of UEs (in the example the ones identified with erratic behavior) are included in an analytics ID subscription, because NWDAF might need to collect enough data (which includes more data to smooth the data collected from the erratic UEs/group of UEs) in order to have a better accuracy on analytics output as defined in TS 23.288 Clause 6.2.1: "If no sufficient data is collected to provide an estimation for the requested level of accuracy before the time deadline, the service shall return a zero confidence. Otherwise, the NWDAF may wait until enough data is collected before providing a response or a first notification."

# 2. Text Proposal

It is proposed to capture the following changes vs. TR 23.700-91

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

## 6.75 Solution #75: AF influencing NFs triggers for interactions with NWDAF

### 6.75.1 Description

This solution addresses Key Issue #13 "Triggering conditions for analytics" with the specific focus on defining a solution for the following issues of KI#13:

- whether configuration for these triggers is needed;

- whether changes to 5Gs architecture and services are needed to allow for such configuration.

Recently, there has been an increase extension on the role of AFs influencing different aspects of how 5GS controls the UEs and/or group of UEs related to the AFs. Examples of the AF capabilities to influence 5GS for specific UEs and/or group of UEs are providing: traffic and routing information, QoS reference information for session management, specific charging requirements, service parameters for UEs, among others. The main motivation is that AFs can provide valuable information to 5GS, so that 5GS NFs can better make use of its resources and provide adequate services to the UEs and/or group of UEs related to such AFs. In this solution, we propose the same principle to be applied for the selection of UEs and/or group of UEs to be considered during the triggers for analytics IDs consumption by 5GS NFs.

This solution is applicable to scenarios such as the ones described below:

- The scenario in which 5GS knows the behavior of the UE/group of UEs (e.g., UEs are a reduced range of mobility) while the AF knows why the UEs are behaving like that due to its unique knowledge of the application level. Therefore, AF can support 5GS to better use its resources when performing analytics processes. For instance, the scenario considering 5G in a factory service where robots (i.e., UEs) take certain (fixed) routes and some robots may not be active for a long time or may in standby to act as backups. From a network perspective, all these UEs will be connected to the network (eventually with minimal communication), but from an application perspective AF knows about the UEs inactivity for the next few hours/days and can therefore remove them from the generation of analytics IDs, which it means that AF is supporting 5GS to reduce data collection for UEs that have a will nor major role (are inactive from application perspective) on network utilization.

- As a complement to the scenario that rises when AFs or OAM use existing mechanism already defined in R16 TS 23.288, where AF or OAM, or UDM can receive NWDAF the expected UE behavior analytics ID (TS 23.288 Clause 6.7.4). In TS 23.288 it is not document what happens with 5GS when such information is obtained by an NF/OAM. For instance, if an AF (or OAM as indicated in TS 23.288 Clause 6.7.4.1) receives in the Expected UE behavior the indications that UEs or groups of UEs have erratic UE communication behavior, the AF (or OAM) therefore can know the UEs/group of UEs behavior and with the support of our solution can indicate to the further NFs of 5GS that such UEs or group of UEs are restricted/or allowed from being used as target of analytics ID in the calculation of analytics IDs such as service experience, or data congestion.

It is possible that NFs themselves can decide which UEs or group of UEs may be used as target of analytics ID when such NFs subscribe/request analytics IDs to NWDAF (e.g., as defined in Solution #45, in clause 6.45). Nevertheless, AF may be the able to influence 5GS NFs triggering analytics subscription/request on determining the specific UEs and/or group of UEs that should be included in such request. When NFs decide to trigger analytics ID for a specific UE and/or group of UE, such NF may take decisions on such UEs and/or group of UEs treatment based on such analytics ID. As detailed in the scenarios above, NFs might be able to select UEs but this selection might not take into account the perception of the NF in face of what AF know about the reasons for the UE to behave in such an observed way. Therefore, this contribution aims at AF indicating to 5GS the UEs and/or group of UEs that might not be useful to devote 5GS resources (such as data collection) to include such UEs as target of analytics IDs.

We propose a new solution where AFs support NFs to select an appropriated set of UEs and or group of UEs when triggering the subscription to analytics ID. Such influence is related to AFs requesting to 5GS that certain UEs and/or group of UEs should be removed or included on a request for analytics information, when NFs trigger the request/subscription to NWDAF.

The advantage of the proposed solution are:

- Avoid that all NFs need to subscribe to NWDAF to obtain the UE expected behavior in order to be able to determine which UEs such NF should use as target of analytics IDs. This reduces the load on analytics generation: computational load at NWDAF (potential to save energy); reduce load of data collection because if NFs subscribe to UE expected behavior with different parameters (e.g. TA) NWDAF needs to collect data from multiple areas.

- Avoid delays on the generation of analytics IDs when such UEs or groups of UEs (not relevant from application perspective for a given point in time) are included in an analytics ID subscription. Without any support on the selection of the UEs/group of UEs, NFs subscribe to NWDAF and NWDAF might need to collect enough data (which includes more data to smooth the data collected from not representative UEs/group of UEs) in order to have a better accuracy for the requested analytics output as defined in TS 23.288 Clause 6.2.1. This will lead to increase of data collection.

This solution may be used standalone or combined with other solutions already defined in the TR 23.700-91 in order to refine the configuration information the NFs require to trigger the proper subscription, request to analytics IDs.

The main principles of the solution are:

- AFs provides the Analytics Subscription Information (ASI), which defines the properties of analytics IDs for specific UES or group of UEs. The properties are the request to include a restriction or to remove a restriction for NFs to consume analytics IDs from NWDAF for the indicated UEs and/or group of UEs controlled by the AF. The effect of removing a restriction is that NFs are allowed once again to consume the analytics IDs for any UEs and/or group of UEs that they determine as necessary.

- NFs have their own mechanisms to determine which analytics IDs they shall request. The definition of such mechanisms is out of the scope of this solution.

- NFs have their own mechanisms to determine the set of UEs or group of UEs that should be included in the subscription to an analytics IDs.

- The ASI information is a configuration information complementing the internal logic of the NFs on the decision of which UEs and/or group of UEs should be included in the subscription to analytics IDs of such NF.

- The ASI information is independent of NFs. The ASI is associated to analytics IDs. It contains a list of analytics ID and for each analytics IDs it has the indication of the restrictions of UEs and/or group of UEs to be used for such analytics IDs.

NOTE: An indication of a restricted analytics ID for a specific UE and/or group of UE does not prevent a 5G NF to consume the same analytics ID for a different set of UEs and/or group of UEs.

- The analytics subscription information, is stored at UDM, and serve as triggers for:

- NFs to interact with NWDAF for analytics IDs when such NF is performing UE registration, session management, UE mobility procedures as defined in TS 23.502;

- UDM to notify NFs about changes in the restrictions for analytics IDs for specific UEs and/or group of UEs.

- The UDM keeps the relationship of which NFs are related to which ASIs and uses this information when it needs to provide a notification to NFs. This relationship is established when NFs query UDM to check whether for a given analytics ID there exist a related ASIs stored at UDM that should be taken into consideration by the NF aiming at subscribing to such analytics ID.

### 6.75.2 Procedure



Figure 6.75.2-1: AF influencing consumption of analytics IDs for specific UEs and/or group of UEs

There are two possible options for enabling the analytics subscription information to be stored at UDM:

1a. (*Option 1: Via Configuration*) The analytics subscription information is configured, stored, and maintained at UDM.

NOTE 1: If Step 1a is executed, the Steps 1b, 2 and 3 are skipped.

1b. (*Option 2: Via AF directly or indirectly with NEF support*) AFs provides the analytics subscription information (ASI) to UDM, directly if AF is allowed by operator to do so, or via NEF. UDM exposes services that can be invoked with the following input parameters: identification of NF providing the ASI, list of one or more restricted analytics IDs for specific UEs or group of UEs.

2. UDM receives, stores, and maintains the analytics subscription information based on interaction with AF (via NEF).

3. UDM provides to AF (directly or via NEF) the identification of the ASI to enable AF to change the properties of the analytics IDs or the list of UEs or group of UEs associated with stored ASIs.

4. One or more UEs are performing session establishment or UE registration or UE mobility via interactions with 5GS.

5. The NF (e.g., AMF if the UE is performing registration, or SMF when performing PDU session setup for UEs, or PCF when performing policy association), when selecting the list of UEs and/or group of UEs to be included in the subscription to analytics IDs they are configured to trigger, determines that there is an available ASI information about the UE (or UEs, or groups of UEs). The NF invokes the service exposed by UDM to retrieve the restrictions associated with an ASI. The parameters included in the request are a list of analytics IDs, identification of the UEs and/or group of UEs, Notification Target Address and identification of the NF requesting the ASI.

NOTE 2: AFs indicate to 5GS ASI per Analytics ID. Different NFs may be configured by the operator to subscribe to different analytics IDs. When the NFs are triggering subscription to their configured analytics ID, they check with UDM whether there exist an ASI that can support them in the decision of which UEs and/or group of UEs can be included as analytics target of the analytics ID subscriptions to be triggered.

6. UDM verifies if there exist ASIs related to the parameters included in the received request from the NF.

7. UDM provides a response to the NF based on the matching of the requested fields and the maintained ASIs.

7a. If there is a match for to some or all of the fields in the request, UDM sends to the NF the list of restricted analytics IDs for UEs and/or group of UEs and the associated ASI.

7b. If there was not a match for any field, UDM sends to the NF an indication of no applicable ASI for any of the requested fields.

NOTE 3: The NF might also receive the ASI in case of UE mobility from the previous NF serving the UE or group of UEs, e.g., via UE context transfer. In this case, the NF may not perform the steps 5 – 7.

8. Based on the received information from UDM, the NF triggers interactions with NWDAF.

8a. In case the NF receives an indication of no application ASI, the NF can decide according to its internal logic or configuration to further request analytics ID related to the UEs and/or group of UEs.

8b. In the case the NF receives one or more restricted analytics IDs for the one or more UEs and/or group of UEs, the NF triggers subscriptions/request to NWDAF taking into consideration the received restricted analytics IDs for specific UEs and/or group of UEs.

NOTE 4: The operators may configure NFs with further mechanism to decide on the enforcement (or not) of received restricted specific UEs and/or group of UEs to be considered in the subscription to an analytics ID.

NOTE 5: The steps 9 – 11 may be executed in parallel to the steps 4 – 8.

9. OAM (9a) or AF (9b) provides updated ASI to UDM. Examples of updates on ASI are change the properties from imposed restriction to removed restriction (or vice versa) on analytics IDs for a list of UEs and/or group of UEs; or change the list of UEs and/or group of UEs for restricted analytics IDs (i.e., include or remove UEs and/or group of UEs).

10. UDM identifies the NF consumers of ASI that are affected by the updated ASIs. UDM uses the Notification Target Address to interact with the identified NF consumers of ASI to provide the updated restrictions.

11. The one or more NFs that received the updated restrictions from UDM further interact with NWDAF in order to comply with the updated restrictions imposed or removed for its consumption to analytics IDs for UEs and/or group of UEs.

### 6.75.3 Impacts on services, entities and interfaces

AF:

- Provide analytics subscription information to 5GS

NEF:

- New services to allow AF providing analytics subscription information to be stored at UDM.

UDM:

- New data structure for storing the analytics subscription information

- New services or extension of existing services for interactions between UDM and NFs to allow the analytics subscription information to serve as trigger for NFs to consume analytics IDs from NWDAF for specific UEs and/or Group of UEs.

AMF, SMF, PCF:

- Retrieve or be notified about the requested or removed restrictions on using specific UEs/ Group of UEs on the subscription to analytics ID, upon the execution of session management procedures.

- Extensions of the information exchanged between AMFs, SMFs, and PCFs to support the exchange of the restriction to analytics IDs for specific UEs and/or group of UEs during mobility procedures.

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