**3GPP TSG-SA WG2 Meeting #139e S2-2003802merge**

**1 June - 12 June 2020, eMeeting revision of S2-2000773**

**Source: Motorola Mobility, Lenovo**

**Title: Solution on efficient data collection by multiple NWDAF**

**Document for: Approval**

**Agenda Item: 8.1**

**Work Item / Release: FS\_eNA\_ph2 / Rel-17**

***Abstract of the contribution:****.*

# Introduction

This solution addresses Key Issues 11 & 1 and 2.

Merging attempt of S2-2003802, S2-2003875, S2-2003898, S2-2003779?

The details of this solution are presented below, as part of the proposed changes to TR 23.700-91.

# Proposal

It is proposed to include the following Solution in the eNA TR.

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# 6 Solutions

## 6.0 Mapping Solutions to Key Issues

Table 6.0-1: Mapping of Solutions to Key Issues

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| --- | --- | --- | --- | --- |
| Solutions | Key Issues | | | |
| 6.X | 11 | 1 | 2 |  |
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## 6.X Solution for Key Issues 1, 2, 11: Using a dedicated NF for data collection

### 6.X.1 Description

Editor's note: Describe the solutions. (sub) clause(s) may be added to capture details, procedural flow etc.

The architecture to support data collection for multiple NWDAF sets is shown in Figure 6.X.1-1. The solution proposes Network Functions to provide the data required by the NWDAF to derive analytics to a dedicated NF (Data Collection Network Function – DCNF). The DCNF subscribes to Network Function to collect data based on subscription requests from each NWDAF.. This is illustrated below.



Figure 6.x.1-1 - DCNF architecture

The advantage with this approach is that the NWDAF collect data from a single NF (DCNF) reducing the load at the NWDAF on identifying the NF that contains the required data. An example is shown in Figure 6.x.1-2 where the NWDAF requires location information from the AMF to derive analytics on location changes. All AMFs in the PLMN provide location events to a single network function (DCNF). The NWDAF subscribes from the DCNF to retrieve the relevant data to derive analytics.



Figure 6.X.1-2 - NFs providing data to a central data storage NF

The DNCF may be a functionality within the NWDAF or may be a separate Network Function supporting a dedicated data collection functionality. The advantage of the latter is that it reduces the processing load at an NWDAF as each NWDAF will have a single point of contact with the DCNF when subscribing to be notified of one or more Events.

To support NWDAFs deployed in a distributed environment a DCNF is configured to support a serving area (stored in the NRF). The NWDAF discovers a DCNF supporting a specific serving area from the NRF.

The method how each NF identifies what Events need to be provided to the DCNF is as follows:

Option 1

- The NWDAF subscribes from the DCNF with a list of one or more Events that the NWDAF needs to be notified to derive analytics. The NWDAF identifies the Events based on the Analytics request by a consumer NF.

- The DCNF determines from the list of Events the NF types that needs to be contacted. The DCNF subscribes from each identified NF with a corresponding list of one or more Events to be notified.

- When an Event occurs each NF that the DCNF has subscribed to notifies the DCNF with the data associated with the Event (e.g. TAI. Cell ID if the Event is Location Changes). The DCNF forwards the notification to the NWDAF having subscribed to the event notification.

Option 2

- The NWDAF identifies the NF that provides the required data from the NRF and subscribes from a DCNF to collect the data from the identified NF

- The DCNF establishes a new Event Exposure service to the identified NFs or updates an existing Event Exposure service if the DCNF identifies that data has been collected before from the identified NF.

The following signal flow describes the procedure.

Figure 6.X.1-2: Procedure for data collection by using DCNF

1. An NF-A sends analytics request to an NWDFA by using Nnwdaf\_AanlyticsInfo\_Request or Nnwdaf\_AnalyticsSubscription\_Subscribe service of the NWDAF.

2. If option 2 is used the NWDAF use Nnrf\_NFDiscovery service of NRF to discover and select NF data producer(s), e.g. NF-B.

3. The NWDAF uses Nnrf\_NFDiscovery service of NRF to discover and select DCNF. The information to discover and select a DCNF may include DNN, S-NSSAI, type of data to be collected, service area.

4. The NWDAF use a service of DCNF, e.g. Ndcnf\_EventExposure\_Subscribe to send the data subscription request to the DCNF. The message may contain one or more of following parameters: Event ID and/or name of NF-B, address(es) of NF-B, the type of data to be collected, and data collection attributes.

5. The DCNF identifies the NF types that need to be contacted based on the Event IDs requested. The DCNF determines the NF types to contact corresponding to the Event ID requested based on internal implementation (Option 1) or alternatively the NF address(es) provided in step 4 (Option 2).

5a. if Option 1 is used the DCNF subscribes to each identified NF type including a list of one or more Event ID(s) associated to the NF type. The DCNF may subscribe to all NFs of specific NF type (e.g. if NF type is AMF the DCNF subscribes to all AMFs) which avoid the need to track what NF contains the required information (e.g. NF that serves a specific UE).

If Option 2 is used and the data type has not been collected before, or the data is being collected but having different collection attributes, the DCCF uses an event exposure service, such as Nnf\_EventExposure\_Subsribe where the NF could be AMF, SMF for example, to subscribe for the required data type. For example, if the data type has been collected before, the existing subscription parameters may be updated such as Expiry time, Area of Interest.

The DCNF uses the existing Event Exposure APIs provided by each NF to retrieve the relevant data.

5b. The NF-B sends data notification to the DCNF, for example by using Nnf\_EventExposure\_Notify service.

6. The DCNF uses a service, for example Ndccf\_EventExposure\_Notify to send the data to the NWDAF(s) that subscribed for this data.

7. The NWDAF performs data analytics.

8. The NWDAF sends the analytics results data to the NF-A by using Nnwdaf\_AnalyticInfo\_Response or Nnwdaf\_AnalyticSubscription\_Notify service.

When there are multiple NWDAFs in a network deployment the DCNF needs to handle Event Notification subscriptions from multiple NWDAFs. As multiple NWDAFs may request subscription to the same Event a further signalling optimisation is for the DCNF to re-use existing Event Notification Subscription(s) from each NF when reporting Events to each NWDAF. The cases are:

- If multiple NWDAFs subscribe to the same Event ID, i.e. target the same UE(s) or target the same area of interest the DCNF re-use an existing Event Notification subscription to each network function of the same NF type that report this Event and relay the information to multiple NWDAFs.

- If multiple NWDAFs subscribe to the same Event ID but contains different criteria, e.g. a second NWDAF subscribes to be notified of Events targeting a different UE the DCNF modifies an existing Event Notification subscription to NFs of the same NF type that report this event, requesting additional criteria to be reported from the same Event.

- If multiple NWDAFs subscribe to Event ID(s) that can be reported by the same NF type the DCNF modifies an existing Event subscription towards one or more network functions of the same NF type to report additional Event IDs. For example, the DCNF may have an existing Event Subscription with an AMF providing notifications of Event ID "Location Changes". When a second NWDAF subscribes to the DCNF to be informed of notifications of Event ID "Reachability Status" changes, the DCNF may modify an existing event subscription to all NFs of the same NF type adding the additional Event ID "Reachability Status" to be reported to the DCNF.

In case of multiple NWDAF deployments the DCNF may store the data related to an Event ID locally in case a second NWDAF request to subscribe to the same Event ID. Such approach will reduce the load of signalling and the latency to retrieve the required data. The DCNF stores the data locally as long as there is an active subscription related to this Event ID from an NWDAF. The Event IDs that the DCNF may store is up to network operator configuration.

NOTE: How the DCNF stores the information locally is based on implementation and out of scope of 3GPP.

The call flow below provides the procedure.



Figure 6.X-4 - Support of multiple NWDAFs subscribing to DCNF with a list of Event ID(s)

More details of the call flow are provided below:

1. - 6.- Steps 1 through 6 are the same as the steps 1 - 8 in Figure 6.X-3.

7. - 8. The DCNF also forwards the Event Exposure Notification to NWDAF 1. The DCNF may locally store the information provided by each NF.

NOTE: How the DCNF stores the information locally is based on implementation and out of scope of 3GPP.

9. At some point a second NWDAF (NWDAF 2) may receive a request to provide analytics output. The NWDAF 2 subscribes to the DCNF for the Events required.

10 The NWDAF 2 subscribes from the DCNF with a list of one or more Events to be reported. If option 2 is used the DCNF also include the address of the NF to collect the data.

11. The DCNF subscribes for new Events or modifies an existing subscription or provides locally available Events as follows

- The DCNF uses an existing subscription to NF(s) if the request from NWDAF 2 matches to the request from NWDAF 1, i.e., the criteria for the Event ID(s) requested by the NWDAF 2 match the criteria for the Event ID(s) requested by NWDAF 1.

- The DCNF may modify an existing subscription to NF(s) if the request from NWDAF 2 can be supported by an existing Event Notification Subscription towards specific NF types. For example, the DCNF may determine that the request from NWDAF 2 requires the same Events to be reported as with NWDAF 1 but contains different criteria (i.e. targets different UEs or different service area), or the request from NWDAF 2 requires Events that can be reported by the same NF types that the DCNF has an existing subscription with.

- The DCNF creates a new subscription to NF(s) if there is no existing subscription from other NWDAF to report this Event ID.

- For all cases the DCNF maintains an internal mapping between the Event Notification subscription from each NWDAF and the Event Notification subscriptions to the NF for a particular Event ID

12. The DCNF subscribes to new Events or modifies an existing subscription according to step 11

13. The NF sends an Event Notification including the Event ID

14. The DCNF determines the NWDAF(s) to forward the Event Notification message for this Event ID based on its mapping table. The DCNF may also store the data locally and provide such local data when a new NWDAF request data associated to this Event ID.

15a.-15b The DCNF forwards the Event Notification to NWDAF 1 and/or NWDAF 2

### 6.X.2 Impacts on Existing Nodes and Functionality

Editor's note: Capture impacts on existing 3GPP nodes and functional elements.

No impacts to existing nodes and functionality.

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