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

**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.

The solution proposes Network Functions to provide the data required by the NWDAF to derive analytics to a dedicated NF that collects data from multiple NFs (Event Providers). This is illustrated below.



Figure 1 - Proposed NWDAF architecture utilising the DCNF

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 and avoiding the need to subscribe to multiple NF to collect the same data.

An example is shown in Figure 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 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.

**Update since pre-SA2 CCs**

**Addressing distributed environments**

In a distributed environment, NWDAFs may be placed at the edge of the network in order to improve the performance of collecting relevant data and providing analytics to consumer NFs at the edge. If a distributed environment contains multiple NFs, a DCNF can also be included improving the data collection. In such a case the DCNF will be configured to serve a particular area. The NRF will contain details of service areas supported and also what Event IDs it can collect.

**Addressing how long the DCNF has the data available for multiple NWDAFs.**

A DCNF will start collecting data from a NF when there is an event subscription from an NWDAF. The DCNF may keep the data available, e.g. based on configuration so as to report the data to multiple NWDAFs. If there is no NWDAF subscribing to a specific Event ID the DCNF removes the local data.

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 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 solution proposes Network Functions to provide the data required by the NWDAF to derive analytics to a dedicated NF that collects data from multiple NFs (Event Providers). This is illustrated below.



Figure 6.X.1-1 - Proposed NWDAF architecture utilising the DCNF

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 and avoiding the need to subscribe to multiple NF to collect the same 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:

- 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 relays the notification to the subscribed NWDAF.

The following signal flow describes the procedure.



Figure 6.X.1-3 - Method for the NFs to publish data to a DCNF

0. DCNF registers with the NRF. The DCNF may include in the registration request the Service Area supported (e.g. geographical area, or cell ID, TAI) and a list of S-NSSAI(s) indicating the network slices supported

1. A Consumer NF requests from the NWDAF to provide analytics. For example, an NF may request analytics on Observed Service Experience for a specific UE (identified by a SUPI) that uses a specific application on a specific DNN. The request may indicate that the analytics should be filtered on a specific area of interest or specific network slices (S-NSSAIs).

2. NWDAF discovers the DCNF from the NRF. The NWDAF may include in the request the Service Area and/or list of S-NSSAI(s) if the Analytics request in step 2 included this information.

3. The NWDAF identifies the Events that needs to be collected as per 3GPP TS 23.288 (each analytics request with specific analytic ID requires specific list of one or more Event ID(s).

4. The NWDAF subscribes from the DCNF (using the Event Exposure subscribe/notify service operation) a list of one or more Events (identified by Event ID(s), that need to be notified. The NWDAF may include an indication that the notification should be filtered in an area of interest or applicable only to specific network slices, if such information was requested in step 2. The request also includes a correlation ID.

5. The DCNF identifies the NF types that needs to be contacted based on the provided list of Event ID(s).

6. 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 subscribes 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). The DCNF may contact NFs of NF type in specific area of interest or supported network slice (identified by S-NSSAI) if the request in step 5 included such information. The request also includes a Correlation ID that is used by the DCNF to correlate this request with the subscription from the NWDAF in step 5, that is, the DCNF maintains a mapping of the subscription from the NWDAF to the subscription(s) to each NF type.

7. When an NF identifies that an Event that the DCNF has subscribed to, occurs, the NF notifies the DCNF

8. Each NF that the DCNF has subscribed to provides a notification that an Event (identified by an Event ID) has occurred. The notification includes the data associated to the Event ID and the correlation ID provided in step 7.

9. The DCNF relays the data provided by notifying the NWDAF. The DCNF identifies the EventNotification subscription message using the correlation ID.

10. The DCNF notifies the NWDAF with the relevant data

11 NWDAF builds analytics based on data collected

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.

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 may locally store the information provided by each NF and then relay the information to the NWDAF

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.

Steps 11a-12a or Steps 11b - 17b takes place

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. In such a case the DCNF relays monitoring events from an existing subscription between the DCNF and NFs and may also provide locally available data. The DCNF may store the data related to Event ID locally based on configuration. The DCNF may delete the locally available data for an Event ID when all NWDAF unsubscribe from the DCNF to report such Event.

- The DCNF modifies 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.

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

13. The DCNF relays events to NWDAF 2 based on an existing subscription or a new subscription according to step 11.

### 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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