**3GPP TSG-SA5 Meeting #142-e *S5-222064Rev01***

**e-meeting, 4 - 12 April 2022**

**Source: China Telecom**

**Title:** **pCR 28.864 new KI on NRM enhancement to support Multiple NWDAF Deployment**

**Document for: Approval**

**Agenda Item: 6.5.6**

# 1 Decision/action requested

***The group is asked to discuss and agree on the proposal.***

# 2 References

[1] 3GPP TS 23.700-91: "Study on enablers for network automation for the 5G System (5GS); Phase 2".

[2] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

[3] 3GPP TS 23.501: "System Architecture for the 5G System"

[4] 3GPP TR 28.864-000 "Study on Enhancement of the management aspects related to NWDAF"

# 3 Rationale

## 3.1 Discussion

In [1] and [2], the enhancement on architecture for supporting the deployment of multiple NWDAF instances has been introduced.

If multiple NWDAF instances are deployed, an NWDAF can act as an aggregate point (i.e. Aggregator NWDAF) and collect analytics information from other NWDAFs, which may have different Serving Areas, to produce the aggregated analytics (per Analytics ID), possibly with Analytics generated by itself.

According to [2], if multiple NWDAF instances are deployed, the architecture supports deploying the NWDAF as a central NF, as a collection of distributed NFs, or as a combination of both.

 If multiple NWDAF instances are deployed, an NWDAF can act as an aggregate point (i.e. Aggregator NWDAF) and collect analytics information from other NWDAFs, which may have different Serving Areas, to produce the aggregated analytics (per Analytics ID), possibly with Analytics generated by itself.

**Observation 1:** In case where multiple NWDAF instances are deployed, an NWDAF can act as Aggregator NWDAF, while the other NWDAFs play the role that provides analytics information to this Aggregator NWDAF.

The Aggregator NWDAF is an NWDAF instance with additional capabilities to aggregate output analytics provided by other NWDAFs. It is able to send analytics requests to the corresponding NWDAFs, and it has the "analytics aggregation capability" registered in its NF Profile within the NRF, so that a NWDAF consumer uses the discovery mechanism from NRF as defined in TS 23.501 [3] to identify NWDAFs with analytics aggregation capability and other capabilities.

**Observation 2:** The Aggregator NWDAF in multiple NWDAF deployment has "analytics aggregation capability" and has this information registered in its NF Profile within the NRF.

To perform the analytic aggregation, the Aggregator NWDAF supports the requesting and exchange of "Analytics Metadata Information" between NWDAFs when required for the aggregation of output analytics. And the parameters in "Analytics Metadata Information" can be requested by "Analytics Metadata Request" between NWDAFs.

Aggregator NWDAF might indicate "analytics metadata provisioning capability" in the discovery request sent to NRF, requesting to NRF to reply back with, if available, those NWDAF instance(s) which supports "analytics metadata provisioning capability" functionality, i.e., supports as indicated during particular NWDAF instance registration procedure.

**Observation 3:** NRF stores the NF Profile of the NWDAF instances, including "analytics metadata provisioning capability" when supported by the NWDAF.

**Observation 4:** There are interactions between NWDAFs where the Aggregator NWDAF acts as the service consumer of the other NWDAF(s) and requests "Analytics Metadata Information" to aggregate the output analytics for the requested Analytics ID(s).

The Analytics logical function (AnLF) and Model Training logical function (MTLF) are logical functions in NWDAF. The AnLF performs inference, derives analytics information, and exposes analytics service. The MTLF trains Machine Learning (ML) models and exposes new training services (e.g., providing trained ML model). NWDAF can contain an MTLF or an AnLF or both logical functions.

It is intuitive that the "analytics metadata provisioning capability" and "analytics aggregation capability" are only valid for the NWDAF containing the AnLF logical function, that is, containing only the AnLF or containing both AnLF and MTLF logical functions.

**Observation 5:** The "analytics metadata provisioning capability" and "analytics aggregation capability" are only valid for the NWDAF containing the AnLF.

The NWDAF architecture allows for arranging multiple NWDAF instances in a hierarchy/tree with a flexible number of layers/branches. The number and organisation of the hierarchy layers, as well as the capabilities of each NWDAF instance remain deployment choices.

**Observation 6:** The capabilities of each NWDAF instance are deployment choices.

## 3.2 Summary

With the above observations:

* **Observation 1:** In case where multiple NWDAF instances are deployed, an NWDAF can act as Aggregator NWDAF, while the other NWDAFs play the role that provides analytics information to this Aggregator NWDAF.
* **Observation 2:** The Aggregator NWDAF in multiple NWDAF deployment has "analytics aggregation capability" and has this information registered in its NF Profile within the NRF.
* **Observation 3:** NRF stores the NF Profile of the NWDAF instances, including "analytics metadata provisioning capability" when supported by the NWDAF.
* **Observation 4:** There are interactions between NWDAFs where the Aggregator NWDAF acts as the service consumer of the other NWDAF(s) and requests "Analytics Metadata Information" to aggregate the output analytics for the requested Analytics ID(s).
* **Observation 5:** The "analytics metadata provisioning capability" and "analytics aggregation capability" are only valid for the NWDAF containing the AnLF.
* **Observation 6:** The capabilities of each NWDAF instance are deployment choices.

we propose to have the following KI studied in TR 28.864.

# 4 Detailed proposal

Start of 1st Change

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[xa] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

[xb] 3GPP TS 28.541: "5G Network Resource Model (NRM)"

Start of 2nd Change

# 4 Key Issues and potential solutions

## 4.Y Key Issue #X: NWDAFFunction IOC enhancement to support Multiple NWDAF Deployment

### 4.Y.1 Description

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According to [xa], in the case where multiple NWDAF instances are deployed, an NWDAF can act as Aggregator NWDAF, while the other NWDAFs may play the role that provides analytics information to this Aggregator NWDAF.

For the Aggregator NWDAF in multiple NWDAF deployment, it has the "analytics aggregation capability", with which the Aggregator NWDAF is able to perform some extra tasks comparing to the normal NWDAF (i.e. the NWDAF without "analytics aggregation capability"), such as:

- divide the area-of-interest and act as the service consumer to interact with the other NWDAF(s) supporting "analytics metadata provisioning capability" to request "Analytics Metadata Information" cooresponding to multiple devided area-of-interests.

- aggregate the output analytics for the requested Analytics ID(s).

The deployment of multiple NWDAF introduces the capability of "analytics aggregation capability" and "analytics aggregation capability", which make the NWDAFs with and without such capabilities behave differently. As a result, when multiple NWDAFs are deploied, the operator may want to distinguish the NWDAF instances based on these differences, so that the management can be performed accordingly.

However, the current NWDAFFunction IOC defined in [xb] cannot reflect the differences on the NWDAF capability aspect.

In this Key Issue, the potential solution(s) is provided to enhances the NWDAFFunction IOC to support reflecting the differences on the NWDAF capability aspect in multiple NWDAF deployment.